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**Dragonflies (Odonata) of Botswana,
with ecological notes.**

by **Elliot Pinhey**

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Occasional Papers

of the National Museums and Monuments of Rhodesia

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ABSTRACT

One hundred and thirteen species of Odonata are included, with keys. Three new species are described, as well as the unknown female of *Trithemis brydeni* Pinhey.

The majority of species are from the Okavango delta which, with its permanent streams, channels, pools and swamps, as well as thick patches of bush and forest, forms a very rich Odonata region, with some close affinities to west and north west Zambia, its swamps and riparian forest streams. The Linyati-Chobe swamps also show Zambian affinities. Comparatively few records are so far available from the more arid parts of Botswana and these, as expected, are mainly of widespread species and migrants.

Expeditions which obtained Odonata are listed as well as a number of private collectors. Notes on habits and distribution, as well as a gazeteer, are included.

SOURCE OF MATERIAL

Expeditions

Numerous expeditions have assisted in the accumulation of dragonfly records:-

Transvaal Museum. March-September, 1930. Vernay-Lang Kalahari Expedition. (Material, G. van Son).

National Museum, Bulawayo. February 1967. Maun (and 50 km northwards) to Mohembo (Philip, Pinhey, Raphael); January 1970. Maun to Mohembo (Philip, Pinhey, Wheeler); March-April 1974. Maun to Mohembo and W. Caprivi, Maun to Chobe and Kasane (de Moor, Philip, Pinhey, Raphael); September 1974. Chobe rapids (Kasane) (de Moor, Philip, Pinhey, Raphael); March 1976. Savuti Channel to Linyati swamps (same team).

Falcon College (Leader: J. Stakesby Lewis), Essexvale. December 1968. Maun to Khwaai River (Pinhey, Raphael, and members of Falcon College.); August 1969. Maun to Lake Ngami (and Drotsky Caves) (Members of Falcon College.); April 1971. Nxai Pan (Philip and members of Falcon College.); December 1973. Maun to Four Rivers (Philip, Raphael, Pinhey and Falcon College.); December 1975. Maun to Four Rivers (de Moor, Philip, Pinhey, Raphael and Falcon College.)

Peterhouse School (Leader: P. J. Ginn), Marandellas. January 1974. Kalahari. Campsite Nathane-Musu; August 1974. Moremi Game Reserve; April 1975 To Toromoja, Botletle River; August 1975 Moremi Game Reserve (and Chobe River); April 1976. Nata. Odonata on these expeditions collected by one of the Tett brothers (Adrian, Christopher, David and Nicholas).

Individual collectors

The earliest available records were of Odonata collected by Lt. A. Schultze in South Africa, Süd-west-Afrika and the Kalahari (vide Ris, 1908). Recent collectors have been K. M. Adams, Nov.-Dec. 1975, near Kazungulu; G. Bailey, Feb.-May 1976, near Gaborone; and the following, mainly in the Okavango delta:- Mr. and Mrs. A. Archer, various dates; B. I. Balinsky, Apr. 1962, Dec. 1963 — Jan. 1964 (recorded Balinsky 1964, 1965); G. Guy, July 1967; T. Liversedge, various dates; R. McBee, Dec. 1974; E. C. G. Pinhey, Dec. 1965, Dec. 1974 (Kasane); P. Steyn, Aug. 1970; S. Williams and A. McDermott, May-July 1974; P. Ginn, Apr.-May 1976.

Abbreviations

Abbreviations for the main expeditions and collections are as follows: BC — Balinsky collection; FC — Falcon College expeditions; NMC — National Museum, Bulawayo, collections; NME — National Museum expeditions; TM — Transvaal Museum collections

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I should like to thank members of National Museum Staff, as well as Mr. D. K. B. Wheeler, who co-operated with the Odonata collecting; and Falcon College and their expedition leader, J. Stakesby Lewis, without whose willing assistance and encouragement this survey would have been far less complete. G. Bailey sent useful material from Gaborone district. Prof. B. I. Balinšky's records have been taken from his papers and some Transvaal Museum ones were provided by Mrs. E. Breytenbach. Anthony and Mrs. Archer, T. Liversedge, Graham Guy and the young Tett brothers all provided interesting records; Odonata of Chief's Island were sent by Steven Williams and Ann McDermott; and one of the records for *Anax bangweuluensis* Kimmins came from Mr. R. McBee of Maun Secondary School. Mike Slogrove was most helpful to our expeditions in the Chobe National Park areas.

BOTSWANA ODONATA

Ecological considerations

The Okavango River flowing south from Angola, crosses the Caprivi Strip obliquely and enters Botswana at Mohembo. It continues, accompanied by Papyrus swamp and *Phragmites*, as a fast-flowing river to Sepopa and gradually diffuses into swamps, channels and islands which form the delta. At places it is more or less fringed by thick bush or small forest patches. On the south eastern side the Thamalakane River develops out of swamp and flows past Maun to link up with the Nghabe and Botletle Rivers, the latter running sinuously eastwards to empty into the Makgadikgadi Pan. South of the delta the Nghabe river flows into the shallow Lake Ngami, of variable extent but with few Odonata taxa.

The level of the delta swamp system is maintained, with fluctuations, not only by rainfall but also by floods developing far to the north in the Okavango River. This increase of Okavango flow generally reaches Mohembo at the beginning of the year but it does not affect the southern end of the delta for several months, in fact, in the dry season.

These conditions, together with a comparative wealth of bush and woodland, provide ideal conditions for resident and migrant Odonata, making it one of the richest and most interesting Odonata ecosystems in Southern Africa. Conditions are available for species preferring stagnant pools and swamps or fast currents for others; shade for teneral adults or for sylvan species such as *Parazyxomma flavicans* (Martin). Such conditions are unfavourable for Gomphidae, except *Cinitogomphus* which is an evident palustrine.

It is believed that at one time the Upper Zambezi River flowed southwards and not on its present easterly course via Barotseland (Bond, 1975). It apparently flowed through or near the Kwando fault across the Caprivi, through what is now the Linyati-Chobe swamps, continuing southwards across the Makgadikgadi flats to join the Limpopo River. This course may have partly assisted in providing marked Odonata similarities between the swamps and

swamp-streams of western and northern Zambia, as well as east Angola, and the delta. The present link between the Kwando-Chobe River and the Okavango is through the Chobe-Linyati swamps which occasionally, in flood conditions, overflow southwestwards in the Selinda Spillway (Makwekgawa).

The Linyati swamps, fed by the Kwando River and diffusing with swamps which develop eastwards into the Chobe River, a tributary of the Zambezi River, have only been very briefly investigated for this survey but sufficient information has been obtained to show at least some affinities with Zambian swamps. In particular, *Ceriagrion bidentatum* Fraser, common in N.W. Zambia, has been found both on the Kwando River in the Caprivi and in the Linyati swamps. From these swamps the Savuti Channel, fringed with swamp, flows eastwards into Chobe National Park and provides a few taxa typical of the Okavango delta.

One further discovery (by Bailey) on the Notwane River, Gaborone, may reflect the suggested earlier course of the Zambezi River. This was the capture of *Lestes simulans* Martin, known also at the Victoria Falls and sparingly in the Okavango delta.

The Chobe River itself naturally shows Odonata affinities with the Zambezi River between the Victoria Falls and Katambora, but some species from those areas have not yet been found on the Chobe or elsewhere in Botswana although seven of them at least should occur there: *Lestes amicus* Martin (no. 1), *L. uncifer* Karsch (6), *Enallagma subtile* Ris (35), *Neurogomphus vicinus* Schouteden (48), *Paragomphus sabicus* Pinhey (53), *Anax speratus* Hagen (57), and *Trithemis aconita* Lieftinck (90). Ecological conditions for all these are to be found between Kazungulu and Linyati and so these species are included in this survey. Three other species not yet found in Botswana are also included as probable discoveries: *Agriocnemis angolensis* Longfield (37), found in the Caprivi, *Bradinopyga cornuta* Ris (83) in S.W. Africa and Matabeleland and *Rhyothemis mariposa* Ris (104), known from the W. Caprivi and common in Zambian swamps. Conditions are unsuitable for Tetratheminae, with the possible exception of *Tetrathemis polleni* (Selys).

Other regions of Botswana not mentioned above are mainly Kalahari bush with rain pools and few permanent streams. The Odonata of these areas are mostly widespread species and migrants, tolerant to various ecological conditions, sometimes to drought. For instance, in February 1967 large tracts of flat, low-lying areas between Nata and Maun were flooded by rain water and contained great numbers of only a single species, *Lestes pallidus* Rambur. Members of this genus are known to be resistant to drought conditions. Their ova remain viable in soil or mud until heavy rains provide standing water in grassland and their larvae can develop. Consequently, this genus is often the first to appear in pools or flood plains after rains commence. Brinck (1955: 206) found no Odonata at all in Kalahari pools of S.W. Botswana.

Melanic tendencies

During the February 1967 expedition all these very numerous *Lestes pallidus* in the flood plains were the melanic f. *wahlbergi* Ris, except for a few juveniles of the pale brown, more typical form. On the Maramba River near Victoria Falls I have found that the melanic form *zambeziensis* Pinhey, of *Pseudagrion glaucescens* Selys, is prevalent in quiet flooded margins of the river (Pinhey, 1964a: 74). These observations suggest that shallow flood waters induce melanism at least in certain conditions. In the Okavango delta, and elsewhere, melanics and

normal forms of a species may occur simultaneously, possibly with the gradual change to flooding. It is apparent in *Aciagrion steeleae* Kimmins, several species of *Pseudagrion* Selys Group B (Pinhey, 1964a) and *Orthetrum machadoi* Longfield.

In this connection, it may be mentioned that females of *Trithemis stictica* (Burmeister) show a very strong tendency in the Okavango swamps to have infuscated wing apices, but with a few individuals having hyaline wing-tips.

Equivalent taxa in different areas

1. Zambian and Okavango swamps. The Odonata similarities in these areas have been mentioned already and ignoring widespread taxa the ones common to both include: *Lestes pinheyi* Fraser, *Pseudagrion deningi* Pinhey, *P. fisheri* Pinhey, *P. helenae* Balinsky, *P. sjoestedti jacksoni* Pinhey, *P. rufostigma* Longfield, *Aciagrion steeleae* Kimmins, *Agriocnemis victoria* Fraser, *Cinitogomphus dundoensis* Pinhey, *Anax bangweuluensis* Kimmins, *Macromia kimminsi* Fraser, *Orthetrum machadoi* Longfield, *O. robustum* Balinsky, *Aethiothemis discrepans* Lieftinck, *Diplacodes okavangoensis* spec. nov., *Trithemis aequalis* Lieftinck, *T. brydeni* Pinhey.
2. Linyati swamps, Savuti Channel and Okavango delta. *Agriocnemis ruberrima albifrons* Balinsky, *A. victoria* Fraser, *Trithemis monardi* Ris, *Rhyothemis fenestrina* (Rambur).
3. Significant in Zambia and Linyati swamps. *Ceriagrion bidentatum* Fraser.
4. Discontinuous distribution probably attributable to inadequate locality data. *Brachythemis wilsoni* Pinhey, Okavango delta, Shaba and equatorial Africa; *Sympetrum navasi* Lacroix, Okavango system, mid-Zambezi River and equatorial Africa.

Artificial conditions

Two aspects may be mentioned. Ornithological mist nets suspended across several swamps near Four Rivers to catch Reed Warblers etc. occasionally caught Odonata. All were *Anax bangweuluensis*, except one *Pantala flavescens* (Fabricius). Secondly, at mercury vapour and ultra-violet lights in front of white sheets Odonata are quite frequently attracted. Sevastopulo has mentioned a few species at light traps near Mombasa. In the Okavango, the taxa most frequently seen at the sheets are *Pseudagrion* spp., *Agriocnemis* spp., *Lestinogomphus angustus* Martin, *Orthetrum* spp., *Hemistigma albipuncta* (Rambur), *Trithemis* spp., *Rhyothemis fenestrina* and *Pantala flavescens*. All these and the species mentioned by Sevastopulo (1972), are, in my opinion, diurnals disturbed during the light-trapping operations. The only significant species sometimes seen at sheets or in lighted rooms are crepusculars like *Gynacantha* Rambur, attracted during their normal hours of flight at dusk.

TAXONOMY

New taxa

New taxa described here are the following:-

Phyllogomphus brunneus spec. nov.

Macromia paludosa spec. nov.

Diplacodes okavangoensis spec. nov.

Metallotype ♀ of *Trithemis brydeni* Pinhey.

Odonata in Botswana may be broken down into families, with reference to species numbers used in this survey:-

Family	Ref. nos.	Actually recorded	Probables not recorded
Lestidae	1-6	4	2
Protoneuridae	7-8	2	
Platycnemididae	9	1	
Coenagrionidae	10-41	30	2
Calopterygidae	42	1	
Chlorocyphidae	43	1 (sight record)	
Gomphidae	44-53	8	2
Aeshnidae	54-59	5	1
Corduliidae	60-63	4	
Libellulidae	64-113	47	3
Total		recorded 103	expected: 10 species

KEY TO THE MAJOR GROUPS OF BOTSWANA ODONATA (ADULTS)

1. Forewing and hindwing very similar in shape. Discoidal cell an obliquely placed quadrilateral. Head broad transversely, eyes widely separated. suborder ZYGOPTERA 2
 — Hindwing broader near base than forewing. Discoidal cell a triangle, its axes transverse or longitudinal. Head compact, eyes in contact (except in Gomphidae) suborder ANISOPTERA 7
2. Each wing with 4 or more antenodal cross veins (Ax). Discoidal cell with cross-veins superfamily **Calopterygoidea** 6
 — Each wing with only 2 antenodal cross veins. Discoidal cell not crossed. 3
3. Pterostigma elongated, rectangular, above 2 or more cells. superfamily **Lestinoidea** family LESTIDAE
 — Pterostigma a square, rhomboid or parallelogram, 1 cell long or less. superfamily **Coenagrionoidea** 4
4. Anal vein 1A absent or not reaching beyond discoidal cell. family PROTONEURIDAE
 — 1A well developed, extending well beyond discoidal cell. 5
5. Discoidal cell almost rectangular. Longitudinal veins mainly straight. family PLATYCNEMIDIDAE
 — Discoidal cell with lower distal angle acute. Longitudinal veins irregular distally family COENAGRIONIDAE
6. Wings very broad, not strongly narrowed at base. Discoidal cell with many cross veins. Pterostigma very short or absent. family CALOPTERYGIDAE
 — Wings narrow, broadly constricted at base. Discoidal cell with only 1 or 2 cross veins. Pterostigma elongated. family CHLOROCYPHIDAE

7. Antenodal cross veins not mainly coincident in costal and subcostal spaces. Discoidal cells of fore- and hindwing similar in shape and well distal to arculus superfamily **Aeshnoidea** . . . 8
 — Antenodal cross veins coincident in costal and subcostal spaces. Discoidal cells very different in shape in the two wings, and close to arculus at least in hindwing superfamily **Libelluloidea** . . . 9
8. Compound eyes well separated family GOMPHIDAE
 — Compound eyes in contact with each other family AESHNIDAE
9. A few of the antenodal cross veins thickened (primary Ax). Posterior lateral margin of eye with a slight projection family CORDULIIDAE
 — Without primary antenodal cross veins. Eye without posterior lateral projection family LIBELLULIDAE

Suborder ZYGOPTERA (Damselflies)

The dominant zygopteran genera in Botswana are *Lestes* Leach and *Ceriagrion* Selys, represented by only few species, and the large genus *Pseudagrion* Selys.

Superfamily LESTINOIDEA

Family LESTIDAE

Only one genus is represented.

LESTES Leach (1815)

The species concerned in this review are distinguishable from other Zygoptera of similar dimensions by the elongated pterostigmata and slender body. In life they rest on grasses, sedges or other vegetation with their wings half open, unlike other Botswana damselflies which close their wings together. African members of the genus *Lestes* require revision but the few representatives in the fauna under review are moderately easy to distinguish.

During the earlier months of the summer the commonest species in the Okavango delta is *L. pinheyi* Fraser but soon after the heavy rains *L. pallidus* (Rambur) and especially its melanic form *wahlbergi* Ris become abundant in many parts of northern Botswana.

Some members of this genus, especially *pallidus* are notable as the first Odonata of the season to invade rain pools.

Key to *Lestes*

1. Wings all dark yellow, browner apically. Pterostigma long, at least 2.5 mm, cream between black veins. Synthorax with regularly shaped iridescent green bands. Superior appendages forcipate *L. amicus* Martin
 — Wings clear hyaline, at most somewhat greyish yellow in old males, the apices not brown. Pterostigma 2 mm or less 2
2. Superior appendages of ♂ distinctly down-turned in outer half. Thorax with metallic green or blue bands in both sexes, abdomen also metallic dorsally 3
 — Superior appendages of ♂ forcipate. Thorax and abdomen with or without black markings but not metallic 5
3. Mesepisternum of thorax with slender, regular green stripes; in mature ♂ broadly pale blue pruinose but with green and black lines still evident *L. plagiatus* (Burmeister)
 — Mesepisternum with broader green bands usually very irregular and with black spots 4

4. Abdomen less than 34 mm. Apical portion of superior appendage slender, digitate, turned down at a right angle; inferior appendage without apical spine. Pterostigma 1,5 mm. Synthorax of ♂ broadly metallic green dorsally, mesepimeron mainly black; in ♀ or immature ♂ the metallic band very irregular *L. pinheyi* Fraser
 — Abdomen 37 mm or more. Apical portion of superior appendage (less sharply) down-turned to thin hairy blades; inferior very short, bulbous, with fine apical spine. Pterostigma about 2 mm. Synthorax with duller irregular fasciae *L. uncifer* Karsch
5. Thorax with prominent black dorsal and lateral spots (partially obscured in mature pruinose male). Superior appendage of ♂ with bluntly rounded inner basal tooth *L. simulans* Martin
 — Thorax pale to reddish brown or heavily blackened but without spots or only traces of 1-2 dots. Superior appendage of ♂ with sharp inner basal tooth 6
6. Thorax plain brown, sometimes with 1-2 dark spots. Pterostigma brownish yellow to brown. Segments 9-10 with brown mid-dorsal line. Superior appendage brownish cream *L. pallidus* Rambur
 — Thorax, at least in ♂, heavily blackened, especially at sides. Pterostigma dark brown. Segments 9-10 all black, but in ♀ sometimes paler brown with dark brown dorsal line. . . . *L. pallidus* f. *wahlbergi* Ris
 Intergrades occur between *wahlbergi* and typical *pallidus*.

1. **Lestes amicus** Martin, 1910: 85, 91

Plate 1: 1

Described originally from Mozambique this distinctive deep yellow-winged species with brown wing-tips has been found in southern Tanzania, northern Zambia and Shaba, as well as the "rain forest" at the Victoria Falls. It is probable that it may be found in thicker bush near the Chobe river but so far I have no Botswana records.

2. **L. pallidus** Rambur, 1842: 252

Lestes ictericus Ris (*nec* Gerstaecker), 1921: 270

Lestes wahlbergi Ris, 1921: 272

L. pallidus was said to have been described from the Cape, despite the fact that the type female bears a Senegal label (Gambles, 1976). The usual red-brown form found in Botswana has been attributed to *ictericus* Ris, not to *ictericus* Gerstaecker (1869) which Gambles indicates, from examination of the type, is a different species. During my first visit to the Okavango delta in February 1967 the melanic form *wahlbergi* was in vast numbers in rain pools between Nata and Maun. A few less mature red-brown examples were referable to f. *pallidus*, with intermediates in all stages to very black *wahlbergi*.

Despite this abundance, *wahlbergi*, according to my records, is restricted in its range: South West Africa, southern Angola, northern Botswana, Matabeleland and Ris' original locality "Caffraria". I am inclined to regard *wahlbergi* as a melanic form conditioned by flood-conditions.

Botswana records.

NMC: Lethlakane Jan. 1959; 80-140 km N.W. of Francistown Febr. 1967 (NME); Nata, Gweta and Makgadikgadi Pan Febr. 1967, March 74 (NME); Nxai Pan Apr. 1971 (Philip); 15-30 km S. of Maun Febr. 1967, March 1974 (E.P., F.d.M.); Toteng March 1974 (NME); Sehitwa Febr. 1967 (NME); Tsau Febr. 1967 (NME); Sepopa Febr. 1967, March 1974 (NME); 100 km N. of Maun Dec. 1968, Apr. 1974 (NME); Khwaai R. Dec. 1968 (FC); Chobe Nat. Park (S. Gate) and Kachikau Apr. 1974 (NME); Chobe Rapids (Kasane) Sept. 1974 (NME); Goha Hills Apr. 1974, March 1976 (NME); Savuti Channel camp March 1976 (NME).

TM: Tsotsorogo Pan June-July 1930 (G. van Son); Metsimaklaba March 1930 (G. van Son).

BC: Moremi Game Reserve Dec. 1963 - Jan. 1964 (*wahlbergi*).

Schultze: recorded this species (as *ictericus*) in pans in S. Botswana (Ris, 1908).

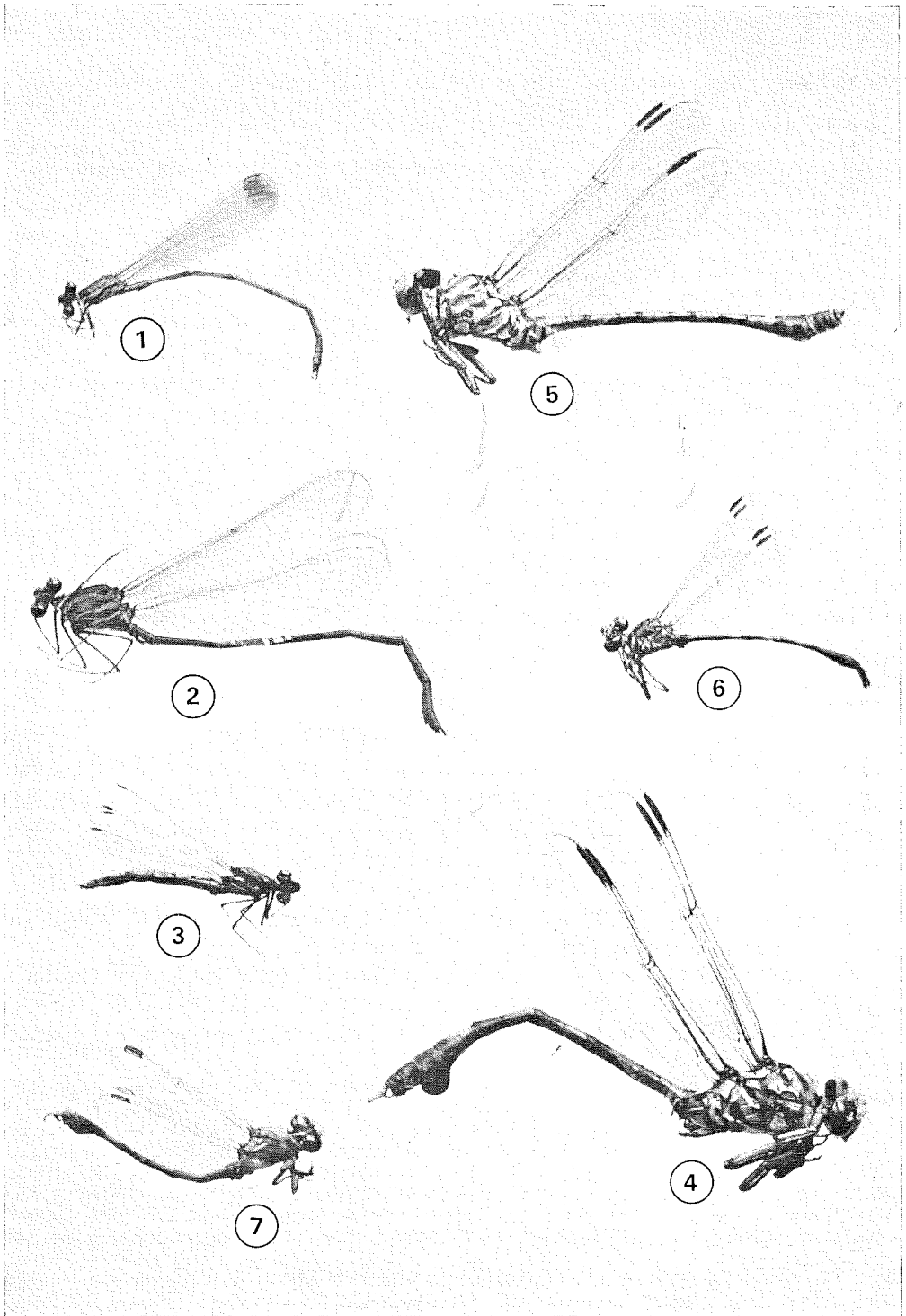


Plate 1:

1. *Lestes amicus* ♂, 2. *Phaon iridipennis* ♂, 3. *Platycypha caligata* ♂, 4. *Ictinogomphus ferox* ♂, 5. *Cinitogomphus dundoensis guyi* ♂, 6. *Lestinogomphus angustus* ♂, 7. *Paragomphus genei* ♂.

3. **L. pinheyi** Fraser, 1955c: 10

Described from Mashonaland, this species occurs also in Zambia and through Zaire northwards to N. Nigeria. In Botswana it is particularly common in Okavango woodland and grassland, at pools and swamps.

Botswana records.

NMC: Maun Dec. 1968, Dec. 1975 (FC); Nghabe R. (S. of Maun) March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); Xaro (S. of Shakawe) March 1974 (NME); Shakawe Jan. 1970 (NME); Khwaai R. Dec. 1968 (FC); Moremi S. Gate Dec. 1975 (FC); Four-Rivers Dec. 1973, Dec. 1975 (FC); Xugana Lagoon Dec. 1973, Dec. 1975 (FC); Xugana — Gadikwe Dec. 1973 (FC); Chobe rapids (Kasane) Sept. 1974 (NME); Linyati Expl. camp March 1976 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

4. **L. plagiatus** (Burmeister)

Agrion plagiatum Burmeister, 1839: 824

Described originally from Durban, this species is found in open bush or dry savannah from South to equatorial Africa.

Botswana records.

NMC: Notwane River, S. of Gaborone Febr., May 1976 (G. Bailey).

5. **L. simulans** Martin (1910)? subsp.

Although this differs slightly from true *L. simulans* I am not prepared to describe it as a new taxon until the African *Lestes* have been revised. Martin stated that *simulans* was described from "Afrique continentale, probablement orientale". In the National Museum there are examples placed under *simulans* from Congo Rép. (Brazzaville), W. Uganda and Nigeria. The undescribed taxon, probably a subspecies, is from Mashonaland, Mozambique, Victoria Falls, a series from Khwaai River and one pair from Mohembo. Bailey collected one male in the south of Botswana, affording slight support to the former southward flow of the Zambezi River.

Botswana records.

NMC: Mohembo March 1974 (NME); Khwaai R. Dec. 1968, Dec. 1973 (FC); Notwane River, 23 km S. of Gaborone 18 Febr. 1976 (G. Bailey).

6. **L. uncifer** Karsch, 1899: 381

Described originally from E. Tanzania this large species occurs locally between Mozambique and Victoria Falls, northwards to tropical East and West Africa. I have nowhere seen it in large numbers, unlike the closely allied *pinheyi*. It may perhaps occur in bush or woodland on the Chobe River.

Superfamily COENAGRIONOIDEA

family PROTONEURIDAE

A small family whose members are chiefly found in woodland and forest or in shaded places along streams. Only one genus and two species are known at present from Botswana.

ELATTONEURA Cowley (1935)

Slender species with broad heads. Mature males broadly pruinose blue on thorax; females and immature males very pallid to pale brown. The females have two pairs of characteristic strap-like stylets on the prothorax.

Key to *Elattonneura*

1. ♂: Superior appendage with ventral flange bearing a small hook with a second smaller one above it; ♀: anterior stylets long and out-turned, posterior stylets much shorter, inturned *E. glauca* (Selys)
— ♂: Superior appendage with ventral flange ending in one hook; ♀: anterior and posterior stylets short and broad, the posterior not much inturned *E. tropicalis* Pinhey

7. *Elattonneura glauca* (Selys)

Disparoneura glauca Selys, 1860: 443

Although well distributed from the Cape Province to equatorial Africa there are few Botswana records. In March 1974 it was collected north of Mohembo in the S.W. African Caprivi at places between the frontier and Andara (NME).

Botswana records.

NMC: Xaro (S. of Shakawe) March 1974 (NME); Shakawe Febr. 1967 (NME).

8. *E. tropicalis* Pinhey, 1974b: 1

Prior to 1974 this species was confused with *E. frenulata* (Hagen, 1860) of the S.W. Cape Province and later found in Angola. *E. tropicalis*, described from Victoria Falls, is widespread in subtropical and tropical East and West Africa. It is normally larger than *frenulata* and *glauca*. So far we only have a single Botswana locality.

Botswana record.

NMC: Chobe rapids (Kasane) Sept. 1974 (NME).

Family PLATYCNEMIDIDAE

In Africa the principle genus is *Platycnemis* Charpentier, well known in the Palaearctic region but in this continent confined to equatorial swamp forests. Only one genus and species known in our area.

MESOCNEMIS Karsch (1891)9. *Mesocnemis singularis* Karsch, 1891b: 67

Widely distributed in subtropical and equatorial Africa, favouring streams or rivers with moderately fast currents. In March 1974 it was collected at Andara (NME) in the western Caprivi.

Botswana records.

NMC: Shakawe Jan. 1970 (NME); Chobe rapids (Kasane) Sept. 1974 (NME).

Family COENAGRIONIDAE

Although six genera are represented here they are dominated by the large genus *Pseudagrion* Selys. Certain *Ceriagrion* Selys, *Agriocnemis* Selys and the ubiquitous *Ischnura senegalensis* (Rambur) are widely distributed, especially in the delta.

Key to genera

1. Anal vein leaves posterior margin at Ac or less than the length of Ac before this vein 2
 — Anal vein leaves margin at least the length of Ac before this vein 4
2. Ac nearer to first than to second Ax. No postocular spots. Frons with sharply angled crest, the face projecting forwards. Abdomen red or reddish brown, rarely suffused in ♂ with black. *Ceriagrion* Selys
 — Ac usually halfway between antenodals or nearer second Ax. Frons rounded, without sharp crest. Postocular spots generally present. Abdomen not plain red or red-brown; almost always with a distinct black dorsal band 3
3. Pterostigma a parallelogram with upper distal angle acute. Forewing varying from 10-14 Px. ♀ without vulvar spine on 8th sternite *Pseudagrion* Selys
 — Pterostigma shorter or more rhomboidal. Forewing with 9-12 Px. ♀ with vulvar spine on 8th sternite *Aciagrion steeleae* Kimmins
4. Arculus situated far beyond 2nd Ax. Quadrilateral of forewing with anterior edge about half of posterior edge. Small species *Agriocnemis* Selys
 — Arculus at 2nd Ax or shortly after it. Quadrilateral of forewing with anterior edge less than half of posterior edge. Mostly of moderate size 5
5. ♀ without vulvar spine on 8th sternite some *Pseudagrion* Selys
 — ♀ with vulvar spine on 8th sternite 6
6. Postclypeus with strong metallic sheen. ♂: pterostigma of forewing half blue, half white; 10th segment in ♂ strongly raised; inferior appendages long, turned obliquely upwards *Ischnura senegalensis* (Rambur)
 — Postclypeus non-metallic. ♂: pterostigma plain; 10th segment not usually strongly raised; inferior appendages not so *Enallagma* Charpentier

CERIAGRION Selys (1876)

Four species have been recorded from Botswana, including the ubiquitous *C. glabrum* and the tropical forest species *C. bidentatum*. A dubious record of a teneral female of *C. sakeji* Pinhey (Pinhey 1967: 9) has proved to be *C. suave* Ris.

Key to *Ceriagrion*

1. Inferior anal appendage longer than superior appendage and having a sharp posterior tooth. Arculus beyond 2nd Ax. Head and thorax very green. Epaulette of ♀ with black streak from it along posterior edge of mesostigmal lamina *C. bidentatum* Fraser
 — Inferior appendage not longer than superior, sometimes shorter. Arculus at 2nd Ax. Head and thorax rarely green in ♂. Epaulette in ♀ without black streak 2
2. Vertex at least partly blackish brown; abdominal segments more or less suffused with black. Superior appendage extending horizontally backwards, distinctly longer than inferior. Inferior with sharp posterior tooth. Cerci of ♀ slender; posterior lobe of prothorax well arched at sides *C. katamborae* Pinhey
 — Vertex and abdomen not blackish brown or black. Superior appendage curved downwards, not distinctly longer than inferior. Inferior without sharp posterior tooth. Cerci of female conical 3
3. Segment 10 in ♂ with prominent dorso-lateral teeth; inferior appendage with rounded posterior swelling. Posterior lobe of prothorax in ♀ evenly curved; a prominent round black epaulette *C. glabrum* (Burmeister)
 — Segment 10 in ♂ without teeth, deeply invaginated dorsally; inferior appendage broadly curved posteriorly. Posterior lobe of prothorax in ♀ more or less kinked laterally; epaulette rather rounded but less developed *C. suave* Ris

10. *Ceriagrion bidentatum* Fraser, 1941b: 64

Described from Uganda, this is a forest species recorded also from Nigeria and Zaire and it occurs in Angola, Zambia and Malawi. Brown collected one female on the Kwando River, Caprivi, April 1970. On the National Museum expedition in 1976 Philip captured a male in forest fringing the Linyati swamps.

Botswana records

NMC: Linyati Explor. camp 12 March 1976 (NME).

11. *C. glabrum* (Burmeister)

Agrion glabrum Burmeister, 1839: 821

Described originally from the Cape Province this red species (the female often with a green thorax) is widespread and abundant in the Ethiopian region, including the islands, and Arabia. It may be found in open country, woodland or dense bush. It is evidently widespread in Botswana. A ♀ at Xugana, 5 Dec. 1975, was captured with dipterous prey (Muscidae).

Botswana records.

NMC: Nxai Pan Apr. 1971 (Philip); Botletle R. Febr. 1967 (NME); Maun Dec. 1975 (FC); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970 (NME); Khwaai R. Dec. 1968 (FC), Febr. 1969 (T. Liversedge); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Meakome camp Dec. 1973 (FC); Serondella camp (Chobe Nat. Park) and Kasane Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams); Savuti Channel and Linyati swamps March 1976 (NME); Notwane R., Gaborone, Febr. — March 1976 (G. Bailey).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

12. *C. katamborae* Pinhey, 1961a: 20

Described from Katambora, Zambezi River (west of Livingstone, Zambia), this species was collected sparingly there and in N.W. Zambia. Balinsky first recorded it in the Okavango swamps and it was moderately common between Maun and Sepopa in 1967. Only a single male was collected at Four Rivers in 1973 but numbers were seen there in Dec. 1975. The male is variable in colours, from red, to heavily melanized specimens and the face is often bright pink, the labrum occasionally pale blue in immature examples. Examples *in copula* have been collected. It evidently favours swamps rather than pools and streams where other *Ceriagrion* may be abundant.

Botswana records.

NMC: Maun Febr. 1967 (NME); Sepopa Febr. 1967 (NME); Shakawe and Mohembo Jan. 1970 (NME); Mboma (Moremi) Feb. 1969 (T. Liversedge); Txaxanika (Moremi) Aug. 1975 (N. Tett); 13 km N. of Maun Feb. 1967 (NME); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1975 (FC).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

13. *C. suave* Ris, 1921: 316

Described from Katanga (Shaba), this has been recorded rather sparingly between Rhodesia and equatorial Africa. It has been found in several areas in the delta but far less commonly than *glabrum*. In Dec. 1973, for instance, a special search for this species was made in the Four Rivers area but only 1 ♂, 2 ♀ were discovered in woodland amongst large numbers of

glabrum. In Dec. 1975 it was only slightly commoner in the same locality. It occurs in the Andara region of the western Caprivi.

In the male the pterostigma is brown with a pinkish white edge, framed in pale brown. In *glabrum* the edge of this stigma is creamy white. In life, the eye of male *suave* is yellowish green with an olive dorsal cap and a brown horizontal ring slightly below the cap. In a juvenile female the eye is dull olive above, whitish cream below.

Botswana records.

NMC: 16 km S. of Maun Dec. 1968 (FC); Sepopa and surroundings Febr. 1967, March 1974 (NME); Xaro (S. of Shakawe) Nov. 1973 (T. Liversedge); Shakawe Febr. 1967, Jan. 1970 (NME); Mohembo March 1974 (NME); Moremi S. Gate Dec. 1975 (FC); Khwai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana and Xugana Lagoon Dec. 1975 (FC); Chobe rapids (Kasane) Sept. 1974 (NME); Linyati Explor. camp April — May 1976 (P. Ginn).

PSEUDAGRION Selys (1876)

This, by far the largest African genus of Odonata, was revised by Pinhey (1964a), the members being divided into two Groups A and B on characters of both sexes. Group A includes many species, some widespread in continental Africa, such as *P. kersteni* (Gerstaecker), *P. salisburyense* Ris and *P. spernatum* Karsch. Most of the species are dark on the thorax and of larger size than the average B species. Those in B, apart from being generally smaller, with smaller anal appendages, have a tendency to be broadly blue, green or red on the thorax, with infraspecific varieties having more black on the thorax. *P. deningi* Pinhey and *P. commoniae* Förster are exceptionally dark for Group B. The overall distinguishing features in the two groups depend, however, on the presence or absence of terminal spines on segment 10 in the male and of modification to the lamina of the mesothorax in the female.

Prior to the 1973 Falcon College Expedition 11 species of *Pseudagrion* had been collected in the Okavango swamps and all, rather surprisingly, belonged to Group B. It was thought (Pinhey, 1967: 5, 6) that Group A had not penetrated the swamps or perhaps they had been eliminated by ecological changes. On this 1973 Falcon College expedition to Four Rivers, however, two females were captured at Xugana which were Group A and appeared to be *P. fisheri* Pinhey, a local species described from N.W. Zambia. The 1975 Falcon College expedition to the same area confirmed this record by the collection of two more females and one male at Xugana by African Assistant Raphael. In more arid zones both groups can be expected.

Key to *Pseudagrion*

Males (mature)

- 1. Segment 10 without terminal dorsal spines (Group A) 2
- Segment 10 with flattened terminal dorsal spines (Group B). Inferior appendage always short 3
- 2. Labrum more or less green, postclypeus green with black basal line. Synthorax all pruinose blue in mature ♂, black with fine pale yellowish antehumeral stripe in juvenile, but not metallic. Superior appendage very short, narrowly branched; inferior much shorter. Abdomen 30 mm or less *P. salisburyense* Ris
- Labrum orange-yellow, postclypeus all black. Synthorax greenish bronze-black with narrow yellow antehumeral stripe. Superior appendage broadly forked; inferior unusually long, almost as long as superior. Abdomen 33 mm or more *P. fisheri* Pinhey

3. Vertex and synthorax all black 4
— Back of head with postocular spots, synthorax black with pale antehumeral stripes or all brightly coloured on mesepisternum 6
 4. Face and legs all black. Inferior appendage longer than superior appendage
..... *P. commoniae nigerrimum* Pinhey
— Tibiae reddish brown. Inferior appendage not longer than superior 5
 5. Face all red. Superior appendage small and short *P. whellani* Pinhey
— Face green, but postclypeus black. Superior appendage massive, oblique *P. deningi* Pinhey
 6. Synthorax greenish black with narrow yellow antehumeral stripe. Superior appendage short, with broad *inner* flange; inferior upturned *P. sudanicum rubroviride* Pinhey
— Synthorax either all bright, pale-coloured or black with broad red, blue or green antehumeral stripes 7
 7. Face blue or green 8
— Face red or orange 12
 8. Branches of superior appendage distinct and in horizontal field *P. helenae* Balinsky
— Superior appendage unbranched or with branches below one another in vertical field 9
 9. Superior appendage much shorter than segment 10 10
— Superior appendage approximately as long as segment 10 11
 10. Segment 2 with U-shaped or cat's head black marking *P. glaucescens* Selys
— Segment 2 with spear-head marking *P. assegaai* Pinhey
 11. Lower branch of superior appendage angled at one third from apex of main branch, the lower branch without basal spine. Segment 2 with a black cat's head mark *P. coelestis* Longfield
— Lower branch of superior not angled, extending right to base of appendage and having a basal spine. Segment 2 with U-shaped mark *P. nubicum* Selys
 12. Synthoracic dorsum mainly red 13
— Synthoracic dorsum mainly black with red or reddish antehumeral stripes (sometimes obscured at maturity) 15
 13. Inferior appendage large, upturned *P. acaciae* Förster
— Inferior appendage hatchet-shaped, i.e. horizontal with a dorsal swelling 14
 14. Thorax bright red, not pruinose. Superior appendage not longer than inferior appendage
..... *P. massaicum* Sjöstedt
— Thorax pruinosed to a purplish red. Superior appendage distinctly longer than inferior
..... *P. sublacteum pseudomassaicum* Pinhey
 15. Vertex mainly red. Antehumeral stripe rather clubshaped or irregular .. *P. sjöstedti jacksoni* Pinhey
— Vertex red and black. Antehumeral stripe more regular, not club-shaped 16
 16. Frons red. Antehumeral stripe bright red *P. rufostigma* Longfield
— Frons partly black. Antehumeral stripe orange or dull red *P. whellani* Pinhey
- Females
1. Mesothorax with a narrow black epaulette (Group A) 2
— Mesothorax without an epaulette (Group B) 3
 2. Prothorax with long stylets. Synthorax black dorsally with broad yellow or greenish yellow antehumeral stripes; a dorsal black spot on second lateral suture. Cerci short and thick. Abdomen 29 mm or less *P. salisburyense* Ris
— Prothorax without epaulettes. Synthorax greenish black with narrow yellow antehumeral stripes; a black stripe on second lateral suture. Cerci almost as long as segment 10. Abdomen over 30 mm ..
..... *P. fisheri* Pinhey
 3. Prothoracic stylets absent or reduced to kinks on hind margin of posterior lobe 4
— Prothoracic stylets measurable, extending one quarter or more across middle lobes 9
 4. Hindlobe of prothorax distinctly trilobed. Labrum with broad black basal band; postclypeus all black. Mesostigmal lamina forming a high black vertical ridge. Synthorax black to well below humeral suture, the antehumeral stripe severed in middle. Femur with two black stripes *P. deningi* Pinhey
— Hindlobe complete, not divided. Labrum without black band; postclypeus all pale or with minute dots. Mesostigmal lamina if raised is mainly yellow. Femur with one black stripe 5

5. Synthorax black down to below humeral suture with pale antehumeral half as wide as mesepisternum. Prothoracic stylets in form of vestigial lumps. Mesostigmal lamina very narrow. Synthorax laterally with stripe on first lateral suture, a dorsal spot on second lateral suture *P. sudanicum rubroviride* Pinhey
 — Synthorax mainly pale, the black not extending directly below humeral suture, but with short lines or traces on lateral sutures 6
6. Postclypeus with three small black basal dots. Prothoracic stylets as vertical traces on posterior edge of posterior lobe. Mesostigmal lamina a raised yellow ridge, black behind this. Femora with thick black stripes *P. massaicum* Sjöstedt
 — Postclypeus without basal dots. Prothoracic stylets absent or forming anterior swellings on edge of posterior lobe 7
7. Prothoracic stylets absent. Mesostigmal lamina like *massaicum* *P. sublacteum pseudomassaicum* Pinhey..
 — Prothoracic stylets present as small kinks 8
8. Mesostigmal lamina with straight yellow anterior ridge and curved black posterior ridge *P. communiae nigerrimum* Pinhey
 — Mesostigmal lamina with thin, curved yellow anterior ridge, then a black depression and posteriorly a thin black ridge *P. whellani* Pinhey
9. Prothoracic stylets extending at least halfway across middle lobe of prothorax 10
 — Prothoracic stylets short, extending one third or one quarter across middle lobe 12
10. Abdomen long and slender, over 30 mm. Mesostigmal lamina a yellow triangle with broad straight black posterior ridge. Femora each with two black lines. Pterostigma a parallelogram, the upper distal angle not extended *P. glaucescens* Selys
 — Abdomen 26 mm or less. Mesostigmal lamina a pale triangle with curved black posterior ridge. Femora with single black stripes. Upper distal angle of pterostigma more or less extended 11
11. Prothoracic stylet all yellow. Side of thorax without stripe on first lateral suture ?*P. helenae* Balinsky
 — Prothoracic stylet yellow with black tip. Side of thorax with black stripe on first lateral suture
 *P. nubicum* Selys
12. Stylet extending only a quarter or less across middle lobe. Side of thorax with only dorsal dots on sutures or nil. Femur with brown lateral stripe or trace 13
 — Stylet extending about a third across middle lobe. Side of thorax usually with stripe on first lateral suture (occasionally only trace). Femur with black stripe 14
13. Mesostigmal lamina with broad yellow ridge, with black posteriorly below this ridge. Femora with only traces of brown *P. acaciae* Sjöstedt
 — Lamina a black triangle with straight yellow anterior ridge. Femora with brown lateral stripe
 *P. assegaii* Pinhey
14. Postclypeus with three black spots or these linked up broadly. Mesostigmal lamina a small black triangle, yellow on thin anterior curved ridge, black posterior ridge *P. rufostigma* Longfield
 — Postclypeus with three small dots or all black. Mesostigmal lamina not small, with thick curved yellow anterior ridge, thin black posterior ridge *P. sjöstedti jacksoni* Pinhey

PSEUDAGRION Group A

14. *Pseudagrion fisheri* Pinhey, 1961a: 29

Hitherto this species, described from N. Mwinilunga district, has only been found in N. and N.W. Zambia and near Caianda in east Angola. Females were discovered at Xugana in 1973 and both sexes on an island in Xugana Lagoon in Dec. 1975. The only difference in markings between the populations is that the labrum in the Xugana females is greener than the greenish ochreous described in 1961 for Mwinilunga females, but this may be individual or developmental. There is no clear-cut subspecific distinction.

In life the eye of a Xugana ♀ was green with an olive horizontal ring in the centre and an olive-brown cap; labrum bright green.

Botswana records.

NMC: Xugana — Gadikwe 9 Dec. 1973 (FC); Xugana Lagoon 6, 8 Dec. 1975 (FC).

15. *P. salisburyense* Ris 1921: 306

Described from South Africa and Rhodesia, this species is widespread from South to equatorial Africa in bush or savannah. It prefers rivers and streams to stagnant waters. In Botswana it is known in the drier areas.

Botswana records.

NMC: Notwane River and Thlwane River, S. of Gaborone Febr. — May 1976 (G. Bailey).

PSEUDAGRION Group B16. *Pseudagrion acaciae* Förster, 1906a: 56

Described originally from the Transvaal this is a slender species with red head and thorax. It is common in many parts of Africa from Natal to Egypt and Tripolitania, except, apparently, the western equatorial region. It is not a palustrine species but favours running water in streams and rivers.

Botswana records.

NMC: Shakawe Febr. 1967, March 1974 (NME); Chobe rapids (Kasane) Dec. 1974 (NME).

17. *P. assegaii* Pinhey, 1950a: 261

Described from the Transvaal and Mashonaland, this blue species is found also in Matabeleland and Zambia but it is generally very local. It differs in the male from other blue species by the black spear-head marking on segment 2, instead of the U-shaped or cat's head formation in other blue species.

Botswana records.

NMC: Maun Febr. 1967 (NME), Dec. 1968 (FC); 17 km S. of Maun March 1974 (NME); 25 km N. of Maun Febr. 1967 (NME); Moremi S. Gate Dec. 1975 (FC); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1975 (FC); Savuti Channel camp March 1976 (NME); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams).

BC Moremi Game Res. Dec. 1963 — Jan. 1964.

18. *P. coelestis* Longfield, 1945: 9, 28

Pseudagrion coelestis samfyae Pinhey, 1964a: 95

A local blue species closely related to *P. nubicum* Selys but much less widespread. Originally described from S. Angola, *coelestis* is found in the Zambezi Valley and south central Africa and it is common and widespread across northern Botswana. The taxon *samfyae* is a melanised form, not a subspecies, and was collected amongst typical *coelestis* in March 1974. It is not always common in the depth of the swamps: for instance, at Four Rivers only 1♂ was collected in Dec. 1973 and none in Dec. 1975.

In life the eye of the ♂ is ventrally pale blue, above this a black horizontal ring, then a grey-blue zone and, finally, a brown dorsal cap. Postocular spots sky blue. Antehumeral stripes pale blue, end segments of abdomen sky blue.

Botswana records.

NMC: 80 km N.W. of Francistown Febr. 1967 (NME); Botletle R. and Makala-ma-bedi Febr. 1967 (NME); Maun Febr. 1967 (NME), Dec. 1968 (FC), March 1974 (NME); 17 km S. of Maun March 1974,

Nghabe R. (33 km S. of Maun), Toteng, Tsau and Nokaneng Febr. 1967 (NME); Lake Ngami Aug. 1969 (FC); Sepopa Febr. 1967, March 1974 (NME); Shakawe Febr. 1967, March 1974 (NME); 14 km N. of Maun Febr. 1967 (NME); Khwaai R. Dec. 1968 (FC); Four Rivers (1♂) Dec. 1973 (FC); Chobe Park (W. Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME), Dec. 1974 (E. Pinhey).

19. **P. commoniae nigerrimum** Pinhey

Erythromma commoniae Förster, 1902: 69

Pseudagrion nigerrimum Pinhey, 1950a: 265

P. commoniae was described from Eritrea; *nigerrimum*, possibly a form, not a subspecies, was described from the Zambezi River. This very black species occurs from Mozambique and Rhodesia northwards to Eritrea. Like *acaciae* it favours streams and rivers with moderate currents.

Botswana records.

NMC: Chobe Park Apr. 1974 (NME); Chobe rapids (Kasane) Apr. 1974, Sept. 1974 (NME); Notwane R., Gaborone March 1976 (G. Bailey).

20. **P. deningi** Pinhey, 1961a: 28

Described from Lake Bangweulu, Zambia, this was reported from the Okavango delta by Balinsky and it was found to be abundant there on the Museum expedition of 1967. It is a very black species, like the previous one, but smaller, with unusually massive superior appendages in the male, a trilobed prothoracic hindlobe and broken antehumeral stripes in the female.

Botswana records.

NMC: Botletle R. July 1967 (G. Guy); Maun Febr. 1967 (NME), Dec. 1968 (FC); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970, March 1974 (NME); 14 km N. of Maun Febr. 1967; Mboma (Moremi) Febr. 1969 (T. Liversedge); Txatxanika (Moremi Game Res.) Aug. 1970 (P. Steyn), Aug. 1975 (N. Tett); Khwaai R. Dec. 1968 (FC); Jugu Jugu (Boro R.) July, Aug. 1974 (S. Williams & A. McDermott); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Lagoon Dec. 1975 (FC); Savuti Channel camp and Savuti Channel West, March 1976 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

21. **P. glaucescens** Selys, 1876a 42(2): 498

Pseudagrion glaucescens f. *zambeziensis* Pinhey, 1964a: 73

This long, slender blue species was described originally from Sierra Leone and is, in fact, widespread from the Zambezi Valley to equatorial E. and W. Africa. The melanic form *zambeziensis*, described from the Victoria Falls, appears to develop during flood conditions, possibly in the shallower waters overflowing the banks of streams. The species favours streams and rivers, rather than pools. In Botswana it was first discovered on the Thamalakane River, Maun, on the Museum expedition in 1967.

Botswana records.

NMC: Typical f. *glaucescens* Maun Febr. 1967 (NME); Chobe rapids (Kasane) Dec. 1974 (NME).
f. *zambeziensis*: 16 km N. of Shakawe Febr. 1967 (NME); 12 km N. of Shakawe March 1974 (NME); Savuti Channel camp March 1976 (NME).

22. **P. helenae** Balinsky, 1964a: 3

Pseudagrion helenae f. *planiramus* Pinhey, 1964a: 96, 97

A blue species, related to *coelestis* and *nubicum*, but with a different orientation of the male's superior appendage. Typical *helenae* (♂) was discovered by Balinsky in the "Ngamiland Game Reserve" (Moremi) Dec. 1963, with further males in Jan. 1964. The melanic f. *planiramus* was collected at Luwingu, north of Lake Bangweulu, Zambia, March 1961 and further examples, one of them intermediate to *helenae* at Msamfu, Kasama (N. Zambia), March 1969 (E. Pinhey). In the Okavango the species is more frequent at Maun than elsewhere, from our records, with only single examples in other localities.

The female of this species has not yet been recorded. No examples have been seen yet *in copula* but two females collected at Maun, 8 Febr. 1967 (E. Pinhey), are suspected to be this species. These are very similar to *P. nubicum* Selys which has not been seen near Maun and in fact has only been recorded from the Botletle River in April.

♀ *helenae* (?): face green, postclypeus with three large black spots; frons with black basal crescent; vertex to the sides and behind the ocelli black, some black between the ocelli, large green postocular spots and a green line at back of occiput.

Prothorax green and yellow, the middle lobe black above with the usual central green twin spots; stylets long, spatulate; mesostigmal lamina a yellowish triangle with curved black posterior ridge which expands outwardly. Synthorax mainly green, with black mid-dorsal stripe, a broken humeral stripe; traces on lateral sutures. Femora with black outer stripe. Pterostigma a brown parallelogram, slightly extended at upper distal angle.

Abdominal segment 1 blue with black antero-dorsal spot; segment 2 with metallic stripe expanded before distal end; segment 3-7 with metallic band constricted at both ends of segments; 8-10 blue, 8 with a band which is contracted posteriorly, 9 with two basal black triangles, 10 all blue. Cerci pale brown, conical.

Abdomen 27 mm, hindwing 19 mm.

The second female has the black facial and thoracic markings somewhat reduced.

Botswana records.

NMC: paratype ♂ Maun Jan. 1964 (B. Balinsky); Maun and 14 km S. of Maun Feb. 1967 (NME); Mboma (Moremi) Febr. 1969 (T. Liversedge); Txatxanika (Moremi Game Res.) Aug. 1970 (P. Steyn); Four Rivers 1♂ Dec. 1973, 1♂ Dec. 1975 (FC).

TM: holotype ♂ Moremi Game Res. Dec. 1963 (B. I. Balinsky).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

23. **P. massaicum** Sjöstedt, 1909 (1910): 48

A small generally common red species described originally from Mount Kilimanjaro and found from the Cape Province northwards to East Africa. It occurs rather sparingly in various parts of Botswana, according to our records.

Botswana records.

NMC: Toromoja Apr. 1975 (N. Tett); Maun July 1967 (G. Guy), Dec. 1968 (FC); Nghabe R. and Botletle R. S. of Maun Febr. 1967 (NME); Sepopa Jan. 1970 (NME); 25 km N. of Maun Febr. 1967 (NME); Khwaai R. Dec. 1968 (FC); Notwane River, S. of Gaborone Febr. — March 1976 (G. Bailey).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

24. ***P. nubicum*** Selys, 1876a, 42(2): 501

A small widespread blue species described from Nubia and known from Rhodesia northwards to equatorial East and West Africa and again northwards to Egypt.

No specimens were found on the National Museum Okavango expeditions but N. Tett obtained the first Botswana examples at Toromojo in April 1975. In other parts of Africa it appears to be more common in the months from May to November, with few records during December to February. Perhaps it is a late emergent in the Okavango system.

Botswana records.

NMC: Toromojo, Botletle River 27 Apr. 1975 (N. Tett).

25. ***P. rufostigma*** Longfield, 1945: 11, 28

A red species described from south Angola and known from swamps in east Angola, N. Zambia and Shaba (Katanga), this species was not found in Botswana until the Falcon College 1973 expedition to Four Rivers. In this area it is by far the commonest of the red *Pseudagrion*. It is very closely allied to *P. sjöstedti* but favours swamps rather than streams or rivers.

The pterostigma is distinctly red in the male, but whitish yellow to pale yellowish brown in the female, and elongated in both sexes at upper distal angle. The superior appendage differs from that of *sjöstedti* in being bifurcate. In the female the pale red antehumeral stripe in Okavango specimens varies from slightly more than half the width of the mesepisternum to as wide as in *massaicum*, with merely thick mid-dorsal and humeral stripes.

Botswana records.

NMC: Txaxanika (Moremi) Aug. 1975 (N. Tett); Four Rivers Dec. 1973, Dec. 1975 (FC); 17 km E. of Four Rivers Dec. 1975 (FC); Xugana and Xugana-Gadikwe Dec. 1973 (FC); Xugana Lagoon Dec. 1975 (FC); Linyati Explor. camp March 1976 (NME).

26. ***P. sjöstedti jacksoni*** Pinhey

Pseudagrion sjöstedti Förster, 1906a: 62

Pseudagrion jacksoni Pinhey, 1961. *Dragonflies of Eastern Africa*: 37

P. sjöstedti, described originally from Cameroun, is the most variable of all the African *Pseudagrion*, with several forms and races described between Rhodesia and equatorial Africa. The taxon *jacksoni* was described from N. Uganda, and in Uganda (Pinhey, 1964 a) it may be only a form of *sjöstedti*, whereas in Zambia and the Okavango delta it is constant and an apparent racial entity. I would regard it in these regions as a climatic subspecies rather than a form. A parallel is afforded by forms of the lepidoptera *Danaus chrysippus* (Linnaeus), which in West equatorial Africa is constantly in the whiter taxon *alcippus* (Cramer), and some species of *Colotis* Hübner, which exhibit only seasonal forms in Southern Africa but with more constancy in equatorial Africa.

This species was first found in the Okavango on the Museum expedition of 1967. It does not appear to be very common there, but it is widespread.

Botswana records.

NMC: Botletle R., 90 km E. of Maun Febr. 1967 (NME); 14 km S. of Maun Febr. 1967 (NME); Tsau R. March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970 (NME); Mboma

(Moremi) Febr. 1969 (T. Liversedge); Txaxanika (Moremi) Aug. 1975 (N. Tett); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana Lagoon Dec. 1975 (NME); Chobe rapids (Kasane) Sept. 1974 (NME).

27. **P. sublacteam pseudomassaicum** Pinhey

Coenagrion sublacteam Karsch, 1893a: 40

Pseudagrion pseudomassaicum Pinhey, 1951: 93

P. sublacteam was described from Togo, *pseudomassaicum* from South Africa. It is not yet certain that there is any racial significance and *pseudomassaicum* may be only a direct synonym of *sublacteam* (Dumont, 1973). It is a reddish species larger than *massaicum* the mature male coated with pruinosity to produce a purplish effect. Occasional males may have the pruinosity denser, all pale blue on the thorax. Fairly common from Natal to East and West equatorial Africa, with another subspecies *mortoni* Ris in Western Asia.

Although commonly found at flowing waters of rivers and streams it seems equally "at home" in swamp conditions.

Botswana records.

NMC: Botletle R. July 1967 (G. Guy); Sepopa Febr. 1967 (NME); Shakawe March 1974 (NME); 16 km N. of Shakawe Febr. 1967 (NME); 14 km N. of Maun Febr. 1967 (NME); Mboma (Moremi) Febr. 1969 (T. Liversedge); Txaxanika (Moremi) Aug. 1975 (N. Tett); Four Rivers Dec. 1973, Dec. 1975, 17 km E. of Four Rivers Dec. 1975 (NME); Xugana Oct. 1971 (A. Archer), Dec. 1975 (NME); Xugana-Gadikwe Dec. 1973 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Savuti Channel West March 1976 (NME).

28. **P. sudanicum rubroviride** Pinhey

Pseudagrion sudanicum Le Roi, 1915: 337

Pseudagrion rubroviridis (sic) Pinhey, 1956a: 23

P. sudanicum was described from the southern Sudan; *rubroviride* is a darker taxon but constantly so in its main range and therefore a subspecies. It was described from the Victoria Falls. The species extends from Rhodesia to E. and W. tropical Africa. Pinhey (1951) records it from the Limpopo River on the Botswana border.

Subspecies *rubroviride* is a dark metallic insect in the male which generally favours rivers and streams. Apart from the Limpopo River record it has been taken at Andara in the western Caprivi (1 ♂) March 1974, and it was first taken in the delta in 1967. The Andara specimen was taken as prey of *Laxenecera albicincta* Lw. (Asilidae).

Botswana records (other than the Limpopo record).

NMC: Makala-ma-Bedi (Botletle R.) Febr. 1967 (NME); Maun Sept. 1971 (A. Archer); Shakawe Jan. 1970 (NME); Jugu Jugu (Boro R.) June 1974 (S. Williams & A. McDermott); Mboma (Moremi) Feb. 1969 (T. Liversedge); Chobe Rapids March 1976 (NME).

29. **P. whellani** Pinhey, 1956a: 18

This is a dark species, related to *P. commoniae* but not so black, and with reddish brown tibiae. Described from Victoria Falls and distributed northwards to equatorial Africa. It prefers rivers or streams. It was taken at Andara (Caprivi) in March 1974.

Botswana records.

NMC: Nata Febr. 1967 (NME), April 1976 (Peterhouse Exp.); Xaro, 25 km S. of Shakawe March 1974 (NME); Kachikau Apr. 1974 (NME).

ACIAGRION Selys (1891)

Slender-bodied species closely resembling the bluer species of *Pseudagrion*, but the pterostigma is normally shorter, in some *Aciagrion* more rhomboidal and the female normally has a ventral spine on segment 8. In some respects they are similar to *Enallagma* Charpentier. Two species known in Botswana, including a remarkable capture near Gaborone by Bailey.

Key to *Aciagrion*

1. Short-bodied, dark species, abdomen under 27 mm. Vertex broadly black with small narrow blue postocular spots. Pterostigma more extended on costal than on proximal edge. ♂: superior appendage much longer than inferior *A. steeleae* Kimmins
 — Very long-bodied, pale brown or blue species, abdomen at least 35 mm. Vertex with scarcely any black, the postocular spots large, broad. Pterostigma with proximal edge as long as costal. ♂: superior appendage shorter than inferior *A. gracile attenuatum* Fraser

Subgenus *ACIAGRION* Selys

30. ***Aciagrion steeleae*** Kimmins, 1955: 109

Aciagrion steeleae abercornensis Pinhey, 1958b: 103

A. steeleae was described from Lake Bangweulu, Zambia, and *abercornensis*, which is only a melanic form, not a race, from further north at Mbala (Abercorn). As mentioned above it is like a slender blue *Pseudagrion* or *Enallagma*, with slightly shorter pterostigma. It is distributed over north and central Zambia, Shaba (Katanga), east Angola and in the Okavango swamps. It is mainly a swamp species and in December 1973 it was found plentifully, including f. *abercornensis*, in grassland and pools at Four Rivers, with great numbers of teneral in woodland.

In life the mature male's eye is pale green with a black cap; below the cap there is a black horizontal ring separated from the cap by a blue zone. Thoracic markings and end segments of abdomen sky blue.

Botswana records.

NMC: Sepopa Febr. 1967 (NME); Khwaai River Dec. 1968 (FC), Febr. 1969 (T. Liversedge); Four Rivers Dec. 1973, Dec. 1975, and 11 km E. of Four Rivers Dec. 1973 (FC); Xugana-Gadikwe Dec. 1973 (FC); Xugana Lagoon Dec. 1975 (FC).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

Subgenus *MOMBAGRION* Sjöstedt

31. ***A. ?gracile attenuatum*** Fraser

Mombagrion gracile Sjöstedt, 1909 (1910): 44

Aciagrion attenuatum Fraser, 1928: 126

One very teneral female *Aciagrion* submitted by Bailey is probably this species, but confirmation would require a more mature example or a male. *A. gracile* was described from the Usambara Mountains of east central Tanzania, *attenuatum* from Zomba, Malawi. The former is known from North Malawi to Uganda, *attenuatum* from Mozambique, Rhodesia, S. Malawi and Zambia.

This species prefers quiet pools and streams in which there are grasses or sedges. It is easily distinguished by the very long slender abdomen. Bailey's capture is the most southerly recorded for this genus.

Botswana record.

NMC: Notwane River, Gaborone 18 Apr. 1976 (G. Bailey).

ENALLAGMA Charpentier (1840)

Very poorly known so far in Botswana, but *E. angolicum* Pinhey, the smallest and most interesting species is locally common in the main swamps of the delta. Most *Enallagma* are superficially similar to some of the blue *Pseudagrion*, differing in venation and other features, but *angolicum* is smaller than the average and in the field it is only easy to separate it at a glance from the equally small *Agriocnemis* Selys, of similar habits, by its abnormally small rhomboidal pterostigma which is bright pink or red.

Key to *Enallagma*

1. Pterostigma a narrow rhomboid, very convex on outer edge. Labrum with black basal band. Forewing with 8-9 Px. ♂: mesepisternum with pronounced lobes at ventral end; segment 9 blue, 8 and 10 black; superior appendage a broad blade with dorsal tooth *E. angolicum* Pinhey
— Pterostigma a parallelogram. Labrum without black basal band. Forewing with 9 or more Px. 2
2. Thorax and abdomen very slender. Pterostigma not elongated at upper distal angle. Thorax all pale brown without black markings. Femora all pale with only trace of lateral brown in ♂, not in ♀. ♂: superior appendage broad, obliquely horizontal *E. subtile* Ris
— Thorax and abdomen not very slender. Pterostigma slightly elongated to an acute angle (upper distal angle). Thorax broadly black. Femora with prominent black markings 3
3. Antehumeral stripe in ♂ narrow, in ♀ broad. Femora ♂ black posteriorly, ♀ with black lateral line. Abdomen ♂ with dorsal black band on 1-7 and 10. Superior appendage of ♂ projecting obliquely horizontal. ♀: posterior lobe of prothorax projecting back in middle *E. glaucum* (Burmeister)
— Antehumeral stripe rather broad in ♂, narrow in ♀. Femora ♂ black posteriorly and laterally, ♀ with black lateral streak. Abdomen ♂ dorsal band on 1-8½, base of 9, and all 10. Superior appendage very short, down-turned. ♀: posterior lobe of prothorax very narrow, straight along posterior edge *E. nigridorsum* Selys

32. *Enallagma angolicum* Pinhey

Enallagma minutum Ris, 1931: 102 (praeocc. *Trichocnemis minuta* Selys, 1857, Cuba)

Enallagma risi Pinhey, 1962: 135 (nom. nov. pro *minutum* Ris)

Enallagma angolicum Pinhey, 1966: 9 (nom. nov. pro *risi* Pinhey, praeocc. *En. risi* Schmidt, 1961, Afghanistan)

Enallagma moremi Balinsky, 1967: 15 (nom. nov. pro *risi* Pinhey, nec *risi* Schmidt)

Syn. nov.

The synonymy recorded for this small species is one of those instances of misfortune in dealing with a large and cosmopolitan genus, known in Africa, Asia, Europe and America. After recording the species in N. Zambia (1961a) as *minutum* and again from Angola (1961b) under the name *risi* I obtained a copy of Schmidt's paper (1961) and awaited an opportunity (1966) to rename this species (*angolicum*), unaware that Balinsky, finding it in the Okavango (1964), was intending to rename it *moremi* (1967).

This small *Enallagma*, distinguishable from *Agriocnemis* during field collecting by the narrow bright red pterostigma, is found very locally in stagnant swamps and pools amongst grasses, sedges and similar vegetation. Described originally from Angola it has been found in N. Zambia near Mbala, 1954 (Pinhey) and Balinsky collected it in the Moremi Game Reserve. In December 1973 it was found only very sparingly in a swamp at Four Rivers, but two years later large numbers of both sexes were collected in the same area.

♂. Labrum green, broadly black at base; genae and front of orbits paler green; eye (in life) black above, green in middle, bright yellow ventrally; postclypeus black; frons and vertex metallic black with long narrow blue-green postocular spots.

Synthorax black to first lateral suture, with a pair of rounded, vertical black ventral lobes and a narrow green antehumeral stripe; a dorsal spot on second lateral suture. Femora black, yellow anteriorly. Pterostigma a small bright pink rhombus, as short as in some *Aciagrion*, with distal edge well curved. Forewing with 8 Px. Arculus slightly distal to second Ax.

Abdomen with metallic black dorsal band on all segments except 9 which is all sky blue. Base of abdomen green lateroventrally. The black superior appendage projects backwards rather in the shape of a boar's head in lateral view, the "ear" being a dorsal tooth; seen from inner surface it is very different, in the form of a broad outer portion curving ventrally to a broad tooth, and the dorsal ear-tooth is linked to a broad upper flange sweeping dorsally into the 10th segment. The shorter, greenish yellow inferior appendage is crescentic, thickened dorsally at inner end. These appendages are, in fact very distinctive.,

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

♀. A superficial inspection suggests there are two forms, one andromorphic, the other heteromorphic, but the latter are all teneral specimens and it seems probable that these are only developmental phases. The mature andromorphic ♀ is similar in markings to the ♂, differing chiefly in the absence of postocular spots, a brown pterostigma, and segment 9 all black above. In a mature Mbala (Zambia) ♀ segment 9 is pale blue on distal half. The black on segment 1 is less in some examples.

In less mature females the dark markings on head and thorax are all red-brown, but the abdominal markings are black. The femora are entirely ochraceous yellow. This seems to be intermediate between the two main forms.

In the heteromorphic (teneral) ♀ the face and vertex are all brownish orange (dried state), the thorax all plain pale reddish to pinkish brown. Femora pale ochraceous. Segment 1 all brownish ochreous except a black transverse posterior bar; segment 2—8 and 10 metallic black above, 9 black at base, otherwise pale bluish ochreous. In life the head and face were bright pink to pinkish orange, the thorax all pinkish red. Other females are still paler, segment 1 without black bar, segments 9—10 nearly all pale blue; evidently still more teneral. Faint brown lines appear on femora in some.

The presence of the intermediate stage appears to confirm that the hetero- and homo-chroic females are developmental phases.

Botswana records.

NMC: Mboma (Moremi) Febr. 1969 (T. Liversedge); Four Rivers Dec. 1973 (sparsely), Dec. 1975 (common) (FC); Xugana Dec. 1975 (FC); Savuti Channel (20 km W. of camp March 1976) (NME).

TM: Moremi Game Res. Jan. 1964 (B. I. Balinsky).

BC: Moremi Game Res. Jan. 1964.

33. **E. glaucum** (Burmeister)*Agrion glaucum* Burmeister, 1839: 821

Described from the Cape Province this blue species is generally common and widely distributed in the continental Ethiopian region.

It probably occurs on pools or streams in many of the drier areas of the territory. It is not normally a palustrine species.

Botswana records.

NME: Notwane River, 23 km S. of Gaborone Febr. — May 1976 (G. Bailey).

Schultze: recorded *glaucum* from pans in S. Botswana (Ris 1908).

34. **E. nigradorsum** Selys, 1876a 41: 531

Described originally from Zanzibar, this blue species is found from Mozambique and Rhodesia northwards to equatorial E. and W. Africa. It inhabits pools and slow streams and although I have found it abundantly on the swampy verge of a lake in Tanzania it is, again, not essentially a swamp species. So far I have only found it in Botswana near the Gomane River, north of Francistown.

Botswana records.

NMC: 140 km N.W. of Francistown 5 Febr. 1967 (NME).

35. **E. subtile** Ris, 1921: 332

Described from Shaba (Katanga), this very slender pale brown species is very local but widely distributed from South to equatorial Africa. It occurs on rivers and streams and since it is found at the Victoria Falls it will probably be seen near the Chobe River.

ISCHNURA Charpentier (1840)36. **Ischnura senegalensis** (Rambur)*Agrion senegalense* Rambur, 1842: 276

The type series is said to have come from places as far apart as Senegal and Bombay. It is in fact the most widespread, and frequently the commonest, of the Zygoptera throughout Africa, apparently occurring also through Asia to the Phillipines. Its wide distribution is undoubtedly due very largely to a high tolerance of ecological conditions, being found in fresh waters or waters of quite high salinity, even existing close to hot springs.

It occurs in the Caprivi and in many parts of Botswana. One ♂ was captured 20 km west of Savuti Channel camp with dipterous prey (Chironomidae).

Botswana records.

NMC: North Makgadikgadi Pan March 1974 (NME); Gweta Febr. 1967 (NME); Nxai Pan Apr. 1971 (Philip); Makala-ma-Bedi (Botletle R.) Febr. 1967 (NME), July 1967 (G. Guy); Maun Febr. 1967, Dec. 1975 (NME); 17 km S. of Maun March 1974 (NME); Nghabe R. (S. of Maun) Febr. 1967 (NME); Toteng Dec. 1968 (FC); Lake Ngami Aug. 1969 (FC); Sehitwa Febr. 1967 (NME); 15 km S. of Tsau Febr. 1967 (NME); Tsau R. March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); Mohembo Febr. 1967 (NME); Jugu Jugu (Boro R.) Aug. 1974 (S. Williams); 80-100 km N. of Maun Dec. 1968 (FC); Mboma (Moremi) Febr. 1969 (T. Liversedge); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC);

Chobe Nat. Park S. Gate Apr. 1974 (NME); Satao Apr. 1974 (NME); Kachikau Apr. 1974 (NME); Chobe Nat. Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Savuti Channel and Savuti Channel West March 1976 (NME); Notwane R., Gaborone March 1976 (G. Bailey).

TM: Tsotsoroga Pan June — July 1930 (G. van Son).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

AGRIOCNEMIS Selys (1869)

The species of this genus are all small and occur gregariously in certain areas of swamps or the swamp verges of streams. Their flight is poor and since they are often hidden amongst grasses or sedges they are only effectively collected in numbers by sweeping.

Key to *Agriocnemis*

1. Orbits ventrally black. Synthorax with black stripe on second lateral suture. ♂: superior appendages forcipate *A. victoria* Fraser..
- Orbits not black ventrally. Second lateral suture with no stripe, at most a dorsal spot 2
2. Males 3
- Females 6
3. Prothoracic hindlobe complete. Superior appendage with needle-shaped ventral tooth . . . *A. exilis* Selys
- Prothoracic hindlobe divided into three portions. Superior appendage without needle-shaped tooth 4
4. Superior appendage longer than segment 10, spatulate. Pterostigma of hindwing indented at costa . . .
- *A. angolensis* Longf.
- Superior appendage shorter than segment 10, downcurved apically. Pterostigma normal 5
5. Frons with at most a narrow incomplete green transverse band. Pterostigma brown. Inferior appendages as long as segment 10, normally horizontal; superior appendages downturned, tapering to an apical tooth
- *A. gratiosa* Karsch
- Frons with broad cream or white pruinose band, complete or incomplete. Pterostigma red. Inferior appendages much shorter than segment 10, upturned; superior appendages broad and thick
- *A. ruberrima albifrons* Balinsky
6. Prothoracic hind portion of ♀ trilobed
- 7
- Prothoracic hindlobe complete, not divided
- 8
7. Prothorax, central lobe shorter than lateral lobes. Labrum brown (teneral) or purple (mature) with a thin cream edge
- *A. exilis* Selys
- Central lobe extending further than lateral lobes. Labrum orange or green with large black centro-basal area
- *A. angolensis* Longfield
8. Mesostigmal laminae connected by a ridge; posterior lobe of prothorax without median extension. Labrum orange or brownish orange. Frons without white pruinosity
- *A. gratiosa* Karsch
- Mesostigmal laminae without connecting ridge; middle lobe of posterior portion of prothorax extended further than lateral lobes. Labrum brown or blackish brown with thin yellow edge. Frons with white pruinosity
- *A. ruberrima albifrons* Balinsky

37. *Agriocnemis angolensis* Longfield, 1945: 15

Described from south Angola, Balinsky recorded examples from Andara in the western Caprivi collected in 1960 and F. de Moor and E. Pinhey collected a few more in swamps at Andara in 1974. It is, like other species of the genus, a swamp species but it has not yet been recorded in Botswana. Another race, subsp. *spatulae* Pinhey, has been found in N.W. Zambia.

The Andara specimens were collected 3 Nov. 1960 (F. Gaerdes) and 27 March 1974 (NME).

38. *A. exilis* Selys, 1869c: 24; Selys, 1872: 182

Described originally from Madagascar this small species is locally abundant in swamps of the continental Ethiopian region as well as several of the Indian Ocean islands. It is abundant in many parts of the delta and also at Andara in the western Caprivi. One example was taken at a light trap at Savuti Channel camp.

Botswana records.

NMC: Botletle R. Feb. 1967 (NME); Maun Dec. 1968, Dec. 1975 (FC); 17 km S. of Maun March 1974 (NME); Tsau R. March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); Xaro (25 km S. of Shakawe) March 1974 (NME); 12 km N. of Shakawe March 1974 (NME); Mohembo Feb. 1967 (NME); Khwaai Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Chobe Nat. Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Savuti Channel, Savuti Channel West and Linyati Expl. camp March 1976 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

39. *A. gratiosa* Gerstaecker, 1891: 190

Described from Tanzania, this is slightly larger than the other Botswana *Agriocnemis* and is found locally in pools from Natal to East Africa. It is not usually in swamps but grassy pools. It was first found in Botswana during the 1967 expedition and occurs in the western Caprivi at Andara road ferry.

Botswana records.

NMC: 140 km N.W. of Francistown Febr. 1967 (NME); Sepopa Febr. 1967, March 1974 (NME); Shakawe Febr. 1967, Jan. 1970, March 1974 (NME); Xugana Dec. 1975 (FC); Satau Apr. 1974 (NME); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME).

40. *A. ruberrima albifrons* Balinsky

Agriocnemis ruberrima Balinsky, 1961: 72-91

A. ruberrima albifrons Balinsky, 1963: 249

Typical *ruberrima* Balinsky is known from Natal, subsp. *albifrons* only from the Okavango where Balinsky collected it in April 1962. In the field the ♂ and sometimes the ♀ can be distinguished from the other *Agriocnemis* mentioned here by the white frons and red pterostigma, which is a parallelogram unlike the red rhomboidal pterostigma of *Enallagma angolicum* which frequents some of the same swamp-pools. In life the female postocular spots and a stripe just below the humeral suture are pale pinkish white; antehumeral stripes blue-green. The species is common where it occurs.

Botswana records.

NMC: Maun Febr. 1967, Dec. 1975 (NME); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970 (NME); Xaro (25 km S. of Shakawe) March 1974 (NME); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Lagoon Dec. 1975 (FC); Savuti Channel camp and Linyati Expl. camp March 1976 (NME).

TM: holotype, allotype, Okavango swamps Apr. 1962 (B. I. Balinsky).

BC: Okavango swamps Apr. 1962.

41. *A. victoria* Fraser, 1928: 123

This small species was described from Uganda and occurs from Zambia to equatorial West Africa. It was first found at Sepopa in the Okavango swamps on the 1967 expedition

but it is usually less common than *exilis* or *r. albifrons*. It is distinguished by the orbits being ventrally black and the male superior appendages forcipate. In the female the occiput is usually black but in some females there may be a red occipital stripe.

Botswana records.

NMC: Sepopa Febr. 1967 (NME); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana and Xugana Lagoon Dec. 1975 (NME); Savuti Channel camp and Linyati Explor. camp March 1976 (NME).

Superfamily CALOPTERYGOIDEA

Family CALOPTERYGIDAE

In Africa this is a small family but it consists of most of the largest and certainly the broadest winged of our Zygoptera. Only one species occurs south of the latitude of the lower Kunene-Zambesi Rivers.

PHAON Selys (1853)

42. *Phaon iridipennis* (Burmeister)

Plate 1: 2

Calopteryx iridipennis Burmeister, 1839: 827

Described from Natal, this large species, with iridescent wings, is generally common in woodland, forest or other shaded localities between Natal and equatorial E. and W. Africa. It was found in Botswana in 1970 and at Andara in the W. Caprivi in March 1974 (E. Pinhey).

Botswana records.

NMC: Shakawe Jan. 1970 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Notwane River, S. of Gaborone March 1976 (G. Bailey).

Family CHLOROCYPHIDAE

By contrast with all our other Zygoptera, members of this family have short thick abdomens, a snout-like face and narrow wings.

PLATYCYPHA Fraser (1949)

Males of this genus have broad foliate tibiae which are red or yellow on one surface, white on the other. They employ these coloured legs for courtship displays.

43. *P. caligata* (Selys)

Plate 1: 3

Libellago caligata Selys, 1853: 57

Described from Natal, this species is common on streams or rivers from there to equatorial Africa. It is not a swamp species. Apart from the distinctive, flattened scarlet and white tibiae (yellow and white in teneral specimens), the male is distinguished by its sky blue abdomen, which is red at the sides of the basal segments. It was found at Andara, W. Caprivi, in March 1974 and occurs at the Victoria Falls. de Moor had a sight record of one at Chobe rapids Sept. 1974.

Botswana record.

Sight record only: Chobe rapids (Kasane) Sept. 1974 (de Moor).

Suborder ANISOPTERA

This suborder includes the largest and most robust Botswana Odonata, especially amongst the larger Gomphidae, Aeshnidae and Corduliidae, but the number of species represented in these families is, not surprisingly, small. Libellulidae is by far the most numerous in species, ranging in size from small *Acisoma* to large *Tramea*. The commonest Botswana Anisoptera are also in this family. In the Okavango delta the most familiar are *Orthetrum icteromelan cinctifrons* Pinhey, *Hemistigma albipuncta* (Rambur), *Diplacodes* spp., *Trithemis* spp. (especially *T. monardi* Ris), *Rhyothemis fenestrina* (Rambur), *Pantala flavescens* (Fabricius), *Tramea basilaris* (Beauvois) and *Urothemis edwardsi* (Selys).

The Libellulidae also include endemic species as well as a few rather unexpected tropical species not known elsewhere in Southern Africa: *Nesciothemis minor* Gambles, *Aethiothemis discrepans* Lieftinck, *Brachythemis wilsoni* Pinhey, *Sympetrum navasi* Lacroix and *Trithemis brydeni* Pinhey.

Superfamily AESHNOIDEA

Family GOMPHIDAE

The dominant species of the few recorded here is *Cinitogomphus dundoensis guyi* Pinhey which is common in some parts of the swamps. A new species of *Phyllogomphus* Selys is described here.

Key to genera

1. Triangles with more than one cross-vein 2
— Triangles not crossed (rarely with one cross-vein) 4
2. Large and robust, both sexes with broad foliations on segment 8 *Ictinogomphus ferox* (Rambur)
— Less robust, both sexes with very narrow foliations on segment 8 3
3. Robust species. Occipital plate narrow, about 4 times wide as long. Inner green antehumeral stripe distinctly joined to collar. Segments 3-7 each with two long, broad yellow fasciae each side. Inferior appendage of ♂ prominent, over one quarter as long as superior
..... *Cinitogomphus dundoensis guyi* (Pinhey)
— Slender species. Occipital plate broad, twice as wide as long. Inner green antehumeral stripe separate from collar. Segments 3-7 with only basal yellow bands. Inferior appendage very small, barely one sixth as long as superior *Gomphidia quarrei* (Schouteden)
4. Forewing with 3 or more cross-veins between RS and MA proximal to fork of RS. Small, slender species; segment 10 very elongated. Anal appendages much shorter than segment 10
..... *Lestinogomphus angustus* Martin
— Forewing with 1-2 cross-veins between RS and MA before the fork of RS. Segment 10 not strongly elongated 5
5. Frons without angled crest, the face projected forwards. Segment 10 constricted at base
..... *Neurogomphus vicinus* Schouteden
— Frons with definite crest, the face normally more vertical. Segment 10 not constricted 6
6. Discoidal field expanding well before nodus. Segment 8 with very large foliations in both sexes. Thorax chocolate brown with green markings. Large and very robust species, abdomen 45 mm or more
..... *Phyllogomphus brunneus* spec. nov...
— Discoidal field not or scarcely expanding. Foliations on segment 8 almost absent or only well developed in ♂. Thorax either greenish yellow with brown markings or black with green markings. Smaller species, abdomen less than 35 mm 7
7. Thorax greenish yellow with reddish brown markings. Superior appendage short and thick, scarcely longer than segment 10; inferior almost as long as superior *Crenigomphus cornutus* Pinhey
— Thorax green with black or grey-brown markings. Superior appendage of ♂ much longer than segment 10; inferior much shorter *Paragomphus* Cowley

ICTINOGOMPHUS Cowley (1934)44. *Ictinogomphus ferox* (Rambur)

Plate 1: 4

Ictinus ferox Rambur, 1842: 173

This large species, described from Senegal, is common at reedy pools or rivers from Natal to equatorial Africa. It was first discovered in the Okavango on the 1968 Falcon College expedition.

I saw an example 4 km E. of Four Rivers camp 9 Dec. 1973. It is only an additional sight record but I was close enough to identify this distinctive species without being able to capture it on that occasion.

Botswana records.

NMC: Maun Dec. 1968 (FC); Toteng Dec. 1968 (FC); Shakawe Jan. 1970 (NME); Four Rivers Dec. 1975 (FC).

CINITOGOMPHUS Pinhey (1964)

Hitherto I have recognized two species in this genus, the type species *C. dundoensis* (Pinhey) from Angola, Zambia and Shaba (Katanga) and *C. guyi* (Pinhey) from the Okavango swamps. On the 1973 Falcon College expedition *guyi* was found to be common at most stopping points between Khwaai Lodge and Four Rivers camp, gradually increasing in abundance towards the camp. The variation in a long series of *guyi* showed certain similar features between this and *dundoensis* inducing me to regard them now as the same species: *C. guyi* (Pinhey) is conspecific with *C. dundoensis* (Pinhey), **syn. nov.**

I consider there are grounds for retaining *guyi* as at least a form, possibly a race of *dundoensis*.

Cinitogomphus dundoensis (Pinhey)

Ictinogomphus dundoensis Pinhey, 1961e: 73

Known only from specimens I have recorded from N. Angola (loc. typ.) and N. Zambia, and we also have it from Shaba (S. Zaire). It is normally slightly larger and more robust than *guyi*. On the labrum there is a more or less complete central stripe; the inner green antehumeral stripe is normally disconnected from the green collar or thinly attached to it; segment 8 with a broad black lateral band widely connected to the black dorsal band.

Measurements (NMC):-

♂ (Shaba) abd. 49 mm, hw 40 mm; ♂ (Msamfu, N. Zambia) abd. 46 mm, hw 33 mm;
 ♀ (Shaba) abd. 46 mm, hw 39 mm; ♀ (Kapiri Mposhi, Zambia) abd. 44 mm, hw 38 mm;
 ♀ (Ndola, Zambia) abd. 43 mm, hw 38 mm.

45. *Cinitogomphus dundoensis guyi* (Pinhey) Stat. nov.

Plate 1: 5

Gomphidia guyi Pinhey, 1967a: 12

This taxon, described from Maun, is usually smaller; the labrum has a central dot, less often a short central line; the inner antehumeral stripe is usually broadly joined to the

collar, occasionally narrowly so or separate; the lateral black on segment 8 is often separate from the dorsal black or if joined to it then not so broadly.

Measurements (all from the Okavango swamps):-

Holotype ♂ abd. 46 mm, hw 36 mm.

Other males abdomen (hindwing in brackets): 44 (36), 46 (37), 45 (36), 46 (36), 45 (35), 43 (35), 46 (37), 47 (37) mm. Average 8♂ abd. 45 mm, hw 36 mm.

Females: 45 (37), 44 (37), 44 (37), 45 (37), 45 (37), 44 (37), 47 (40), 45 (37), 47 (38), 46 (38), Average of 10♀ abd. 45 mm, hw 37,5 mm.

It is possible that if more material of typical *dundoensis* could be examined these differences might be less than they seem, but from available data I regard *guyi* as the more southerly race. It is less likely to be a cline since all the variations in *guyi* are apparent in Four Rivers specimens. Both sexes of *guyi* were abundant in that locality in December 1973, less so in 1975, favouring woodland or their outskirts, but sometimes seen over the swamp-pools.

♀: I consider that since both sexes of nominotypical *dundoensis* have been described there is no call at present for a type to be selected for the female of *guyi*. The female, as is to be expected, resembles the male in colour and markings and differs in the somewhat stouter abdomen. The cerci are yellow, tapering, nearly as long as segment 10.

In life the teneral female has a pale grey eye, browner above; face yellow; thorax with greenish yellow markings; abdominal markings deep yellow.

One ♂ from Four Rivers has the left hindwing deformed, the apex abruptly shortened.

A few examples from Four Rivers have been collected with prey. All were females:-

♀ 5 Dec. 1973 with an alate ponerine ant, *Paltothyreus tarsatus* (Fabricius); ♀ 5 Dec. 1973 with a ♂ acridid grasshopper, *Acrotylus* spec., ♀ 10 Dec. 1975 with a ♀ acridid, *Brachycrotaphus* spec.; ♀ 11 Dec. 1975 with a ♀ cicadid, *Munza basimacula* (Walker).

Botswana records.

NMC: Maun Dec. 1968 (FC); 8 km S.E. of Sepopa Jan. 1970 (NME); 25 km N. of Maun (type ♂) 9 Febr. 1967 (NME); Mboma (Moremi) 1969 (T. Liversedge); 70 km W. of Khwaai Lodge Dec. 1973 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana-Gadikwe Dec. 1973 (FC).

GOMPHIDIA Selys (1854)

Smaller, more slender-bodied than *Cinitogomphus* but superficially with a similar aspect.

46. *Gomphidia quarrei* (Schouteden)

Diastomma quarrei Schouteden, 1934: 57

Described from Zaire this species extends from Mozambique and the Kruger National Park (Balinsky, 1965) to the Victoria Falls, northwards through Zambia, Angola and Zaire to Uganda. The first Botswana record was from Chobe River (1965). At the Victoria Falls at Katambora it is abundant near the wooded fringe of the Zambezi River and this preference for the fringe of woodland on river banks is noticeable in its other haunts. A few specimens have been taken in the Okavango swamps at wooded fringes so that its habitat does not necessarily require a strongly flowing river. However, the streams in the swamps do have currents of moderate strength.

In life, the eye of the ♂ is grey-green to pale olive; brown dorsally. Face, thorax and abdominal markings greenish yellow but segment 7 bright yellow. In the female the colours are similar but the markings on abdominal segments 3-10 are all yellow.

Botswana records.

NMC: Mboma (Moremi) Febr. 1969 (T. Liversedge); Four Rivers Dec. 1973 (FC); Meakome Dec. 1973 (FC); Chobe rapids (Kasane) Dec. 1965 (E. Pinhey), Dec. 1974 (E. Pinhey), March 1976 (NME).

LESTINOGOMPHUS Martin (1912)

Very small, slender, dull green Gomphidae with the tenth segment peculiarly elongated.

47. *Lestinogomphus angustus* Martin, 1912a: 484 Plate 1: 6

In Martin's original description the localities were as far apart as Sikasso, Mali (type) and Kenya. In fact, this small species is widespread from the Zambezi Valley and Mozambique to equatorial Africa. It was discovered at Sepopa in the Okavango delta in 1967. Pairs have been taken *in copula*. It favours the wooded fringes of fast-flowing rivers. It is quite often attracted to insect light traps.

Botswana records.

NMC: Sepopa Febr. 1967, March 1974 (at light) (NME); Shakawe Jan. 1970 (NME); Chobe rapids (Kasane) Sept. 1974 (NME).

NEUROGOMPHUS Karsch (1890)

This is another mainly tropical African genus. Two species are found between the Victoria Falls and Katambora. The commoner species is considered to be *vicinus*.

48. *Neurogomphus vicinus* Schouteden, 1934: 66

Described from Zaire this taxon is locally common on both sides of the Zambezi Valley, especially near Katambora and Kazungulu, less so at the Victoria Falls. It will probably be found near the Chobe River. Both sexes, juveniles and mature specimens, rest on long grass or other low vegetation within 100 m of the river. They tend to fly low most of the time, frequently settling.

PHYLLOGOMPHUS Selys (1854)

Very large, robust Gomphidae with rather slender abdomens, both sexes having broad foliations on segment 8, the last two segments small and cylindrical. The species favour woodland or forest and often fly high in the trees, sometimes to settle lower down on the dead branch of a tree or a stump.

49. *Phyllogomphus brunneus* spec. nov. Fig. 1

When I first collected two females of this species at Katambora (Zambia), 70 km W. of Livingstone in January 1956 one example was severely damaged, the abdomen lost, the other was later believed to be an aberrant example with the foliations on the 8th segment much reduced and extremely narrow. I at first thought these were a large species of *Neurogomphus*. The foliations of the abdomen did not appear to have been broken off, the edges were firm and rounded. In February 1965 I collected two more females on the Maramba

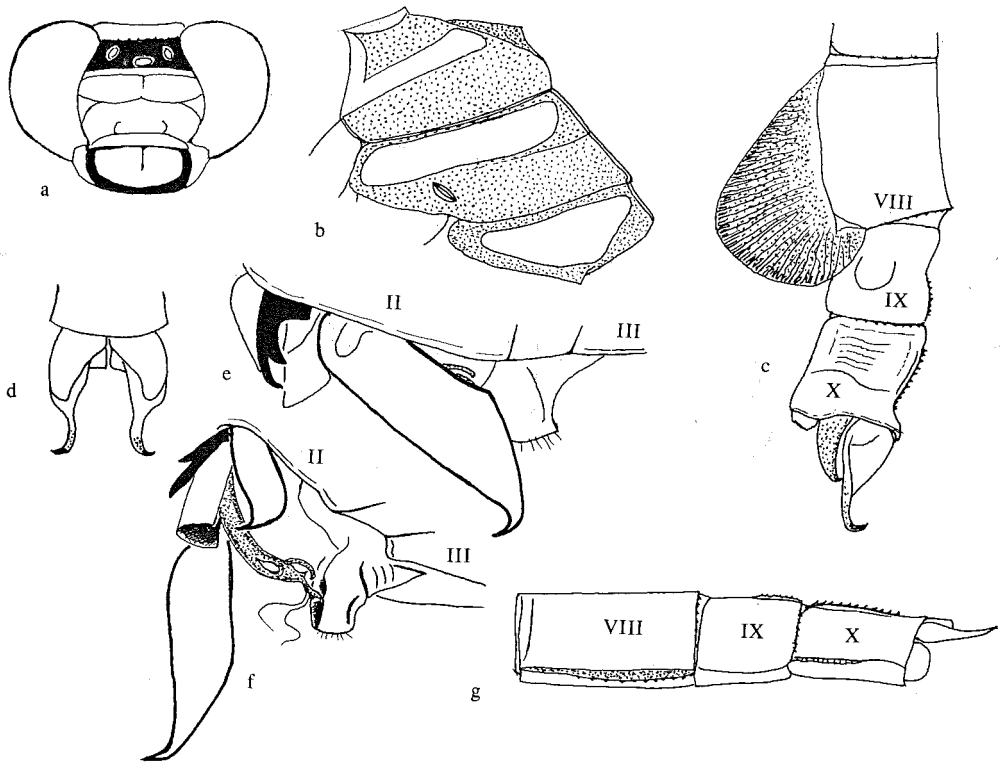


Fig. 1. *Phyllogomphus brunneus*, holotype ♂: a. head; b. synthorax; c. abdomen, segments 8-10; d. superior appendages, dorsal view; e. accessory appendages, from left; paratype ♂: f. accessory genitalia, more ventrally, showing prophallus; allotype ♀: g. abdomen, segments 8-10, form with narrow foliations. In figs. e., f. anterior lamina is all black, hamules heavily outlined, prophallus stippled.

River, a tributary of the Zambezi near the Victoria Falls. These were exactly similar, but with broad foliations indicating they they were *Phyllogomphus*. Others were seen, generally flying near treetop level at the Victoria Falls, Katambora and Chobe River. Their capture is difficult even when they descend and needs a very forceful swing of the net, hence the regrettable abdomen-less example.

It was now evident that these examples were close to *P. schoutedeni* Fraser (1957), described from 5 males taken at Elizabethville (Lubumbashi) in Shaba. It was not until two males were collected at Four Rivers in December 1973 that these Zambezi females were found to represent a new species. The two females taken at Four Rivers had extremely narrow foliations and this sex is obviously dimorphic.

At Four Rivers specimens were seen flying through thick woodland, settling at times but alert and moving off rapidly when approached.

The face in both sexes has less black than *schoutedeni*; foliations of the male more developed; superior appendage longer and more slender.

In life, the male eye is olive, yellow ventrally; face cream; body markings greenish yellow. The female eye is green to olive, yellow, bright yellow or orange-yellow ventrally; face cream; body markings pale greenish yellow.

Holotype ♂ (mature) (Four Rivers). Labium yellowish green, brown at edges, bases of maxillae and mandibles brownish yellow; face in front and frons above yellow-green, the labrum with a short, fine black median line and a black outer margin; frons above narrowly black right across the base. Vertex black, occipital plate pale green above and below. Orbits ventrally black and dark ferruginous.

Pterothorax dark ferruginous. Synthorax above and below and the ante-alar sinus deep chocolate brown with greenish yellow fasciae as follows: dorsal crest, mesothoracic collar which is broadly linked to complete broad antehumeral stripes; a broad stripe on mesepimeron, a trapezoidal band on metepimeron. Femora ferruginous black, tibiae and tarsi black. Fore femur green on inner surface.

Venation black. Pterostigma narrow, black, with 4 cells below it on each wing. Nodal index: $\frac{9.14}{12.10} | \frac{13.10}{12.11}$, primary antenodals are 1st and 5th in all wings. Discoidal field of 2 rows of cells in all wings, expanding before nodal level. Hindwing with 3 cells in anal triangle, other triangles free, anal loop of 4 cells. Membranule long and narrow, white.

Abdomen slightly swollen on basal segments. Auricles pale reddish brown, darker on the evenly curved rim, the posterior edge of which is slightly dentate. Black foliations on segment 8 moderately broad, overlapping on to more than half of segment 9 (in *schoutedeni* they barely overlap one third of segment 9). Segment 1 ferruginous, with brownish yellow stripe against posterior lateral margin; segment 2 ferruginous with broad yellow stripe along ventral margin; segments 3-6 black with yellow basal fascia as far as the transverse carina but crossing this on 6; 7 mainly yellow, the distal third black dorsally; 8 black dorsally, ferruginous laterally; 9-10 ferruginous with the usual phyllogomphine dorsal dentate crest. Superior appendage orange-yellow, the curved terminal portion brown; inferior appendage ferruginous. Accessory appendages black, anterior lamina strongly toothed, the hamules much longer and narrower than in *schoutedeni*. Prothorax as in fig. 1f.

Abdomen (without appendages) 46 mm, hindwing 44 mm, pterostigma (forewing) 3,5 mm.

A paratype ♂ differs in having 5 cells below each pterostigma, but it is similar in markings. Size similar.

Allotype ♀ (mature) (Four Rivers). Essentially similar in markings on face, thorax and abdomen to the holotype ♂. Wings all with traces of amber at bases. In this allotype the foliations on segment 8 are vestigial, extremely narrow. Cerci yellow, thick basally, tapering strongly to an acute apex.

Abdomen 49 mm, hindwing 40,5 mm, pterostigma (forewing) 3,5 mm.

Paratype ♀ (Four Rivers). Similar to allotype but smaller traces of basal amber on wings. Foliations on 8 very slender. Size of insect similar. Paratype ♀ (Katambora) again similar. Basal amber on wings scarcely visible. The foliations on segment 8 are more developed than in the Four River females, shaped like a long slender triangle, about 1 mm wide at greatest width. The second Katambora ♀ is the example without an abdomen.

♀ Morph with foliations on segment 8 as large as in ♂: Two paratype ♀ (Maramba R.)—marked as in Allotype. One paratype ♀ (Chobe R.) — again, as in allotype.

Comparison with *P. schoutedeni* Fraser:-

Fraser (1957) gives smaller measurements for type *schoutedeni* than the above sizes for *brunneus*. A ♂ *schoutedeni* in the National Museum, Bulawayo, from Lubumbashi (examined by Fraser) has the following dimensions:- abdomen 45,5 mm, hindwing 38 mm. It differs from *brunneus* in having a black basal line on labrum and a thicker central line; a black stripe on the suture between postclypeus and frons and an oblique bar across ante- and postclypeus; antehumeral stripe well separated from collar; a green stripe behind the antealar sinus; costal margin of forewing bright yellow on outer edge; auricles yellow, this yellow connected with the ventral yellow stripe on segment 2; segment 10 mainly yellow, only ferruginous at base; foliations on segment 8 not overlapping segment 9 by as much as one third; superior appendage with a strong sub-basal ventral tooth (only a ventral swelling in *brunneus*); inferior appendage more slender; hamule much shorter, broader apically; anterior lamina less strongly toothed.

This species is interesting in being the most southerly known *Phyllogomphus* and in having two structural morphs in the female sex.

Holotype, 1 paratype ♂, allotype ♀ Four Rivers 7 Dec. 1973; 1 paratype ♀ Four Rivers 6 Dec. 1973; 1 paratype ♀ Katambora, Zambia, Jan. 1956 (E. Pinhey); 1 paratype ♀ Maramba River, Zambia, 1 Febr. 1965 (E. Pinhey); 1 paratype ♀ Maramba River 3 Febr. 1965 (E. Pinhey); 1 paratype ♀ Chobe R. (Kasane) Dec. 1965 (E. Pinhey). Types in National Museum, Bulawayo.

In Dec. 1975 no adults were taken at Four Rivers but one larval shuck of a *Phyllogomphus* was collected at a river 3 km S. of Four Rivers 11 Dec. 1975 (E. Pinhey) and this can be presumed to be *P. brunneus*.

Botswana records.

NMC: Four Rivers Dec. 1973 (FC); Chobe R. (Kasane) Dec. 1965 (E. Pinhey).
Larva? Four Rivers Dec. 1975 (E. Pinhey).

CRENIGOMPHUS Selys (1892)

These are more yellowish than the other Gomphidae included here.

Only one species known in Botswana.

50. *Crenigomphus cornutus* Pinhey, 1956b: 83

Described from the Victoria Falls, this is a local species in the Zambezi Valley, Zambia and Shaba (Katanga). It was found in the Caprivi at Andara March 1974, and on the Chobe River in September 1974. It favours long grass near the margins of fast-flowing rivers or streams.

Botswana records.

NMC: Chobe rapids (Kasane) Sept. 1974 (NME).

PARAGOMPHUS Cowley (1934)

This, the largest of our genera of Gomphidae, consists of green species, marked with black, with long, curved superior appendages in the males, the inferior appendage much shorter.

Several species have been found in the Zambezi Valley but only three of these are recorded here. Others include *P. cataractae* Pinhey (1963), *P. nyassicus* Kimmins (1955) and *P. zambeziensis* Pinhey (1960), any of which might also be eventually found in the Kasane region.

Key to *Paragomphus*

1. Face and frons in front with transverse black bands. Superior appendages of male curving to very fine points. Pterostigma black. Thoracic markings black *P. sabicus* Pinhey
 — Face and frons in front unmarked with black. Superior appendages of male thicker, not tapering to a fine point. Thoracic markings brown 2
2. Pterostigma black. ♂: foliations on segment 8 each more than half as broad as diameter of its segment. Superior appendage ending in a single blunt point *P. elpidius* Ris
 — Pterostigma pale brown between black veins or at least partly pale brown. ♂: foliations on segment 8 less than half as broad as diameter of its segment. Superior appendage ending in two points.
 *P. genei* (Selys)

51. *Paragomphus elpidius* (Ris)

Mesogomphus elpidius Ris, 1921: 346

Described originally from Zululand and Zaire, this species is widespread from Natal to equatorial Africa but seldom common except in the Zambezi Valley, in my experience. It is found near river margins but the few Botswana records indicate that it is also found, at least sparingly, in swamps. The foliations on segment 8 in the Botswana males and those from the lowveld of Rhodesia are blacker than some of those from the Zambezi Valley, Natal and elsewhere, but no explanation can be given for this at present. The first Botswana specimen was found freshly dead in a Four Rivers swamp and may have been dropped by a predator? In life the eye was olive above, grey-blue at sides, whitish blue ventrally; face, thorax and base of abdomen with bright green markings; segments 3-7 greenish yellow to yellow.

Botswana records.

NMC: Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC).

52. *P. genei* (Selys)

Plate 1: 7

Gomphus genei Selys, 1841: 245

For years known by its synonym *P. hageni* (Selys, 1871), this species, described from Sicily (*hageni* from Egypt), is the commonest and most widespread of the African Gomphidae, known from South Africa to southern Europe. It is found near rivers, streams and pools but so far it is only known, again sparingly, from three Botswana localities.

Botswana records.

NMC: Four Rivers Dec. 1975 (FC); Chobe rapids (Kasane) Sept. 1974 (NME); Nata Apr. 1976 (Peterhouse Exp).

53. *P. sabicus* Pinhey, 1956b: 83

Larger than the previous two species, this was described from Victoria Falls and has been found locally from the Sabi Valley northwards to Zambia, as well as in Mozambique. It is possibly a race of the Madagascar species *P. fritillarius* (Selys, 1892). Since it is common near the Victoria Falls it will probably be found on the Chobe River in Botswana. It prefers well-flowing rivers and streams.

Family AESHNIDAE

These are the large "Hawker" dragonflies which fly strongly over rivers, streams or even small pools and swamps. Many are diurnal, sometimes, with crepuscular tendencies. Others, dark in colours, with larger eyes, are crepuscular or nocturnal, but only one of these, a *Gynacantha* Rambur, has so far been found in Botswana. Certain of the *Anax* Leach are known to be migrants.

Key to *Aeshnidae*

1. Vein IR₃ forked proximally to pterostigma. Hindwing ♂ with distinct anal triangle, anal margin excised. Eyes large. Body dull greenish brown, not brightly coloured . . . *Gynacantha villosa* Grünberg
— IR₃ forked after middle of pterostigma. Hindwing ♂ without distinct anal triangle, anal margin not excised, the tornus rounded. Eyes moderate. Body with bright colours 2
2. Vein IA in hindwing forming a separate small loop. Abdominal segments 4-8 with only one lateral carina; segment 2 with prominent bright blue transverse dorsal band *Hemianax ephippiger* (Burmeister)
— IA in hindwing not forming an isolated loop. Segments 4-8 with two lateral carinae; segment 2 without prominent blue transverse band *Anax* Leach

HEMIANAX Selys (1883)

One widespread migrant in this genus in Africa, easily distinguished in flight by the bright blue saddle near the base of the abdomen.

54. *Hemianax ephippiger* (Burmeister)

Plate 2: 1

Aeschna ephippigera Burmeister, 1839: 840

This common migratory species was described from Madras and is well known throughout most regions of Africa, southern Europe and parts of Asia. Sometimes seen at dusk but mainly diurnal. It would probably range across any part of Botswana.

Botswana records.

NMC: 140 km N.W. of Francistown Febr. 1967 (NME); Gweta Febr. 1967 (NME); 10-17 km S. of Maun March 1974 (NME); Tsau River (at dusk) March 1974 (NME); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1975 (FC); Goha Hills Apr. 1974 (NME).

ANAX Leach (1815)

Prior to the 1973 Four Rivers expedition only two widespread species of *Anax* were known from the Okavango and it was astonishing to find the little known *A. bangweuluensis* Kimmins in the area.

Key to *Anax*

1. Frons unmarked with darker shades. Abdomen mainly red or reddish brown 2
— Frons with dark basal marking. Abdomen mainly black or mainly blue or green 3
2. Both sexes with dark brown subcostal basal ray on both wings. Abdomen and hindwing well under 50 mm long. ♂: superior appendage foliate, evenly curved on inner edge; ♀: cercus slenderly foliate, evenly curved on inner edge *A. bangweuluensis* Kimmins
— Both sexes without dark brown wing markings but may have amber basal suffusion (especially in ♀). ♂: superior appendage long, slender, irregular on inner edge; ♀: cercus less slender, foliate, evenly curved on inner edge *A. speratus* Hagen
3. Frons with centro-basal black spot and a blue-grey crescent before the ridge. Abdomen pale blue or green with black markings. Abdomen about 50 mm or less. ♂: superior appendage foliate, with broad

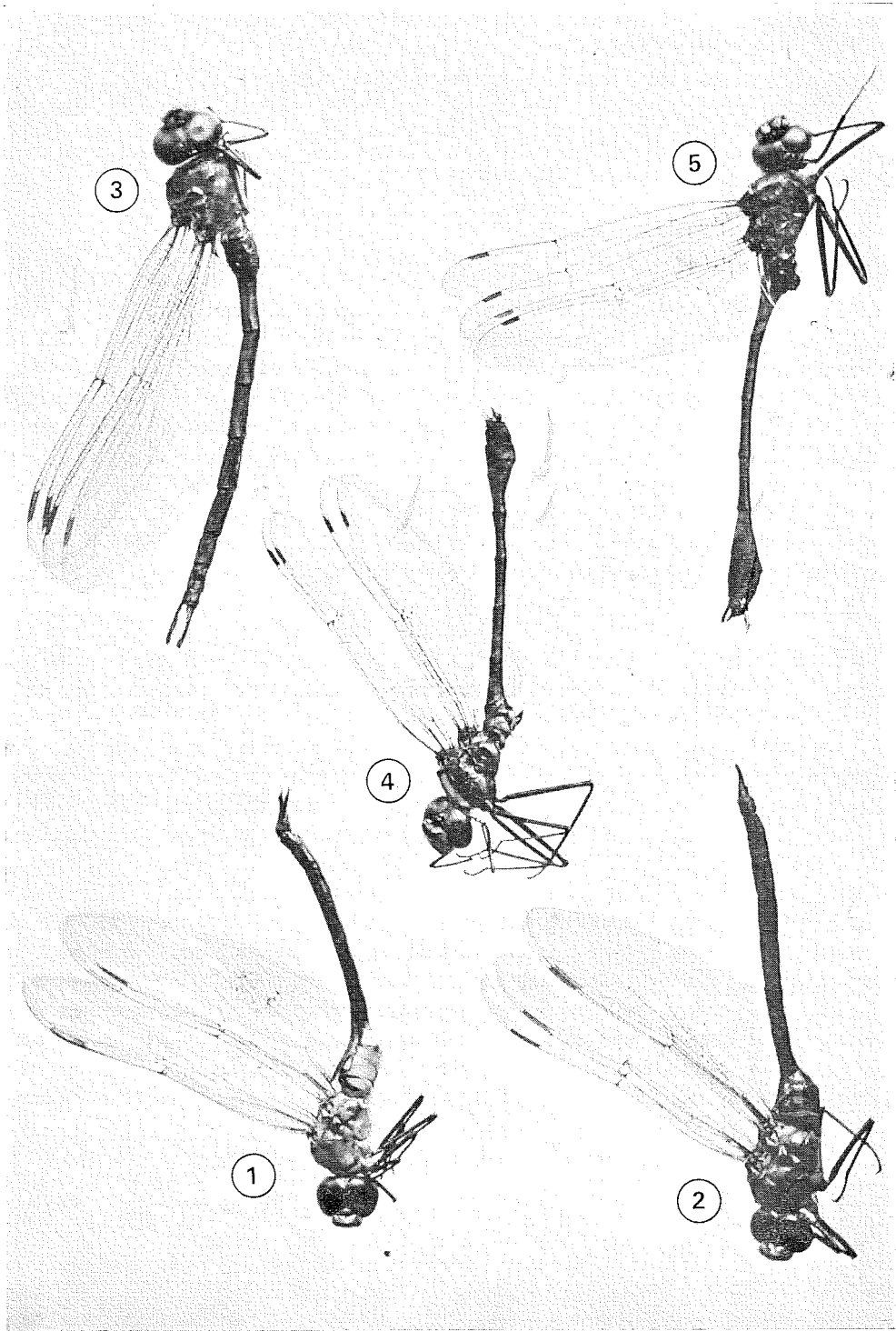


Plate 2:

1. *Hemianax ephippiger* ♂, 2. *Anax bangweuluensis* ♂, 3. *Gynacantha villosa* ♂, 4. *Macromia kimmusi* ♂, 5. *M. bifasciata* ♂.

sinuosity on inner edge but no flange apically; ♀: cercus foliate, evenly curved on inner edge
 *A. imperator* Leach
 — Frons with transversely broad black basal triangle. Abdomen mainly black, with green spots, third
 segment half yellow. Abdomen ♂ over 75 mm, ♀ over 65 mm. ♂: superior appendage foliate with broad
 inner flange continuing to apex; ♀: cercus short, elliptical *A. tristis* Hagen

55. *Anax bangweuluensis* Kimmins, 1955: 110

Plate 2: 2

Described from the northern shores of Lake Bangweulu (leg. M. Steele), Oct. 1946 in north central Zambia, this is a red species, about the size of *A. imperator* Leach but with the colouring of the much larger *A. speratus* Hagen. It was only known from the type ♂ (British Museum) and 3♂, 1♀ taken Nov. — Dec. 1959 at dusk at Bangweulu by R. C. Dening, all except one of which are in the National Museum, Bulawayo, including the single known female described by Pinhey (1961). The first Botswana record was during the 1973 Four Rivers expedition, a fleeting glimpse of one in flight about 3 km before we reached the camp-site. Several males were later seen flying in woodland but only two males were collected, one in an ornithological mist net, the other plucked off a reed by Raphael where it was resting during a downpour. Although Dening had captured a ♂ at light none came to our MV light traps.

In December 1975 at Four Rivers a few of both sexes were collected at bird mist-nets over a swamp and Mrs Winifred Carter of the Smithsonian Institution collecting team at Xugana secured a few from a boat within channels through papyrus beds. Occasional specimens were glimpsed flying through reeds in swamps. Thursday 11th December, the day before we left the camp site, it was dull, rather cold, with spasmodic light rain. Philip and Raphael found large numbers of this species hiding in long grass near camp, taking short flights on being disturbed. A long series of both sexes was collected during or between light rain. They included some juveniles and three pairs *in copula*. A few were also taken by F. de Moor and Pinhey.

In life, mature ♂: eye olive, brownish yellow postlaterally; labrum brownish yellow; clypeus and frons pinkish brown, brownish yellow laterally; thorax and abdomen all dull pale brownish red. ♀: eye grey above, edged with cream posteriorly, below cream-brown; frons, postclypeus, thorax, abdominal segments 1-2 bright pale green; lips and sternite creamy yellow; rest of abdomen deep red-brown dorsally with broad cream lateral band. In some specimens the lateral band on the abdomen is darker yellow and in an old ♀ it is redder and evanescent, thus appearing like the mature ♂; and the thorax reddens. The juvenile ♂ has colours of the normal ♀, with the thorax green, not red, and with the cream lateral band on the abdomen.

Thus, as in other Odonata the juvenile ♂ is gynochroic and only achieves its full red thorax and abdomen at maturity.

The Smithsonian Institution captures were: Xugana ♀ 2 Dec., ♂ 7 Dec., ♀ 10 Dec. (and a possible larva) (Mrs J. B. Carter).

Botswana records.

NMC: Four Rivers 7, 10 Dec. 1973, 7, 8, 9, (26♂, 13♀) 11 Dec. 1975 (FC); en route to Gadikwe Lagoon (1♂) 30 Dec. 1974 (R. McBee).

56. *Anax imperator* Leach, 1815: 137*Anax mauricianus* Rambur, 1842: 184

A. imperator was described from Europe, *mauricianus*, probably only a variety, from Mauritius. Common and widespread on rivers, streams, pools and swamps throughout Africa, except the higher elevations, most of Europe and western Asia. It is regarded as a migrant at times but it breeds freely in African waters. It is recognizable by the bright green thorax and the brightly blue-spotted abdomen of the male, greener in the female. It has been seen at many places in northern Botswana without capture in addition to the records, and is probably common in most parts of the territory. A ♀ near Kachikau 3 April 1974 was captured with prey, another dragonfly, *Crocothemis erythraea* (Brullé) ♂.

Botswana records.

NMC: Lake Ngami Aug. 1969 (FC); Sepopa Febr. 1967, (larval shuck) March 1974 (NME); 14-25 km N. of Maun Febr. 1967 (NME); Four Rivers Dec. 1973, Dec. 1975 (FC); Sum Sum Dec. 1975 (P. Wright, FC); 22 km E. of Kachikau Apr. 1974 (NME).

Schultze: recorded *imperator* from pans in S. Botswana (Ris, 1908).

57. *Anax speratus* Hagen, 1867a: 46

Described originally from the Cape Province this large red species is found in most parts of continental Ethiopian Africa. It is superficially like a very large *A. bangweuluensis* and can be separated from this by its size and by essential differences given in the key. The thorax, again, can be bright green in juveniles and females, or red in the mature male. It favours rivers or streams more often than pools and is not palustrine in habits. It is common at the Victoria Falls and in Matabeleland, as well as S.W. Angola, and is almost certain to be found near the Chobe River.

58. *Anax tristis* Hagen, 1867a: 35

This black species with green thorax and green and yellow abdominal markings is one of the largest African dragonflies. It was described from a ♀ collected in Guinea. It is a widespread and powerful flier, known from Southern to equatorial Africa, as well as from islands in the Indian Ocean as far as the Maldive Islands. It is probably a migrant at times. It is more often seen over pools than rivers and streams. Although diurnal it will frequently fly at dusk.

Botswana records.

NMC: 100 km N. of Maun Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Sum Sum Dec. 1975 (FC).

GYNACANTHA Rambur (1842)

Dark, crepuscular or nocturnal aeshnids with large eyes and long foliate terminal appendages which are sometimes broken off in the female when ovipositing. One species has been taken in Botswana.

59. *Gynacantha villosa* Grünberg, 1902: 233

Plate 2: 3

Originally described from the Tanzania- Malawi border, this species is found from Mozambique through East and Central Africa to equatorial Africa. Occasionally seen near the Victoria Falls, only a single female has so far been known in Botswana, collected by Philip. Botswana record.

NMC: 1♀ Chobe rapids (Kasane) 16 Sept. 1974 (Philip).

Superfamily LIBELLULOIDEA

Family CORDULIIDAE

Although several genera are found in Africa only *Macromia* Rambur is widespread and this is a large genus. Several species are found in the vicinity of the Victoria Falls. In Botswana four species have been collected and one of these appears to be an undescribed taxon in this complex genus.

MACROMIA Rambur (1842)

Medium-sized to very large species with brown or black bodies, usually marked with yellow and exhibiting a metallic sheen. The 10th abdominal segment of the male is generally modified dorsally; either flat or with pronounced tumour and sometimes spinous hairs.

Key to *Macromia*

1. Large species, abdomen over 45 mm. Thorax without yellow lateral stripes (at most a thin yellow humeral line). Abdomen segment 3 mainly yellow. ♂: segment 10 convex but without cones or spines. Superior appendage dark brown *M. bifasciata* Martin
— Abdomen 45 mm or less. Thorax with three distinct yellow lateral stripes. Segment 3 not continuously yellow on basal half 2
2. Abdomen 45 mm or nearly so. Face greenish yellow with a blue-black crescent across front of frons. ♂: segment 10 with twin dorsal spines; superior appendage and genital lobe all yellow
..... *M. kimminsi* Fraser
— Abdomen about 40 mm. Face in front reddish brown to dark metallic blue without a dark crescent ... 3
3. Pterostigma red or reddish brown. Frontal peaks yellow. ♂: segment 10 having a broad dorsal cone with one spine; superior appendage and genital lobe yellow *M. picta* Selys
— Pterostigma black. Frontal peaks dark metallic violet or blue. ♂: segment 10 flat above; superior appendage black; genital lobe black and yellow, with yellow basal spot *M. paludosa* spec. nov.

60. *Macromia bifasciata* (Martin)

Plate 2: 5

Phyllomacromia bifasciata Martin, 1912b: 96

Described originally from Sikasso (Mali) and Dakar (Senegal) this large species is widespread from southern Mashonaland northwards to equatorial central and West Africa. It has been confused with *M. nyanzana* Grünberg (1911) (= *reginae* Le Roi 1915). From records available all specimens from Mozambique, Rhodesia, Zambezi Valley and Botswana, even those formerly thought to be *nyanzana*, are *bifasciata*. The simplest means of distinguishing the two taxa is by the upper surface of the frons in both sexes. In *bifasciata* there are broad yellow fasciae on the inner surfaces of the ferruginous peaks, these spots often linked across the bottom of the groove; in *nyanzana* the peaks are darker ferruginous to purplish, with or without very small isolated yellow spots. The superior appendage of the

male is dark brown in *bifasciata*, frequently paler or even yellow apically; all black in *nyanzana*. In the female, *bifasciata* has much less amber and deep brown on the wing bases and, in particular, the forewing is only amber or brown and amber as far as the second Ax in the costal-subcostal zone, less so posteriorly, whereas in *nyanzana* the base is more continuously coloured to second Ax. The Balinsky record (1967) of *reginae* from the Okavango swamps was therefore, in all probability, *bifasciata*.

In life, the eye of the male is pale blue-green with a yellow posterior edge; frons white or creamy white above, yellow at sides; antehumeral stripe and ante-alar sinus creamy or ivory white; abdominal bands bright yellow. The narrow antehumeral stripe is sometimes absent. In the female the forewing is normally deep amber in the apical region but in old females the apical and basal amber are lost, only the deep brown basal marking being retained.

An example was taken at Andara in the western Caprivi in March 1974, and that same month this species was seen in flight at Shakawe amongst citrus trees, together with the smaller *M. picta* Selys and *M. paludosa* spec. nov. The Maun 1968 record was of a male secured with dust shot, a method used occasionally at other times for elusive Odonata and even Lepidoptera. The species is common at Four Rivers in December. It favours woodland or riverine gallery forest.

Botswana records.

NMC: Botletle River 90 km E. of Maun, and Makala-ma-Bedi Febr. 1967 (NME); Maun Dec. 1968 (FC); Mohembo-Shakawe Apr. 1970 (A. Archer); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Lagoon Dec. 1975 (FC); Savuti Channel March 1969 (T. Liversedge), March 1976 (NME); Chobe River (Kasane) Dec. 1965 (E. Pinhey); Chobe R., Kazungulu Nov.-Dec. 1975 (K. Adams).

TM: (as *reginae*): Maun June 1930 (G. van Son).

BC: (as *reginae*): Moremi Game Res. Dec. 1963 — Jan. 1964.

61. *Macromia paludosa* spec. nov.

Fig. 2

A smaller species than *bifasciata*, the male without cone or spine on the 10th abdominal segment, as in several other species, amongst others *M. subtropicalis* Fraser, *M. occidentalis* Fraser, and the smaller species *M. africana* (Selys) and *M. nigeriensis* Gambles. Of all these, the new species is nearest to *subtropicalis*.

Only a single male was secured at Shakawe, flying amongst other examples of this dark species, together with *bifasciata* and *picta*, as mentioned above, in a small citrus grove. Two very teneral specimens from the Maramba River near Livingstone, Zambia are probably the same species. It is named *paludosa* for its association with the Okavango swamps.

Holotype ♂ (mature). Labium ferruginous; labrum pale red, broadly ferruginous down the middle; anteclypeus brown, postclypeus brown with greenish yellow lateral spot; frons red in front, brown laterally, with greenish yellow spot, the peaks and groove shiny purple with a small narrow green crescent across the groove (fig 2a); vertex dark purple; occiput black; orbits below ferruginous and black.

Prothorax brown, paler laterally. Synthorax dark red-brown with metallic green or blue reflections. Yellow mid-dorsal carina and ante-alar sinuses; three yellow thoracic stripes, a narrow antehumeral and two lateral ones, the upper lateral stripe thickly edged with black. Fore legs black; middle and hind femora ferruginous, black at knees, tibiae black, the hind tibial carina ferruginous.

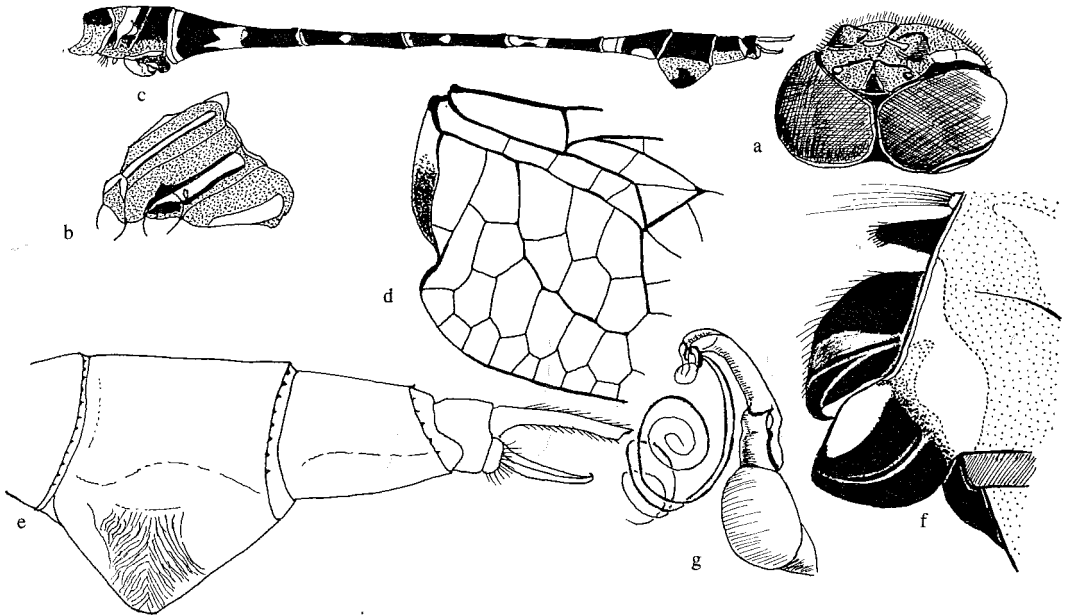


Fig. 2. *Macromia paludosa*, holotype ♂ (except fig. g) a. head, obliquely from above; b. synthorax; c. abdomen; d. base of hindwing from arculus to tornus; e. abdomen, segments 8-10; f. accessory genitalia; g. prophallus of teneral ♂ Maramba River.

In figs a-c and f, stippled areas are ferruginous, plain areas yellow, except joints and anal appendages not marked.

Venation and the narrow pterostigmata black, costae yellow posteriorly. Nodal index $\frac{6.12}{9.9} \mid \frac{13.6}{8.9}$. Discoidal field of one row for first few cells in all wings. Anal loop of 6 cells, anal field and tornus as in fig. 2d; membranule dark brown, creamy white at base.

Abdomen of the usual male *Macromia* shape, partly reddish brown on basal and end segments (stippled zones, fig. 2c), with yellow segmental markings shown in the figure. These yellow markings include a yellow carinal band on segment 2; incomplete basal annuli on segments 3-5 as well as carinal triangles; similar markings on 6 but these linked up laterally as shown; segment 7 yellow at base to just beyond carina, as well as a yellow lateral distal fascia. Foliations on segment 8 broadly triangular. Segment 10 flat above (no spine). Auricles yellow, short, smoothly rounded. Distal ends of segments 3-9 with small spines but none on 10. Anal appendages black. Superior appendage slender, straight, the apex out-turned to a moderately acute point. Accessory genitalia black (fig. 2f); hamule with oblique crest, the apical hook small; genital lobe with an elliptical yellow anterior fascia; prophallus as in fig. 2g.

Abdomen 41 mm, hindwing 36.5 mm, pterostigma (forewing) 2 mm.

Although Fraser gives as dimensions for the type male *subtropicalis* abdomen 43 mm, hindwing 33 mm., this abdominal measurement includes anal appendages and the actual length is c. 39 mm. The holotype of the new species is, thus, slightly larger than the type *subtropicalis*. The frons in *subtropicalis* is dark violet blue without the small yellow crescent, but this fascia is probably variable in such a dark species and might be evanescent. Abdominal segments 5 and 6 are all black in *subtropicalis*. The hamule has a distinctly longer apical hook and the genital lobe is black with an apical yellow spot in *subtropicalis*. *M. subtropicalis* was described from tropical Zaire (Bambesa).

The two teneral males, from Maramba River, near Victoria Falls, Febr. 1964 (E. Pinhey), are of similar size, the markings somewhat paler because of their immature condition. They are almost certainly the same species as *paludosa* but I will not consider them as paratypes. Maturer males are required. No females have been seen. The holotype ♂ is in the National Museum, Bulawayo.

Botswana record.

NMC: 1♂ Shakawe, W. Okavango River 26 March 1974 (E. Pinhey).

62. **M. kimminsi** Fraser, 1954b: 63

Plate 2: 4

Macromia kimminsi junior Pinhey, 1961d: 116

Typical *kimminsi*, described from a male from Sierra Leone, is a large species: abdomen 52.5 mm, hindwing 45 mm. It is readily distinguished from a similar large species *M. bicornis* Förster by the yellow face and frons, with a dark metallic crescent across the frontal crest. In *bicornis*, also from equatorial Africa, the frons is all dark metallic blue above. Both species have twin dorsal spines on segment 10 in the male. Subspecies *junior*, described from a short series of both sexes from Kenya and Uganda, is smaller than *kimminsi*, abdomen (♂) 48 mm, hindwing 43 mm. In Febr. 1960 I collected a male *kimminsi* in north Mwinilunga District, N.W. Zambia. This was still smaller than *junior*: abdomen 45 mm, hindwing 40 mm. In life, this male had an emerald eye, the body markings greenish yellow.

During the 1973 expedition to Four Rivers area two males were captured and the fragmentary remains of a third male were found floating on water a few kilometres from camp. Further males and one female were collected on the 1975 expedition to the same area. In these the dimensions are very close to the Mwinilunga example: abdomen 43-44 mm, hindwing 39-40 mm. The Zambian and Okavango specimens seem to represent still another subspecies, smaller than either of the others but it seems unnecessary for present purposes to provide a subspecific name.

In life, the eye of the Four Rivers male was pale grey-blue, post-laterally greenish cream; labium yellow, face pale greenish yellow; thoracic and abdominal markings yellow; superior appendages yellow. The single female, Dec. 1975, has deep amber postnodal suffusions on all wings but this colour does not quite extend to the extreme apex, nor to the posterior margins of the wings; also traces of basal amber. The species is found in woodland or forest.

Botswana records.

NMC: Four Rivers (both sexes) Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana Lagoon Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC).

63. *M. picta* Selys, 1871a: 552

A small species described from Cape Province, this is the most widespread and sometimes the commonest of the African *Macromia*, extending from South to equatorial Africa. It is not typically a woodland or forest species but it is found in bush country or on the fringe of gallery forest.

Botswana records.

NMC: Maun Jan. 1970 (NME); Shakawe March 1974; Jugu Jugu (Boro River) May 1974 (S. Williams & A. McDermott); Chobe rapids (Kasane) Sept. 1974 (NME); Savuti Channel camp March 1976 (NME).

Family LIBELLULIDAE

This, the largest family in Africa, is well represented in the Okavango delta and it includes a few species of particular interest. Balinsky described *Orthetrum robustum* there and it is common in some areas. A new species of *Diplacodes* Kirby is described below. Three species from equatorial Africa have been found in the delta: *Nesciothemis minor* Gambles, *Brachythemis wilsoni* Pinhey and *Sympetrum navasi* Lacroix. There are two interesting species of *Trithemis* Brauer faunistically linked with Zambian swamps.

Key to Family Libellulidae (average characters)

1. Arculus at or distal to second Ax 2
— Arculus proximal to second Ax 5
2. Last Ax in forewing incomplete. Pterostigma bicoloured, paler distally *Hemistigma albipuncta* (Rambur)
— Last Ax in forewing complete. Pterostigma unicolorous 3
3. Discoidal field in forewing mainly 2 rows in basal half (or starting 3 cells at triangle). Abdomen broad on most segments, triangular in cross-section *Aethiothemis discrepans* Liefstinck
— Discoidal field in forewing mainly 3 rows in basal half. Abdomen slender in ♂, at least after segment 3; cylindrical in ♀ 4
4. Vertex grooved; clypeus narrower than frons. Prophallus with flagellum *Orthetrum* Newman
— Vertex rounded; clypeus broader than frons. Prophallus without flagellum *Nesciothemis* Longfield
5. Costa of forewing with infraction before nodus. Abdomen short and broad. Wings with some dark pigments *Palpopleura* Rambur
— Costa without infraction before nodus 6
6. Last Ax in forewing complete 7
— Last Ax in forewing incomplete 9
7. Small species, hindwing 22 mm or less; abdomen swollen on basal half, then slender. Forewing with only 6½-8½ Ax *Acisoma panorpoides ascalaphoides* Rambur
— Large or small species, abdomen only swollen on segments 2-3 8
8. Large insects, hindwing over 32 mm. Forewing with 7 Ax. Hindwing with dark brown and yellow basal area *Urothemis* Brauer
— Small insects, hindwing 23 mm or less. Forewing with 6 Ax. Hindwing yellow at base with short brown hyphen *Aethriamanta rezia* Kirby
9. Discoidal field in forewing at least slightly expanding distally 10
— Discoidal field in forewing contracting or parallel distally 16
10. Abdomen swollen in basal half. Forewing with only 6½-8½ Ax *Acisoma panorpoides ascalaphoides* Rambur
— Abdomen normal, or only swollen on segments 2-3 11
11. Discoidal field in forewing of 2 rows in basal half 12
— Discoidal field in forewing of 3 rows in basal half 13

12. Cu_2 forewing slightly curved. Frons broadly metallic blue. ♂ with ventral forked appendage on base of abdomen *Chalcostephia flavifrons* Kirby
 — Cu_2 forewing strongly curved. Frons not metallic blue. ♂ without ventral process
 *Diplacodes* Kirby
13. Anal loop short, not extending far distal of triangle in hindwing. Abdomen broad. Forewing with dense apical cell formation *Crocothemis* Brauer
 — Anal loop extending 2-4 cells beyond triangle. Abdomen more or less slender. Forewing apical cells not dense 14
14. Forewing with $6\frac{1}{2}$ - $8\frac{1}{2}$ Ax. Pterostigma usually bicoloured *Brachythemis* Brauer
 — Forewing with at least $10\frac{1}{2}$ Ax 15
15. Radial supplement in forewing of 1 row. Pterostigma bicoloured .. *Hemistigma albipuncta* (Rambur)
 — Radial supplement in forewing of 2-3 rows. Pterostigma all brown or black. Large, robust species with reticulate brown thorax *Bradinyopyga cornuta* Ris
16. Forewing with $6\frac{1}{2}$ - $7\frac{1}{2}$ Ax 17
 — Forewing with at least $8\frac{1}{2}$ Ax 19
17. Hindlobe of prothorax small. Abdomen moderately broad, triangular in cross-section. Pterostigma usually bicolorous *Brachythemis* Brauer
 — Hindlobe of prothorax large. Abdomen slender. Pterostigma unicolorous 18
18. Triangle in forewing crossed. Abdomen plain red or yellow with sparse black markings
 *Sympetrum* Newman
 — Triangle in forewing not crossed. Abdomen differently coloured on basal and distal halves, the distal segments black with yellow streaks *Philonomon luminans* (Karsch)
19. Hindlobe of prothorax large, prominent. Forewing with $8\frac{1}{2}$ Ax *Sympetrum* Newman
 — Hindlobe of prothorax normal 20
20. Triangle in forewing and hindwing almost at same level 21
 — Triangle in forewing 3 or more cells distal to triangle in hindwing 25
21. Anal loop normally open at margin. Hindwing broad, with a brown prenodal band. Crepuscular
 *Tholymis tillarga* (Fabricius)
 — Anal loop distinctly closed before margin 22
22. Anal loop reaching 1-2 cells beyond triangle in hindwing. Body not metallic *Trithemis* Brauer
 — Anal loop reaching 3-4 cells beyond this triangle 23
23. R_3 in forewing scarcely curved. Radial supplement of 1 row. Body not metallic, all black in mature ♂. Wing apices broad. Maturer ♂ with postnodal brown band across both wings
 *Parazyxomma flavicans* (Martin)
 — R_3 very sinuous. Radial supplement of 2 rows. Body metallic. Wing apices narrow 24
24. Pterostigma shorter, about 4 mm. Tibial spurs slender. Abdomen not markedly swollen at base
 *Zygonyx* Hagen
 — Pterostigma over 4 mm. Tibial spurs robust. Abdomen very swollen at base .. *Olpogastra* Karsch
25. Pterostigma of same size in all wings. Body black with metallic sheen. Wings, or at least the hindwing, broadly marked with iridescent black or dark brown *Rhyothemis* Hagen
 — Pterostigma longer in forewing than in hindwing. Body not metallic black. Forewing unmarked; hindwing with only basal yellow or brown markings 26
26. R_3 in forewing very sinuous. Hindwing with only a yellow cloud *Pantala flavescens* (Fabricius)
 — R_3 in forewing almost straight. Hindwing with prominent brown or yellow basal markings
 *Tramea* Hagen

ORTHETRUM Newman (1833)

A large cosmopolitan genus of which six species are so far known in Botswana. The body of the mature male in these is partly or sometimes coated with blue pruinosity, but in most cases the thoracic colour and markings, which are a guide to specific identification, are more or less visible. Examination of the male accessory genitalia is usually necessary for identi-

fication except in *O. trinacria* (Selys), but *O. icteromelan* Ris is generally recognizable in both sexes by the bright yellow or greenish yellow thorax marked with prominent black stripes. The smallest species is *O. machadoi* Longfield. These last two and *robustum* are the commonest species in the swamps of the delta.

One small species *O. hintzii* Schmidt, not yet known from Botswana but widespread in Africa, is worth mentioning here for its prey: ♀ *Massagena*, Save River, Mozambique 6 Dec. 1972 with prey, *Belenois gidica* (Godart) (Lepid.: Pieridae).

Key to *Orthetrum*

Males

1. Large species, abdomen longer than hindwing. Frons with dark line down the front *O. trinacria* (Selys)
— Small to moderate species, abdomen shorter than hindwing. Frons in front unmarked or with circular marking 2
2. Thorax with one white or cream lateral stripe (sometimes obscured) 3
— Thorax without this stripe 4
3. Labium more or less black on posterior lobe. Lip of anterior lamina massive, reaching beyond hamules. Rspl of 2 rows. Outer hamule very broad, depressed, with small hook *O. brachiale* (Beauvois)
— Labium all pale. Lip of anterior lamina not normally extending beyond hamules. Rspl of 1 row (rarely 2). Inner hook of hamule broad, above a ledge on outer hamule. . . *O. chrysostigma* (Burmeister)
4. Membranule mainly white. Inner hook of hamule small, turned back, outer hamule robust. Rspl of 2 rows. Thoracic black markings linear *O. robustum* Balinsky
— Membranule grey 5
5. Outer hamule broadly depressed in middle, inner hamule with back-turned hook small in comparison to the hamule; anterior lamina robust, extending beyond hamule. Rspl of 2 rows *O. brachiale* (Beauvois)
— Outer hamule thick and solid, not depressed. Rspl of 1 row, sometimes 2 6
6. Frontal crest with prominent black double ring. Rspl of 1-2 rows. Abdomen swollen at base, then slender. Inner hook of hamule small, turned more or less outwards *O. icteromelan cinctifrons* Pinhey
— Frontal crest unmarked. Rspl of 1 row. Abdomen less swollen at base, less slender distally. Inner hook of hamule large, strongly directed backwards *O. machadoi* Longfield

Females

1. Large species, abdomen longer than hindwing. Cercus more than twice as long as segment 10 *O. trinacria* (Selys)
— Small to moderate species, abdomen shorter than hindwing. Cercus scarcely longer than segment 10 2
2. Thorax with one white lateral stripe 3
— Thorax without white stripe 4
3. Thorax with moderate black lateral stripes; segments 7-8 black or black with yellow lateral spots. Vulvar aperture with central ridge and with lateral swellings *O. brachiale* (Beauvois)
— Thorax less heavily marked with black; segments 7-8 orange-brown with black lateral stripe. Vulvar aperture with uneven lips and folds *O. chrysostigma* (Burmeister)
4. Segments 4-7 broadly black dorsally and with black lateral markings at ends of segments *O. brachiale* (Beauvois)
— Segments 4-7 mainly yellow to pale brown, but the dorsal carina may be narrowly black and there is often a black lateral stripe 5
5. Dorsal carina of 4-7 not black. Vulvar aperture with very thick lips *O. machadoi* Longfield
— Dorsal carina of 4-7 black 6
6. Membranule white. Thorax pale brown or grey-brown with thin black markings. Crest of frons unmarked. Legs pale brown, black at knees *O. robustum* Balinsky
— Membranule grey. Thorax yellow, with thick black markings. Crest of frons usually with black crescentic markings. Legs yellow, sometimes darkening distally *O. icteromelan cinctifrons* Pinhey

64. ***Orthetrum brachiale brachiale*** (Beauvois)*Libellula brachialis* Beauvois, 1805: 171

Described originally from southern Nigeria this species is found almost throughout the Ethiopian region, with several insular races in Indian Ocean islands. In size this species is also variable but usually approximates to the size of *robustum*. Females or immature males have a greenish yellow colour with strong black markings on the thorax, sometimes with creamy lateral stripes (more like *chrysostigma*), but *robustum* has a pinkish brown thorax and abdomen; and the membranule is darker in *brachiale*.

In March 1974 *brachiale* was collected at Andara, W. Caprivi. It is widespread in the Okavango but not abundant. It favours bush, woodland, forest, or swamp.

Botswana records.

NMC: Nxai Pan Apr. 1971 (Philip); 17 km S. of Maun March 1974 (NME); Toteng March 1974 (NME); Tsau Jan. 1970 (NME); Gumare March 1974 (NME); Sepopa Febr. 1967 (NME); Shakawe March 1974 (NME); Jugu Jugu (Boro R.) May-June 1974 (S. Williams & A. McDermott); Moremi Game Reserve Dec. 1973, Dec. 1975 (FC); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Goha Hills Apr. 1974, March 1976 (NME); Kachikau Apr. 1974 (NME); Linyati Explor. Camp March 1976 (NME); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Apr. 1974 (NME), Dec. 1974 (E. Pinhey), March 1976 (NME); Chobe R., Kazingulu Nov.-Dec. 1975 (K. Adams); Notwane R., Gaborone Apr. 1976 (G. Bailey).

65. ***O. chrysostigma chrysostigma*** (Burmeister)*Libellula chrysostigma* Burmeister, 1839: 857

Described from Teneriffe, Canary Isl., this species is generally common and widely distributed throughout Continental Africa; also southern Europe and western Asia. It is found at streams or pools, in bush or open woodland, but it is not partial to swamps. It is probably to be found in many of the drier areas of Botswana within reach of more or less permanent waters. It has been found at Andara, W. Caprivi, March 1974.

Botswana records.

NMC: Nxai Pan Apr. 1971 (Philip); Maun Jan. 1970 (NME); 33 km S. of Maun Febr. 1967 (NME); Goha Hills Apr. 1974 (NME); 22 km E. of Kachikau Apr. 1974 (NME); Chobe Park (South Gate) Apr. 1974 (NME); Chobe rapids (Kasane) Apr. 1974, Sept. 1974 (NME).

66. ***O. icteromelan cinctifrons*** Pinhey*Orthetrum icteromelas* Ris, 1909b 10: 197*Orthetrum icteromelan cinctifrons* Pinhey, 1970c: 302

Typical *icteromelan* was described from Madagascar; subspecies *cinctifrons*, from Salisbury, Rhodesia, is widespread in Continental Africa from South to the equatorial region. It is locally common, particularly in Southern Africa, and abundant in the Okavango swamps where Balinsky recorded it (1967). It is found at pools or streams and swamps. The bright yellow or greenish yellow body with thick black stripes, together with a black mark on the front of the frons like the figure 8, make it easy to distinguish. Several have been taken with

prey, all being females and their prey being other Libellulidae: *Chalcostephia flavifrons* Kirby ♂, *Hemistigma albipuncta* (Ramb.) ♀ at Linyati camp and *Trithemis monardi* Ris ♀ at Savuti Channel West.

Botswana records.

NMC: Maun Dec. 1968 (FC); 16 km S. of Maun Febr. 1967 (NME); Sepopa March 1974 (NME); Mohembo Jan. 1970 (NME); Khwaai River Dec. 1968 (FC); Four Rivers (extremely common) Dec. 1973, Dec. 1975 (FC); 11 km E. of Four Rivers Dec. 1973 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Savuti Channel camp, Savuti Channel West, Linyati Explor. Camp March 1976 (NME).
B.C.: Moremi Game Res. Dec. 1963 - Jan. 1964

67. **O. machadoi** Longfield, 1955: 35

Orthetrum rhodesiae Pinhey, 1961b: 269

Typical *machadoi* was described from south Angola and occurs from Natal to tropical Central and East Africa. The taxon *rhodesiae*, described originally from swamps in Zambia, is common in swamps of Shaba (Katanga) and the Okavango and seems to be a palustrine morph of this species. It is smaller and darker than normal *machadoi*, possibly a melanic tendency caused by its ecological conditions. Balinsky recorded *machadoi* (1967) and it is in fact abundant at Sepopa and Four Rivers. One ♂ Four Rivers 3 Dec. 1975 had a *Myrmeleon* spec. as prey and another ♂ the following day was the prey of a *Promachus* spec. (Asilidae).

Botswana records.

NMC: Sepopa Febr. 1967, Jan. 1970 (NME); Mohembo Jan. 1970 (NME); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC).
BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

68. **O. robustum** Balinsky, 1965: 3

Balinsky discovered this remarkably interesting species in the Ngamiland Game Reserve (including holotype) Dec. 1963 and had previously collected it at Richards Bay, Natal, 24 Dec. 1957. I have found it in north Zambia. It favours woodland or their vicinity and is abundant at Four Rivers. Examples have been taken there *in copula*.

In the female and immature male the thorax and abdomen are distinctly carneous or pinkish brown; in maturer males it becomes darker, more greenish brown, then pruinose on the abdomen. In life the mature male's eye is grey, pale blue ventrally. In the juvenile male it is grey, faintly browner dorsally; mesepisternum cream, with a black central line, then dull pinkish brown to the humeral suture; sides of thorax pale brown; abdomen pale pinkish brown. The membranule has a larger white area than other species in Central and Southern Africa.

Botswana records.

NMC: Toromoja Apr. 1975 (N. Tett); 16 km S. of Maun Dec. 1968 (FC); Sepopa Febr. 1967, Jan. 1970 (NME); Shakawe Jan. 1970 (NME); 14 km N. of Maun Febr. 1967 (NME); Khwaai R. Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); 11 km E. of Four Rivers Dec. 1973 (FC); Savuti Channel camp March 1976 (NME).
TM: holotype, allotype, Moremi Game Res. [Ngamiland Game Res.] Dec. 1963 (B. I. Balinsky); Mababe Flats June 1930 (G. van Son).
BC: Moremi Game Res. Dec. 1963.

69. **O. trinacria** (Selys)

Libellula trinacria Selys, 1841: 244

Described from Sicily, this large, long-bodied species is generally common from Natal northwards to the North African coast and Mediterranean fringe, as well as parts of western Asia. It prefers rivers, streams and pools in rather open country and has a strong steady flight more like one of the low-flying Aeshnidae than the erratic motion of most *Orthetrum*, but it frequently settles. In the Okavango it is generally common over swamp or grassland, as well as in bush or woodland, but in the shadier areas most are females. Three females were captured with butterfly prey: ♀ Four Rivers 10 Dec. 1973 feeding on ♂ *Junonia orithya madagascariensis* (Guenée) (Nymphalidae); ♂ at Nghabe River 22 March 1974 on ♂ *Mylothris chloris agathina* (Cramer) (Pieridae); ♀ at Savuti Channel West with another pierid, *Eurema brigitta* (Cramer). A ♀ at Savuti Channel camp was captured with libellulid prey: *Nesciothemis farinosum* (Förster) ♂. It is probably widespread in Botswana.

Botswana records.

NMC: Toromoja Apr. 1975 (N. Tett); Gweta Febr. 1967 (NME); Botletle River 90 km E. of Maun Febr. 1967 (NME); Nathane Jan. 1974 (D. & C. Tett); Nghabe River, 17 km S. of Maun March 1974 (NME); Tsau River March 1974 (NME); Sepopa March 1974 (NME); Shakawe Jan. 1970 (NME); Mboma (Moremi) 1969 (T. Liversedge); Sitatonga camp, 100 km W. of Khwaai Lodge Dec. 1973 (FC); Four Rivers Dec. 1973 (FC); Meakome Dec. 1973 (FC); Xugana Dec. 1973 (FC); Kachikau and 22 km E. of Kachikau Apr. 1974 (NME).

TM: Maun and Mababe Flats June 1930 (G. van Son).

NESCIOTHEMIS Longfield (1955)

The common *farinosum* is widespread in the swamps but I was surprised to find the equatorial *N. minor* Gambles at Four Rivers, 3 Dec. 1975.

Key to *Nesciothemis*

- 1. Labrum and labium mainly black. Tibiae black *N. farinosum* (Förster)
- Labrum yellow, lateral lobes of labium yellow with a black inner band. Tibiae black with yellow posterior stripe *N. minor* Gambles

70. **Nesciothemis farinosum** (Förster)

Orthetrum farinosum Förster, 1898: 169

Described from Transvaal, this species is common and widespread from South Africa northwards to Egypt. The pruinose male is variable in tone of pruinosity from pale to dark blue, but this robust species is normally easy to distinguish by the yellow dorsal stripe down the thorax (as in *Hemistigma albipuncta*). The wing apices are normally brown in the female and often with a similar tendency in the Okavango male. Until fully mature the male, even after pruinescence of the abdomen, has the wings strongly saffronated, especially near the base. It favours open country, grassland or swamp, bush or woodland. Size variable in both sexes. Common, especially at Four Rivers.

Botswana records.

NMC: Maun Jan. 1970 (NME); Sepopa Febr. 1967, March 1974 (NME); Shakawe Febr. 1967, March 1974 (NME); Khwaai River Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec.

1973 (FC); Xugana Lagoon Dec. 1975 (FC); Savuti Channel camp, Savuti Channel West, Linyati Explor. camp March 1976 (NME); Chobe Rapids March 1976 (NME); Notwane River, S. of Gaborone Febr. — March 1976 (G. Bailey).

TM: Maun June 1930 (G. van Son).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

71. **N. minor** Gambles, 1966: 161

Described from N. Nigeria this small species is of wider distribution than was at first supposed. In the National Museum, Bulawayo, there is one pruinosed male from Sierra Leone (with deformed left superior appendage), one male from N. Nigeria, one very damaged male from Suakoka, Liberia and on the 1975 Four Rivers expedition I was surprised to find one pruinose male, the first record in the southern half of Africa.

Botswana record.

NMC: Four Rivers 1♂ 3 Dec. 1975 (NME).

PALPOPLEURA Rambur (1842)

Except for the species *P. deceptor* (Calvert), *Palpopleura* are easily recognized by the dark brown or black and the amber patterns on the wings. The two patterned species recorded here are common in nearly all parts of continental Ethiopian Africa but few records are available yet from Botswana. They are frequently found at small pools which have grasses and sedges in them but for some reason they do not appear to favour greatly the swamps of the Okavango delta.

Key to *Palpopleura*

1. Wings long, the costal invagination indistinct; hyaline with few markings: forewing with a yellow costal streak from base to pterostigma and a black subcostal ray *P. deceptor* (Calvert)
— Wings shorter, the costal invagination distinct; forewing with broad amber or blackish brown markings 2
2. Face, sides of thorax and the legs pale yellow. Wings with broad yellow and brown (or black) basal fasciae, with or without a similarly tinted distal zone *P. jucunda* Rambur
— Face, sides of thorax and the legs reddish to blackish brown, the thorax with 2 yellow lateral stripes.
♂ wings with broad black zones at base and along and below costa, without yellow ground colour;
♀ wings with yellow areas, the brown or dark brown fasciae less extensive, discontinuous
..... *P. lucia* (Drury)

72. ***Palpopleura deceptor*** (Calvert)

Hemistigmoides deceptor Calvert, 1899: 241

Described from Somalia, this species is found in the drier areas of Africa from South to equatorial Africa. It is found chiefly at pools containing grasses or sedges, but it is not a palustrine insect.

Botswana records.

NMC: Goha Hills March 1976 (NME).

TM: Metsimaklaba March 1930 (G. van Son).

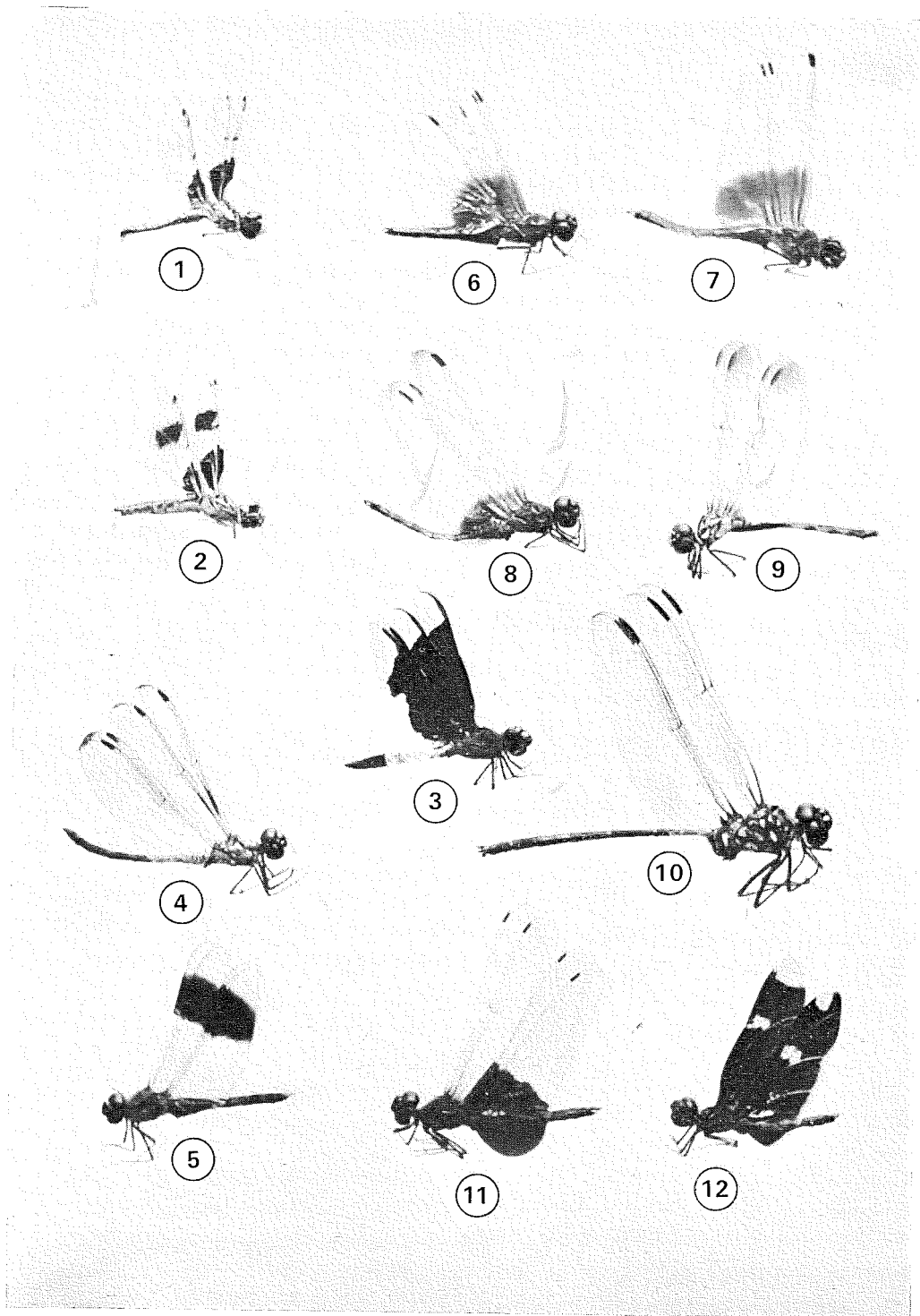


Plate 3:

1-2. *Palpopleura jucunda* ♂, ♀, 3. *P. lucia* f. *lucia* ♂, 4. *Hemistigma albipuncta* ♂, 5. *Brachythemis leucosticta* ♂, 6. *B. lacustris* ♂, 7. *Trithemis kirbyi ardens* ♂, 8. *T. monardi* ♂, 9. *T. stictica* ♀ (aberration), 10. *Olpogastra lugubris* ♂, 11. *Rhyothemis semihyalina* ♂, 12. *R. fenestrina* ♂.

73. **P. jucunda** Rambur, 1842: 134

Plate 3: 1,2

This small species, described from Cape Province, is locally common at grassy pools and swamps from South to equatorial Africa. It is sometimes seen at the quiet swampy verges of streams or their inlets. When collected at Kasane the main river was at low ebb and the species was found at stagnant channels.

Botswana records.

NMC: Chobe rapids (Kasane) Sept. 1974 (NME); Notwane R., Gaborone 15 May 1976 (G. Bailey).

74. **P. lucia** (Drury)

Plate 3: 3

Libellula lucia Drury, 1773: 82

Libellula portia Drury, 1773: 86

Both forms *lucia* and *portia* were described from Sierra Leone and both are widespread, locally abundant in most parts of the Ethiopian region including some of the Indian Ocean islands. Sometimes only one form is found, at other places both will fly together. They inhabit pools, swamps and the calmer stretches of streams and rivers. Both forms are variable in markings of the male and, less commonly, intermediate stages have been found.

So far only form *lucia* has been collected in Botswana. Form *portia* is less heavily marked with black in the male, but the females of the two intergrade in patterns.

Botswana records.

NMC: Jugu Jugu (Boro River) May 1974 (S. Williams & A. McDermott); Chobe rapids (Kasane) Sept. 1974 (NME); Notwane R., Gaborone 15 May 1976 (G. Bailey).

AETHIOTHEMIS Ris (1908)

This genus of several species is only known south of the lower Kunene-Zambezi river latitude from the following species in the Okavango delta.

75. **Aethiothemis discrepans** Lieftinck, 1969: 26

Described from Shaba (Katanga) this species, if all material at present assigned to it is conspecific, is variable in size and markings and extends from Botswana, through Zambia and other parts of Central Africa to Nigeria. Botswana specimens are normally of moderate size, the hindwing 24-27 mm. Zambian and Shaba specimens are, in long series, generally smaller on average. In teneral females the wings are all strongly saffronated from base to nodus and along the costa of the postnodal region.

All our specimens from this particular region have been found in reedy or grassy pools and generally late in the season, from March or April onwards. The first Botswana record was a teneral female at Shakawe 24 June 1970, collected by Anthony Archer. In March 1974 it was abundant between Sepopa and Shakawe.

Botswana records.

NMC: 13 km S. of Sepopa and at Sepopa March 1974 (NME); Xaro, 25 km S. of Shakawe and at Shakawe March 1974 (NME); 12 km N. of Shakawe March 1974 (NME); Shakawe June 1970 (A. Archer).

CHALCOSTEPHIA Kirby (1889)76. *Chalcostephia flavifrons* Kirby, 1889: 337

Described from Angola, this species is easily recognized in the field by its broadly metallic green-blue frons. The mature male is completely pale blue pruinose on the body and it has a peculiar forked ventral process on the first abdominal segment. Another feature is the brownish yellow pterostigma framed in black veins. The species is widespread and locally common from Natal and Mozambique to equatorial Africa. It is not found at the higher elevations on plateaux or mountains. The species prefers reedy or grassy pools and swamps to rivers or streams. The first Botswana record was from Sepopa where it is abundant in *Papyrus* swamp. It is not common in the Four Rivers area in our experience.

Botswana records.

NMC: Sepopa Febr. 1967, Jan. 1970 (NME); Shakawe and Mohembo Jan. 1970 (NME); Meakome and Xugana Dec. 1973 (FC); Linyati Explor. camp March 1976 (NME).

HEMISTIGMA Kirby (1889)77. *Hemistigma albipuncta* (Rambur)

Plate 3: 4

Libellula albipuncta Rambur, 1842: 93

Described from Senegal, this species is common and widespread in bush, woodland or forest in most parts of continental Ethiopian Africa. It is very variable in size, in markings and colours. The brown and creamy white pterostigma help in field recognition. Females and immature males have a cream dorsal stripe on the thorax, but the fully mature male is all pale blue on the body. The male (mature or teneral) usually, but not always, has a black subcostal streak across the antenodals of the forewing; the female rarely has this but it normally has brown wing apices.

This species is common in the delta. It was taken in the western Caprivi in March 1974.

Botswana records.

NMC: Maun March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); Xaro, 25 km S. of Shakawe Nov. 1973 (T. Liversedge); Shakawe Jan. 1970 (NME); 16 km N. of Shakawe Febr. 1967 (NME); Moremi S. Gate Dec. 1975 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (NME); Xugana Oct. 1971 (T. Liversedge), Dec. 1973, Dec. 1975 (NME); Chobe Nat. Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Savuti Channel West and Linyati Explor. camp March 1976 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

ACISOMA Rambur (1842)

The small species mentioned here is recognizable by its blue and black abdomen which is swollen on the basal half, slender on the end segments.

78. *Acisoma panorpoides ascalaphoides* Rambur

Acisoma panorpoides Rambur, 1842: 28

A. ascalaphoides Rambur, 1842: 29

The nominotypical race, described from Bengal, is Oriental; our race *ascalaphoides*, originally described from Madagascar, is known in most parts of the Ethiopian region. The

species is found on quiet rivers or streams, pools or swamps, particularly where there are *Nymphaea* lilies or other plants in the water. It settles flat, without tilting the wings or abdomen. It is common in the Delta swamps or in woodland.

Botswana records.

NMC: Toromoja (Botletle R.) Apr. 1975 (N. Tett); Maun Febr. 1967 (NME); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970 (NME); 12 km N. of Shakawe March 1974 (NME); Mboma (Moremi) 1969 (T. Liversedge); Txaxanika (Moremi) Aug. 1975 (N. Tett); 100 km W. of Khwaai Lodge Dec. 1973 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Chobe Nat. Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1975 (NME); Linyati Explor. camp March 1976 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

DIPLACODES Kirby (1889)

Except for *D. trivialis* (Rambur), an Oriental species which just reaches the Ethiopian region in the Seychelles but nowhere else, this is a difficult genus as far as African species are concerned because of the great variability in markings. The commonest species, *D. lefebvrei* (Rambur) extends over most of Africa, but this species is not only variable in markings but also considerably variable in size. The small Madagascar species *exilis* Ris has been confused in the past with small *Diplacodes* from south east Africa. Lieftinck (1969) showed that *exilis* is purely a Malagasy species and named a taxon from Zambia *D. deminuta* Lieftinck. Whilst this has been a step forward, the position is evidently not yet clear. It has, been evident for some time that there is still another small taxon from Zambia and Botswana nearer to *exilis* than *deminuta*. The naming of this taxon here as *D. okavangoensis* spec. nov. is just a further stage but this does not necessarily account for all the African taxa of this genus.

Key to *Diplacodes*

1. Face and frons in front mainly ivory white, the frons with a black distal transverse line above the postclypeus. Body of mature ♂ and ♀ pale blue pruinose. ♂: anterior lamina very deeply bifid. ♀: vulvar scale very large and prominent, extending beyond level of gonapophyses *D. trivialis* (Rambur)
- Face and frons yellow or black in front; if mainly yellow there is no distinct black frontal line above postclypeus. ♂: anterior lamina evenly curved, not bifid. ♀: vulvar scale not so prominent and not reaching beyond gonapophyses 2
2. Larger species, hindwing at least 20 mm, usually 25 mm or more. Mature ♂, face and thorax all black. ♀ and immature ♂ with yellow face and lips, frons with broad black basal band. Pterostigma brownish yellow. ♀ vulvar scale scarcely invaginated apically *D. lefebvrei* (Rambur)
- Smaller species, hindwing 19 mm or less. ♀ vulvar scale more distinctly invaginated 3
3. Face in mature ♂ more or less all black or dark brown; yellow in ♀ and immature ♂. Mesepisternum black in mature ♂, pale brown to pinkish brown in ♀ and immature ♂, sometimes with faint traces of a brown stripe; a black humeral stripe. Pterostigma cream in ♀ or immature ♂, pale brownish in mature ♂. Abdominal segments 9-10 in mature ♂ all black, in ♀ and immature ♂ with yellow spots *D. deminuta* Lieftinck
- Face always yellow, even in mature ♂. Mesepisternum black in mature ♂, in ♀ and immature ♂ either yellow with brown streaks or black with green or yellow markings. Segments 10 (or 9-10) of ♀ and immature ♂ all black 4
4. Face bright yellow, labrum orange, labium with black median line; frons with broad shiny black basal band. Mesepisternum of ♀ or immature ♂ with greenish yellow stripe against dorsal carina, a broad green antehumeral band and an elongated dorsal yellow triangle. Mature ♂, thorax and abdomen with bluish white pruinosity. Pterostigma brownish yellow. Vulvar scale of ♀ prominent, with small V-shaped notch *D. exilis* Ris

— Face yellow, not bright, labium with broad black median band; frons with narrow or very narrow black basal band. Mesepisternum of ♀ or immature ♂ yellow with oblique brown streak and also a broad antehumeral brown stripe. Only slight pruinosity or none. Pterostigma always creamy white. Vulvar scale not so prominent but with a brown V-shaped notch *D. okavangoensis* spec. nov.
D. deminuta is found in many parts of Mashonaland and Zambia.

79. **Diplacodes lefebvrei** (Rambur)

Libellula lefebvrei Rambur, 1842: 112, 117

Originally described from Egypt this is abundant at quieter waterways, pools, swamps or the margins of rivers, almost throughout Africa (except the South Western Cape Province), and many of the Indian Ocean islands, and western Asia. The taxon *tetra* (Rambur) of Madagascar and Mauritius is apparently a distinct subspecies, the juveniles more heavily marked with black on the thorax than in the nominotypical race. This also occurs in the Seychelles. This species is generally common in the delta swamps but less abundant than the new species. It was found in the Andara region of the western Caprivi, March 1974. It is probably widespread at pools in Botswana.

Botswana records.

NMC: Lake Xau (Dhow) Jan. 1954; Toromoja, Botletle River Apr. 1975 (N. Tett); Maun March 1974 (NME), Dec. 1975 (FC); Nghabe River and 17 km S. of Maun Febr. 1967 (NME), Dec. 1968 (FC), March 1974 (NME); Lake Ngami Aug. 1969 (FC); Tsau River March 1974 (NME); Gumare March 1974 (NME); Sepopa Febr. 1967, Jan. 1970 (NME); Shakawe Jan. 1970 (NME); 12 km N. of Shakawe March 1974 (NME); 25 km N. of Maun Feb. 1967 (NME); 110 km N. of Maun March 1974 (NME); Jugu Jugu (Boro River) May 1974 (S. Williams & A. McDermott); Moremi S. Gate Dec. 1975 (FC); Khwai River 1969 (T. Liversedge); Four Rivers Dec. 1973, Dec. 1975 (FC); 11 km E. of Four Rivers Dec. 1973 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Goha Hills Apr. 1974 (NME), March 1976 (NME); Kachikau and 22 km E. of Kachikau Apr. 1974 (NME); Chobe Game Park (Kasane) Apr 1974 (NME); Savuti Channel camp, Savuti Channel West, Linyati Explor. camp March 1976 (NME); Notwane R., Gaborone May 1976 (G. Bailey).

TM: Metsimaklaba and Tsotsoroga Pan June-July 1930 (G. van Son).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

80. **Diplacodes okavangoensis** spec. nov.

Fig. 3

A small species, like *exilis* of Madagascar and *deminuta*, but more westerly in known distribution than the latter. It has been recorded by Balinsky as *exilis* (1967) from the swamps and it is, in fact, abundant there. The mature insect can be readily distinguished from *lefebvrei* by its small size, hindwing 15-18 mm, and the whitish pterostigma; from *deminuta* (Fig. 3g, h) by the thoracic yellow colour and brown markings and the yellow face of the mature male; also the lack of any yellow spots on segments 9-10 (usually 8-10) of the abdomen.

Its known distribution extends from the Okavango delta of Botswana to Zambia. In my own experience it is only a swamp species.

Holotype, mature ♂ (11 km E. of Four Rivers). Labium ochraceous white, broadly suffused with black medially; labrum ochraceous, broadly black distally; face creamy white, frons narrowly black at base, slightly clouding distally (probably postmortem discoloration). Occiput black, yellow posteriorly, orbits black ventrally.

Thorax and base of abdomen black, slightly dusted with white pruinosity; pro- and synthorax otherwise all black. Legs black.

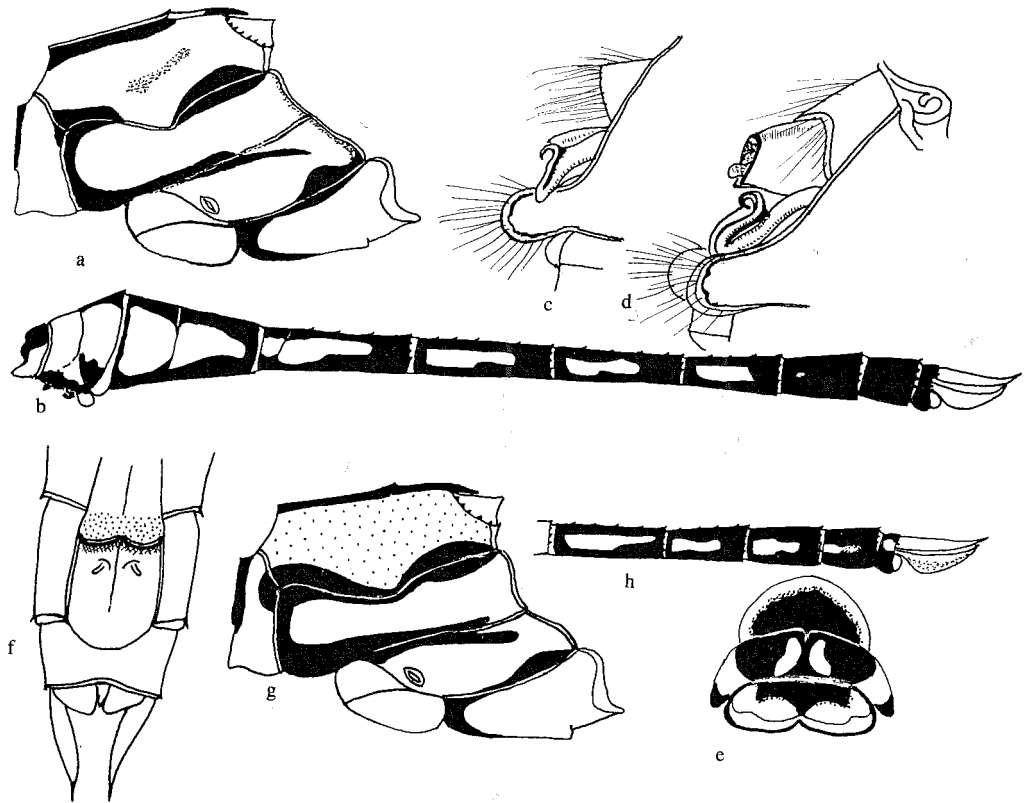


Fig. 3. *Diplacodes*: *okavangoensis*: a-b. paratype ♂, synthorax, abdomen; c. holotype ♂, accessory genitalia and d. paratype ♂ with prophallus; e. paratype ♂, prothorax; f. paratype ♀, abdomen, segments 8-10 ventrally; *deminuta* (Mbala): g-h. synthorax and abdomen.

Venation brown, costa, antenodals and a few crossveins below them, including the arculus, yellow. Pterostigma creamy white, the anterior and posterior veins black, the short veins yellow-brown. Forewings with $6\frac{1}{2}$ Ax, 5 Px, hindwings with 5 Ax, 5 Px. Membranule dark brown, white at base; an amber basal fascia on hindwing.

Abdomen black, showing yellow lateral bars on segments 4 to 7, segment 8 with a small dot. Superior appendage yellow with fine black apex, inferior appendage also yellow. Accessory genitalia (fig. 3c) typical of the genus. Prophallus as in a paratype (fig. 3d), the apex obtuse, hooded.

Abdomen 14 mm, hindwing 16,5 mm.

Paratype males include mature and juvenile examples. Dimensions vary slightly: abdomen 14 - 15,5 mm, hindwing 16,5 - 18 mm. Juveniles show all stages in development from teneral to almost mature males. Labium with black median band; labrum yellow or with distal brown; frons above with narrow black basal band. Prothorax black and yellow as in fig. 3e. Thorax is generally yellow, with black markings (fig. 3a). The antehumeral oblique

stripe is faint, the mid-dorsal carina normally yellow (black in *lefebvrei*). The yellow abdominal pattern is shown in fig. 3b and this continues to maturity; segment 8 may be all black or have a minute lateral spot. In a few mature examples the pruinosity is stronger so that the black thorax has a slight bluish tinge.

Allotype female (nearly mature) (Four Rivers). Labium whitish yellow with a narrow dark brown median band which covers posterior lobe; labrum brighter pale yellow, face and frons whitish yellow, frons with very narrow black basal band; vertex more orange. Rest of head, thorax and the broader abdomen marked as in the juvenile paratype ♂ but no yellow dot on segment 8. Fore femur yellow, but black anterior stripe and black knee, rest of legs black.

Wings as in ♂, but with amber at base of forewing almost to triangle, and in hindwing reaching triangle. Membranule whitish grey, white at base. Forewings with $6\frac{1}{2}$ Ax, 5 Px, hindwings with 5 Ax, 5 Px, as in holotype. Cerci pale yellow with fine black apex. Vulvar scale as in paratype ♀ (fig. 3f).

Abdomen 13.5 mm, hindwing 17 mm.

Paratype females vary from teneral to mature examples, darker on the head and thorax than the allotype. Labium sometimes with only a narrow line on posterior lobe and no black on lateral lobes, a thicker median band in mature ♀, yet sometimes only a narrow line. Frons with thicker blue-black basal band in some juveniles. Labrum always entirely yellow. Thorax in mature paratype with stronger oblique antehumeral black stripe, joined to humeral stripe; in very mature state the mesepisternum is all black; and all stages in between. Amber on both wings reduced at maturity.

Abdomen with or without a small yellow spot on segment 8. All abdominal markings remain visible in mature females.

In the mature condition this species differs from *lefebvrei* in its smaller size, the face and frons remaining yellow, not darkening to black as in that species, except for the development of brown on the labrum of the mature male; frons with narrower basal band; hindwing of ♂ with amber basal marking not deep brown as in *lefebvrei*; pterostigma always almost white; abdomen always showing incomplete complement of lateral yellow spots. In the immature condition the thorax has a fine yellow mid-dorsal line, which is normally black in *lefebvrei*; abdomen without yellow spots on 9-10. The mature specimens also differ from the equally small *deminuta* in the face remaining yellow, not becoming black; pterostigma almost white, yellower in mature *deminuta*. Immature examples have the mesepisternum yellow not pinkish brown, and the abdomen has no spots on segments 9-10, unlike *deminuta*.

In the National Museum *deminuta* is represented from Zululand, several localities in Mashonaland and Zambia. The Zambian localities include Barotse plains, Mwinilunga District, Chambeshi River (S. of Kasama) and Mbala.

The type series of *okavangoensis* is entirely from the Okavango delta. There are examples also from the Barotse plains (overlapping with *deminuta*). One stained ♂ from Ikelenge (N. Mwinilunga District) Jan. 1965 (E. Pinhey) is probably this species as well as a damaged ♂ from Mbala Febr. 1957 (L.D.E.F. Vesey Fitzgerald), these overlapping with *deminuta*. The species was also collected 25 km S. of Kongola, W. Caprivi, 27 Sept. 1970 (H. D. Brown) (NMC).

Holotype ♂, 11 km E. of Four Rivers 11 Dec. 1973 (E. Pinhey), allotype ♀ Four Rivers 10 Dec. 1973 (E. Pinhey). These and many paratypes of both sexes from areas listed below are in the National Museum, Bulawayo. Examples of paratypes of both sexes will be sent to the British Museum (Nat. Hist.) and the Transvaal Museum, Pretoria. The species is abundant in the Okavango at pools, swamps, grassland or woodland.

Botswana records (including paratype localities and dates).

NMC: Maun 13-15 Dec. 1968, 1 Dec. 1975 (FC); Sepopa 12-15 Febr. 1967 (FC), 24-29 March 1974 (NME); 25 km N. of Maun 9-15 Febr. 1967 (NME); Jugu Jugu (Boro River) 25-27 May 1974 (S. Williams & A. McDermott); Txaxanika (Moremi) Aug. 1975 (N. Tett); Khwaai River 9-13 Dec. 1968 (FC); Four Rivers 4-12 Dec. 1973, 3-10 Dec. 1975 (FC); 17 km E. of Four Rivers 7 Dec. 1975 (FC); Xugana 5 Dec. 1973 (FC); Meakome 7, 11 Dec. 1973 (FC).

BC: (as *exilis*): Moremi Game Res. Dec. 1963 — Jan. 1964.

CROCOTHEMIS Brauer (1868)

The two commonest red species are found in Botswana.

Key to *Crocothemis*

1. Pterostigma yellow, over 3 mm long. Abdomen usually over 3 mm broad at maximum width; lateral carina of segment 5 with 17 or more denticles *C. erythraea* (Brullé)
- Pterostigma usually red, 3 mm or less. Abdomen 3 mm or usually less at greatest width; segment 5 with 12 denticles or less *C. sanguinolenta* (Burmeister)

81. *Crocothemis erythraea* (Brullé)

Libellula erythraea Brullé, 1832: 102

Described from Moravia (S. W. Cape) this common, thick-bodied red species is found in most parts of Africa, except in forest, parts of Europe and western Asia where it meets *C. servilia* (Drury). It may, in fact, be only a race of *servilia*.

In the Okavango it is moderately common at pools and swamps, but not in woodlands. The teneral female has strongly saffronated wings.

Botswana records.

NMC: Nathane Jan. 1974 (D. & C. Tett); Makgadikgadi Pan Febr. 1967 (NME); Maun Dec. 1975 (NME); 17 km S. of Maun March 1974 (NME); Lake Ngami Aug. 1969 (FC); 15 km S. of Tsau Febr. 1967 (NME); Tsau March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970 (NME); Jugu Jugu (Boro River) Sept. 1974 (S. Williams & A. McDermott); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana-Gadikwe Dec. 1973 (FC); Goha Hills Apr. 1974 (NME); Parakarungu Apr. 1974 (NME); Kachikau and 22 km E. of Kachikau Apr. 1974 (NME); Chobe Game Park (Kasane) Apr. 1974 (NME); Savuti Channel camp, Savuti Channel West, Linyati Explor. Camp March 1976 (NME); Nata Apr. 1976 (Peterhouse Exp.)

TM: Tsotsoroga Pan and Maun June — July 1930 (G. van Son).

82. *C. sanguinolenta* (Burmeister)

Libellula sanguinolenta Burmeister, 1839: 859

Described from the Cape Province, this is also widespread in most parts of the African Continent. It is much less common than *erythraea* in the Okavango but has similar preferences.

Botswana records.

NMC: Toromoja Apr. 1975 (N. Tett); Sehitiwa Febr. 1967 (NME); Jugu Jugu (Boro River) May — June 1974 (S. Williams & A. McDermott); Chobe rapids (Kasane) Sept. 1974 (NME).

BRADINOPYGA Kirby (1893)

Closely related to *Crocothemis* but the species mentioned here has a more robust thorax, the abdomen more slender.

83. *Bradinopyga cornuta* Ris, 1911b, 13: 547

Described from Mozambique, this species favours drier country, especially rocky hills and outcrops. It is distributed from Natal to Kenya. It is a large dark brown-bodied species with creamy white thoracic spots. It occurs in rocky parts of Matabeleland and has been taken in S.W. Africa: Andowa, Kaokoveld 27 Apr. 1970 (H. D. Brown). It may therefore be found, perhaps, on rocky hills with rain pools such as Tsodilo Hills.

BRACHYTHEMIS Brauer (1868)

Three species have been found in Botswana including the little known *B. wilsoni* Pinhey. The other two species often tend to be highly gregarious.

Key to *Brachythemis*

Males

1. Wings without yellow or orange markings. Abdomen of immature ♂ yellow with broad black lateral band, of mature ♂ almost or entirely black. Frons with continuous black basal band. Wings of mature ♂ with black or brown postnodal band *B. leucosticta* (Burmeister)
 — Wings without black postnodal band but with amber or orange basal area. Abdomen red or yellowish red without broad black lateral longitudinal band 2
2. Basal wing amber very broad, sharply demarcated (and deep reddish orange when mature). Frons with median black basal markings *B. lacustris* (Kirby)
 — Basal wing amber consisting of streaks only. Frons without any black *B. wilsoni* Pinhey

Females

1. Both wings with short orange basal streaks. Frons unmarked with black at base. *B. wilsoni* Pinhey
 — Wings without basal amber or only a trace in anal field of hindwing. Frons unmarked or with black basal markings 2
2. Frons unmarked or with basal black projecting centrally, narrowed at sides. Abdomen with only traces of black lateral stripe. Abdomen thickly fusiform. Hindwing short and broad *B. lacustris* (Kirby)
 — Frons with continuous broad black basal band. Abdomen with a more or less continuous black lateral stripe. Abdomen usually cylindrical. Hindwing longer and narrower *B. leucosticta* (Burmeister)

84. *Brachythemis lacustris* (Kirby)

Plate 3: 6

Trithemis ? *lacustris* Kirby, 1889: 329

Described by Kirby as a *Trithemis*, perhaps for its superficial resemblance to *T. kirbyi* Selys, the type came from Wadelai (Central Africa). It is found in palustrine associations in subtropical and tropical Africa. The bright red male with very broad amber zones on the wings is found chiefly at the swampy verges of streams and rivers but not at stagnant pools or swamps. It was found near Andara, western Caprivi, in March 1974.

Botswana records.

NMC: Sepopa Febr. 1967, March 1974 (NME); Xaro, 25 km S. of Shakawe Nov. 1973 (T. Liversedge); Shakawe Febr. 1967, Jan. 1970 (NME), Apr. 1970 (A. Archer); Chobe rapids (Kasane) Apr. 1974, Sept. 1974, March 1976 (NME); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams).

85. **B. leucosticta** (Burmeister)

Plate 3: 5

Libellula leucosticta Burmeister, 1839: 849

The type series came from places as far apart as Durban, Egypt and Senegambia, and it is found in most parts of Continental Africa, southern Europe and western Asia. The mature male is easily distinguished by its black body, black postnodal band across both wings and the bicoloured pterostigma. Young males may be without a band or with a partial one; females without it except in post-maturity. It prefers open pools, even ones without standing or fringe vegetation and flies low over the ground or the water. It does not seek shade, unlike the superficially similar *Parazyxomma flavicans* (Martin). It is widespread in Botswana less common in the reedy swamps than at small pools.

Botswana records.

NMC: Gaborone Nov. 1970 (E. Pinhey); Nathane Jan. 1974 (D. & C. Tett); Nata Jan. 1970 (NME); Lake Xau (Dhow) Jan. 1959; Toromoja (Botletle River) Apr. 1975 (N. Tett); Maun Dec. 1968 (FC), Sept. 1971 (A. Archer), March 1974, Dec. 1975 (NME); 16 km S. of Maun Dec. 1968 (FC); Lake Ngami Aug. 1969 (FC); Tsau River March 1974 (NME); Sepopa Jan. 1970 (NME); Shakawe Jan. 1970 (NME); Khwaai River Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); 11 km E. of Four Rivers Dec. 1973; Xugana-Gadikwe Dec. 1973 (FC); Kachikau and 22 km E. of Kachikau Apr. 1974 (NME); Savuti Channel and Ngoma March 1976 (NME); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams); Notwane River, S. of Gaborone Febr. 1976 (G. Bailey).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

86. **B. wilsoni** Pinhey, 1952b: 16

Described from Yambio, S.W. Sudan, this species was known sparingly from few localities in N. Nigeria, N. Uganda, N. Zaire and Shaba, until it was found unexpectedly in the Okavango swamps on the Febr. 1967 expedition. These Botswana examples do not seem to differ from typical specimens. It will probably be found at swamps in Zambia. It is a dull red-bodied species with short orange basal streaks on the wings and is confined to swamps or the swampy verges of streams. It has only been found in small numbers.

Botswana records.

NMC: Botletle River, 90 km E. of Maun Febr. 1967 (NME); Maun Febr. 1967 (NME); Nghabe River, 16-17 km S. of Maun Febr. 1967, March 1974 (NME); 14 km N. of Maun Febr. 1967 (NME); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1973 (FC).

SYMPETRUM Newman (1833)

Two species of this large genus are known in the Ethiopian region and both have been found in the Okavango delta. It was, in fact, surprising to find *S. navasi* Lacroix there.

Key to *Sympetrum*

1. Thorax yellow or greenish yellow at sides, redder in front. Pterostigma yellow in both sexes. Venation red on basal half in ♂, yellow in ♀. Abdomen of mature ♂ scarlet, of immature ♂ or of ♀ yellow
 *S. fonscolombi* (Selys)
 — Thorax in front and laterally red, or laterally red and greenish brown. Pterostigma pale brown. Venation black in ♂, brown in ♀. Abdomen more or less red in both sexes, in mature ♂ blood-red
 *S. navasi* Lacroix

87. **Sympetrum fonscolombi** (Selys)

Libellula fonscolombi Selys, 1840: 29, 49, 208.

Described originally from France, this has been found in many of the more open, often the arid, regions of the African Continent and it is common in Europe and Asia. It is a migrant at times. It prefers pools with standing vegetation in it, particularly in the drier areas, and is unlikely to be found in swamp, only at the fringe of such systems. It is probably widespread in Botswana wherever there are grassy pools. It is somewhat variable in size and in the tints of red on the body.

Botswana records.

NMC: S.W. border, north of Mafeking June 1966; Gaborone Nov. 1970 (E. Pinhey); Nathane Jan. 1974 (D. & C. Tett); 140 km N.W. of Francistown Febr. 1967 (NME); Gweta Febr. 1967 (NME); Nxai Pan Apr. 1971 (Philip); Maun June 1971 (A. Archer); 10 km S. of Maun March 1974 (NME); Sehitwa Aug. 1969 (FC); Tsau and Tsau River March 1974 (NME); Sepopa March 1974 (NME); Khwaai River Dec. 1968 (FC); Goha Hills March 1976 (NME); Parakarungu Apr. 1974 (NME); Kachikau Apr. 1974 (NME); Notwane River, Gaborone Apr. 1976 (G. Bailey).

TM: Tsotsoroga Pan June — July 1930 (G. van Son).

Schultze: Southern Botswana (Ris, 1908).

88. **S. navasi** Lacroix, 1921: 378

Described from Ivory Coast, the distribution of this species is poorly known: Gambia, Ivory Coast, Uganda (very common on swampy verges near Kampala — Pinhey, 1961), Shasheki (Zambezi River) Dec. 1961 (G. Guy) and this deep red species was first discovered in Botswana on the Botletle River Febr. 1967 (E. Pinhey). The Maun record is only of one teneral, tortological female collected by hand by P. Steyn.

Botswana records.

NMC: Makala-ma-Bedi, Botletle River Dec. 1968 (FC); Maun Dec. 1973 (FC); Botletle River 16 km S. of Maun Febr. 1967 (NME); 20 km S of Maun, Aug. 1969 (F.C.); Nathane Jan. 1974 (Peterhouse Exp.).

PHILONOMON Förster (1906)

The single species is easily distinguished in the male by the parti-coloured abdomen, half red, half yellow.

89. **Philonomon luminans** (Karsch)

Sympetrum luminans Karsch, 1893a: 22

Described from Togo, this species is common at grassy or reedy pools in warm open country from Natal to equatorial Africa. It was found south of Andara, W. Caprivi March 1974. In the Okavango it is not common in the central swamps, only on the fringe of the delta. One ♂ at Goha Hills was collected in a vacated spider web.

Botswana records.

NMC: Nathane Jan. 1974 (D. & C. Tett); Gweta Febr. 1967 (NME); Tsau River March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); 30 km N. of Maun Febr. 1967 (NME); 80 and 100 km N. of Maun Dec. 1968 (NME); Khwaai River Dec. 1968 (NME); Goha Hills Apr. 1974, March 1976 (NME); Kachikau Apr. 1974 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

TRITHEMIS Brauer (1868)

Some of the common red-bodied species of this genus, particularly *arteriosa* (Burmeister), *annulata* (Beauvois) and *kirbyi ardens* (Gerstaecker), also possibly the pale blue, yellow and black *stictica* (Burmeister) must be widespread in Botswana. *T. falconis* Pinhey was described from the Khwaai River, but it may be a race of *aequalis* Lieftinck; the rare Zambian *brydeni* Pinhey has been found sparingly at Four Rivers, including the hitherto unknown female.

Key to *Trithemis*

Males

1. Abdomen, segments 4-7 black or pruinose blue with short yellow longitudinal streaks 2
— Abdomen, segments 4-5 (usually 4-7) red to yellow, occasionally pruinosed to a purplish red .. 6
2. Genital lobe directed backwards away from hamule; hamular hook sickle-shaped *T. aconita* Lieftinck
— Genital lobe at right angles to body, close to hamule; hamular hook shorter, well curved 3
3. Frons above all steely blue. Thorax bright yellow or bright yellow and pale blue pruinose *T. stictica* (Burmeister)
— Frons with violet or purple sheen. Thorax ochreous or greyish brown to black, sometimes all dark blue 4
4. Forewing with only $8\frac{1}{2}$ (or $9\frac{1}{2}$) Ax. Thorax in immature ♂ yellow, in mature ♂ dull blue. Hamular hook robust, genital lobe large, uniformly broad *T. hecate* Ris
— Forewing with $10\frac{1}{2}$ or more Ax (rarely $9\frac{1}{2}$). Genital lobe short and rounded or slender, tapering .. 5
5. Labium mainly black. Thorax black at maturity, bright pale yellow in immature ♂. Hindwing with deep brown basal fascia. Abdomen with 1 row of yellow streaks each side. Hook of hamule long, sickle-shaped. Genital lobe short *T. brydeni* Pinhey
— Labium yellow with fine brown median line. Thorax grey-brown with slight reddish violet pruinosity. Hindwing with yellow basal fascia. Abdomen with 1-2 rows of yellow streaks each side. Hook of hamule shorter, more curved. Genital lobe slender, tapering *T. aequalis falconis* Pinhey
6. Frons all red. Abdomen scarlet at maturity. Pterostigma very short. Both wings very broadly orange-yellow in basal half. Hamular hook slender, almost straight *T. kirbyi ardens* Gerstaecker
— Frons not all bright red. Abdomen brick red or purplish red. Pterostigma of normal length. Forewing not very broadly amber. Hamular hook curved 7
7. Abdomen broad, segments 4-5 (on one side of dorsal carina) about twice as long as broad. Frons all dull metallic violet above. Abdomen at maturity purplish red *T. annulata* (Beauvois)
— Abdomen slender, segments 4-5 (one side) three times as long as broad. Frons with black basal band. Abdomen brick red 8
8. Hindwing, the orange basal area small, not approaching tornus and not darkened with brown. Segment 6 red with black ventral band. Anterior lamina without distinct apical hair tuft *T. arteriosa* (Burmeister)
— Orange basal area on hindwing almost reaches tornus and the cells are filled in with brown. Segment 6 red with black distal spot. Anterior lamina with distinct apical hair tuft *T. monardi* Ris

Females

1. Segments 4-7 black with short yellow lateral streaks 2
— Segments 4-7 (or at least 4-5) mainly yellow to reddish brown 6
2. Segments 4-7 with 2 yellow streaks each side 3
— Segments 4-7 with 1 yellow streak each side 4
3. Labrum with black central marking extending from base to outer edge; frons above mainly deep metallic blue *T. aconita* Lieftinck
— Labrum unmarked or only a trace of black on outer edge; frons above narrowly blue-black at base *T. aequale falconis* Pinhey
4. Segments 4-5 slender: on each side of dorsal carina the half segment at least three times as long as wide. Forewing with $8\frac{1}{2}$ (sometimes $9\frac{1}{2}$) Ax. Frons above broadly deep metallic blue *T. hecate* Ris

- Segments 4-5 about twice as long as broad, on each side of dorsal carina. Forewing with 10½ Ax or more 5
- 5. Frons above rather narrowly black at base. Thorax pale yellow with separate black lateral lines
 *T. brydeni* Pinhey
 — Frons above very broadly black with strong blue-green sheen. Thorax yellow with the lateral lines linked by an irregular band across them *T. stictica* (Burmeister)
- 6. Segment 8 black with 2 pale lateral stripes or pale with 2 black stripes. Hindwing with an isolated yellow spot in anal region or with pronounced yellow basal streaks
 *T. kirbyi ardens* (Gerstaecker)
 — Segment 8 black with or without 1 pale stripe. hindwing without isolated yellow spot, the basal yellow area suffused 7
- 7. Segment 9 with very broad pale lateral band *T. annulata* (Beauvois)
 — Segment 9 all black, or black with pale dorsal carina 8
- 8. Basal orange area on wings small. Labium with black median band *T. arteriosa* (Burmeister)
 — Basal orange area on wings reaching to or beyond tornus on hindwing. Labium without black marking *T. monardi* Ris

90. **Trithemis aconita** Lieftinck, 1969: 40

Described from Shaba, this slender dark blue species is locally common in forest or thick bush bordering streams and rivers from Natal to equatorial Africa. It is distinctly a shade-seeker.

Since it is common near the Victoria Falls it will probably be found on the Chobe rapids.

91. **T. ? aequalis falconis** Pinhey

Trithemis aequalis Lieftinck, 1969: 44

Trithemis falconis Pinhey, 1970b: 113

T. aequalis was described from Lake Bangweulu, Zambia (2♂, 1♀), at the same time as Pinhey's Monograph on *Trithemis* was being completed in which *falconis* was described from Khwaai River. It is evident that the two taxa are very similar but until a male *aequalis* can be examined I prefer to regard *falconis* as a probable subspecies. The differences noted are: 1. size, for instance, Lieftinck gives the hindwing 31,2 mm in holotype *aequalis*, 30,2 in allotype; in holotype and allotype *falconis*, hindwing is 32 mm. There is slight size variation in the long series of *falconis* now available; 2. Labium of male *aequale* is mainly black on posterior lobe, in all the *falconis* it is either all yellow or sometimes yellow with a median black band; 3. The membrane of the wings is given as greyish yellow in *aequale*, whereas it is hyaline in all *falconis*; 4. The basal band on the female frons is recorded as blackish brown in *aequale* but it is blue-black in female *falconis*. In other respects the description of *aequale* does not differ appreciably from *falconis*. The abdomen of male *aequale* has two rows of yellow streaks in the middle segments, only one row in holotype and some other males of *falconis*, but two rows (as in the female) in a few male *falconis*.

In the Okavango system *falconis* was first discovered at the Khwaai River where both sexes settled on tall grasses near the river and were quite approachable. At Four Rivers it was found in or on the fringe of woodland, particularly in December 1975 when a series of both sexes was collected the first day before breakfast, resting on dead twigs following a bush fire.

Two females collected at Four Rivers Dec. 1973 had deformed wings. One headless ♂ Four Rivers 4 Dec. 1973 was captured as prey of *Orthetrum trinacria* (Selys) (♀).

Botswana records.

NMC: Khwaai River Dec. 1968 (allotype on 10th, holotype 11th) (E. Pinhey); Four Rivers Dec. 1973, Dec. 1975 (common) (FC); 25 km E. of Four Rivers Dec. 1975.

92. **T. a. annulata** (Beauvois)

Libellula annulata Beauvois, 1805: 69

Described from Southern Nigeria this species, with a purplish red male, is common in most parts of Africa, some islands, southern Europe and western Asia. It was taken at Katwitwi, W. Caprivi, Okavango River Apr. 1970 (H. D. Brown). It is common in many parts of Botswana. Kasane specimens, like those of Victoria Falls, are f. *violacea* Sjöstedt.

Botswana records.

NMC: Nata Jan. 1970 (NME); Nxai Pan Apr. 1971 (Philip); Toromaja, Botletle River Apr. 1975 (N. Tett); Maun Dec. 1968 (FC), March 1974 (NME); Nkomane River S. of Maun Febr. 1967 (NME); Sepopa Febr. 1967, March 1974 (NME); Xaro, 25 km S. of Shakawe Nov. 1973 (T. Liversedge); Shakawe Febr. 1967, Jan. 1970 (NME); Jugu Jugu (Boro River) May 1974 (S. Williams & A. McDermott); Khwaai River Dec. 1968 (FC), 1969 (T. Liversedge); Four Rivers Dec. 1975 (FC); Savuti Channel Camp, Savuti Channel West March 1976 (NME); Kachikau Apr. 1974 (NME); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974 (NME).

TM: Maun May — June 1930 (G. van Son); Mababe Flats June 1930 (G. van Son).

93. **T. a. arteriosa** (Burmeister)

Libellula arteriosa Burmeister, 1839: 850

Described from Natal, this common red species is found throughout Africa (except in heavy forest), many islands and parts of western Asia. It is not a swamp species and although probably very widespread in Botswana it is only seen in the Okavango on the fringe. It was taken at Andara March 1974.

Botswana records.

NMC: Makala-ma-Bedi, Botletle River Febr. 1967 (NME); Maun Febr. 1967 (NME); Nghabe River, S. of Maun Febr. 1967 (NME); Jugu Jugu (Boro River) June 1974 (S. Williams & A. McDermott); Savuti Channel Camp, Savuti Channel West March 1976 (NME); Linyati Explor. camp Apr. — May 1976 (P. Ginn); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Sept. 1974, March 1976 (NME); Notwane River, S. of Gaborone Febr. — May 1976 (G. Bailey).

Schultze: recorded *arteriosa* from pans in S. Botswana (Ris, 1908).

94. **T. brydeni** Pinhey, 1970b: 147

Fig. 4

Originally, a series of males was collected at Kasane, N. Zambia March 1969 (E. Pinhey) and later a sight-record of a black species was reported at the northern end of Lake Bangweulu. All these were mature, very black males. On 6th December 1973, R. Aslin of Falcon College collected one teneral male and I collected a mature example on 12th. The teneral male, with yellow thorax crossed by separated black lines, as in *dorsalis* (Rambur), gave an indication of the appearance of the unknown female. This pattern was confirmed by the capture of two females at Four Rivers in December 1975, one on 4th (Pinhey), another on 7th (Philip). At Kasama the males settled on reeds on a dam and on vegetation on the seepage below the

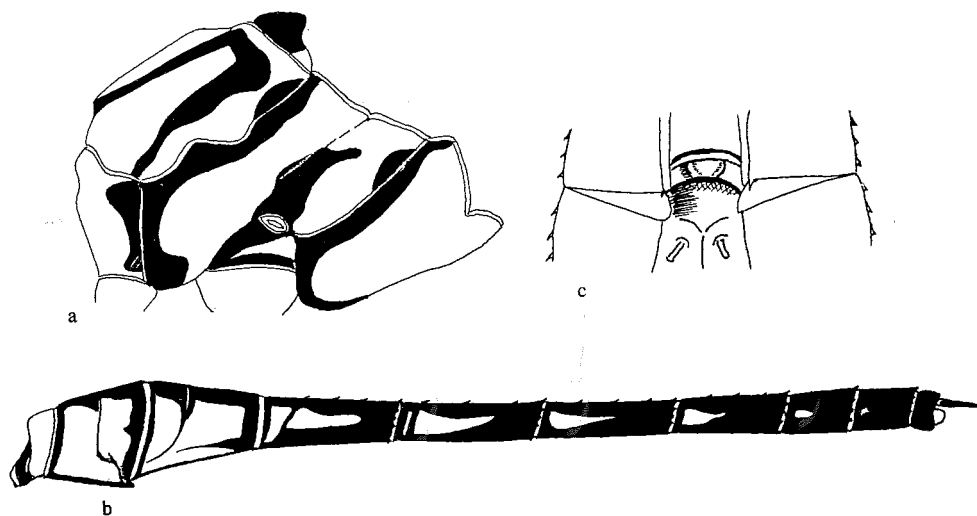


Fig. 4. *Trithemis brydeni*, allotype ♀; a-c. synthorax, abdomen and ventral surface of 8th segment of abdomen.

dam wall. At Four Rivers they were captured at rest on low twigs or grass. The first female was caught inactive at 07.00 hrs on a very low twig. In life the teneral male had a grey eye, reddish brown above; face, thorax and abdominal colour yellow faintly tinged with green. Female similarly coloured on the eye, the face pale green, body markings pale yellow with faint green tips.

Metallotype mature ♀: Labium yellow, broadly black medially, the posterior lobe with yellow lateral spots; labrum greenish yellow with black mid-basal dot and very broad, irregular dark brown distal band. Face and frons greenish yellow; frons above with very broad blue-black basal band, extending forwards in grooves; vesicle green, black posteriorly; occiput dark brown, yellow posteriorly, orbits ventrally black with yellow spots against the eyes.

Prothorax black with very fine yellow anterior collar. Synthorax pale greenish yellow marked with sinuous black lines as in the figure; sternites black with yellow spots. Legs black, fore femur with shortish yellow anterior streak.

Wings hyaline, venation and pterostigma black; bases of all wings with short amber traces. Nodal index $\frac{8.9\frac{1}{2}}{8.7} | \frac{10\frac{1}{2}.8}{8.8}$. Membranule mainly white, with grey streak against anal margin.

Abdomen triquetral, black, with yellow markings as in fig. 4b. Ventrally yellow on segments 1-2, mainly black on 3-8 with narrow inner yellow edges, 9-10 black. Cerci black. Vulvar scales as in fig. 4c.

Abdomen 26,5 mm, hindwing 32 mm.

Paratype ♀ differs slightly: posterior lobe of labium all black; labrum much yellow, with black basal dot but only a narrow black distal band on free margin. Abdomen segment 9 all black. Abdomen 27 mm, hindwing 33 mm.

Holotype and paratype males, metalotype and metaparatype female in National Museum Bulawayo.

Botswana records.

NMC: Four Rivers ♂ 6 and 12 Dec. 1973, ♀ 4 and 7 Dec. 1975 (FC).

95. **T. hecate** Ris, 1912b, 14: 787

Described from Madagascar, this is a slender dark species known from South to equatorial Africa, but rather local. It favours grassy or reedy pools near trees. Balinsky (1967) recorded it from the Okavango swamps where it is, in fact, very common on swamps or in and around bush and woodland.

Botswana records.

NMC: Maun Oct. 1971 (A. Archer), March 1974, Dec. 1975 (NME); Nghabe River 16 km S. of Maun Febr. 1967 (NME), Dec. 1968 (FC); Lake Ngami Aug. 1969 (FC); 13 km S. of Sepopa March 1974 (NME); Sepopa Jan. 1970 (A. Archer), March 1974 (NME); Shakawe Jan. 1970 (NME); 14 km N. of Maun Febr. 1967 (NME); 100 km N. of Maun Dec. 1968 (FC); Jugu Jugu (Boro River) May — June 1974 (S. Williams & A. McDermott), Aug. 1974 (S. Williams); Khwaai River Dec. 1968 (FC), Oct. 1971 (A. Archer); Gabaramokuhi (N. of Khwaai R.) Oct. 1971 (A. Archer); Four Rivers Dec. 1973, Dec. 1975 (FC); 11 km E. of Four Rivers Dec. 1973 (FC); Xugana Lagoon Dec. 1975 (FC); Savuti Channel West March 1976 (NME); Kachikau Apr. 1974 (NME); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe rapids (Kasane) Dec. 1965 (E. Pinhey).

TM: Mababe Flats June 1930 (G. van Son).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

96. **T. kirbyi ardens** Gerstaecker

Plate 3: 7

Trithemis kirbyi Selys, 1881: 465

Trithemis ardens Gerstaecker, 1891: 5, 9, 187

The nominotypical race is Oriental; *ardens*, description from Tanzania, occurs in most open or even arid regions of Continental Ethiopian Africa. The male, with its vermilion abdomen and broad amber wing bases is a striking species, settling on rocks, stones, sand or low vegetation, usually at streams, sometimes pools. It is superficially similar to *Brachythemis lacustris* which, by contrast, is a gregarious palustrine species. I have not seen it on the Okavango River at Sepopa where *lacustris* occurs.

Botswana records.

NMC: Gaborone Nov. 1970 (E. Pinhey); Mosetse River, 130 km N.W. of Francistown Febr. 1967 (NME); Nxai Pan Apr. 1971 (Philip); Maun Dec. 1968 (FC); Chobe rapids (Kasane) Sept. 1974 (NME); Chobe R. Kazungulu Nov. — Dec. 1975 (K. Adams); Nata Apr. 1976 (Peterhouse Exp.).

97. **T. m. monardi** Ris, 1931: 108

Plate 3: 8

Described from southern Angola this is a very local palustrine insect occurring also in swamps of S.W. Africa, Botswana, Rhodesia, Mozambique, Malawi and Zambia. In

appearance it is like *arteriosa* but with broader orange wing bases, tinted with brown in the male. It tends to have a fluttering motion in flight, almost like a *Rhyothemis*. Balinsky (1967) recorded it in the Okavango swamps, where it is abundant.

Botswana records.

NMC: Makala-ma-Bedi, Botletle River Febr. 1967 (NME); Maun Febr. 1967 (NME), Dec. 1968, Dec. 1975 (FC); Nghabe River 16 km S. of Maun Febr. 1967 (NME), Dec. 1968 (FC), March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); 30 km N. of Maun Febr. 1967 (NME); Jugu Jugu (Boro River) May — June 1974 (S. Williams & A. McDermott), Aug. — Sept. 1974 (S. Williams); Mboma, Moremi Febr. 1969 (T. Liversedge); Txatxanika, Moremi Game Reserve Aug. 1970 (P. Steyn), Aug. 1975 (N. Tett); 100 km W. of Khwaai Lodge Dec. 1973 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Savuti Channel Camp, Savuti Channel West, Linyati Explor. camp March 1976 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

98. *T. stictica* (Burmeister)

Plate 3: 9 (♀ aberration)

Libellula stictica Burmeister, 1839: 850

This very attractive, slender pale blue and yellow species, described from Natal, is widespread, frequently common, from there to equatorial Africa. It is found at rivers, streams or pools, resting on grasses, reeds, twigs and other vegetation. It also favours swamps and is common in the Okavango delta.

Like the palustrine *monardi* which has brown wing apices, females of swamp-bred *stictica* tend to strong brown apical fasciae. In juveniles there may be nodal or even long costal brown suffusions, sometimes with strong saffronation of parts of the wing membrane. This tendency to brown apices is also found occasionally in females from Mozambique, Zambia, Mashonaland and other areas, possibly also peculiar to swamp influence. It is not correct to assume that these females represent an ecological entity since a small proportion of female individuals in the Okavango swamps (for instance, at Four Rivers) have entirely hyaline wings except for basal orange traces. It can only be assumed as a palustrine tendency. Females at Chobe rapids do not have brown apices.

Occasional Four River camp females have unusually broad black lateral bands on the thorax, more like *T. nuptialis* Karsch, one of these specimens lacking the brown apical suffusions.

It has also been found at Andara, W. Caprivi March 1974.

Botswana records.

NMC: Maun Dec. 1968 (FC), Jan. 1970 (NME), Sept. 1971 (A. Archer), Dec. 1975 (FC); Nghabe River, 16 km S. of Maun Febr. 1967 (NME); Sepopa Febr. 1967, Jan. 1970, March 1974 (NME); Shakawe Jan. 1970 (NME); Jugu Jugu (Boro River) Aug. — Sept. 1974 (S. Williams); Mboma (Moremi) Febr. 1969 (T. Liversedge); Txaxanika (Moremi) Aug. 1975 (N. Tett); Khwaai River Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana Lagoon Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Savuti Channel Camp, Savuti Channel West, Linyati Explor. Camp March 1976 (NME); Chobe Rapids (Kasane) Sept. 1974 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

ZYGONYX (Selys) Hagen (1867)

Large, robust species which breed in fast-running waters, the adults of non-forest species generally seen near rapids or waterfalls.

Key to *Zygonyx*

1. Frons ♂ bright metallic blue. Abdomen in ♀ and juvenile ♂ black with fine yellow lateral streaks*
Mature ♂ pruinose grey-blue. Hindwing less than 42 mm *Z. natalensis* (Martin)
— Frons ♂ dark metallic violet. Abdomen ♂, ♀ black with rounded yellow lateral spots, non pruinose.
Hindwing 45 mm or more *Z. torrida* (Kirby)

99. *Zygonyx natalensis* (Martin)*Pseudomacromia natalensis* Martin, 1900: 106, 107

Described from Natal, this species is common in most parts of the Continental Ethiopian region over fast streams or rivers; in forest areas it is only on the fringe. Sometimes, as at Victoria Falls or Thika Falls north of Nairobi it may be seen in great numbers.

Botswana records.

NMC: Chobe rapids (Kasane) Sept. 1974 (NME).

100. *Z. torrida* (Kirby)*Pseudomacromia torrida* Kirby, 1889: 299, 340

Type series from Sierra Leone, Teneriffe, etc., this species is found in most parts of Africa, except in heavy forest, as well as adjacent islands, southern Europe and western Asia. Again, only near rapid streams or rivers. It was taken at Andara on the Okavango River, W. Caprivi March 1974 (NME).

In Botswana there is a sight record of this easily recognizable species: Chobe rapids (Kasane) 4 Apr. 1974 (E. Pinhey).

Botswana records.

NMC: Savuti Channel Camp March 1976 (NME)

***OLPOGASTRA* Karsch (1895)**

Typical *Olpogastra* have the base of the abdomen very swollen, the rest slender. Subgenus *Zygonoides* Fraser has the abdomen broader, less enlarged at base.

Key to *Olpogastra*

1. Abdomen very thick at base then very slender; abdomen as long as or longer than hindwing (*Olpogastra*). Frons above all metallic blue in ♂, broadly so in ♀; yellow markings on thorax and abdomen tending to small spots *O. lugubris* Karsch
— Abdomen moderately thick at base, then more fusiform in ♂, robust in ♀; shorter than hindwing (*Zygonoides*). Frons above partly metallic blue in ♂, only a trace in ♀.; yellow body markings in the form of stripes *O. fuelleborni* Grünberg

101. *Olpogastra fuelleborni* Grünberg, 1902: 235

Type series from Sudan and Tanzania-Malawi border. A robust species found on rivers or streams from South Africa to the Sudan but local. Common at Victoria Falls.

The single specimen (♀) taken so far in Botswana in 1974 was collected with Trichoptera prey (*Amphipsyche* spec.).

Botswana record.

NMC: Chobe rapids (Kasane) 1♀ 4 Apr. 1974 (NME).

102. **O. lugubris** Karsch, 1895: 199, 201 Plate 3: 10

Described from Dongola (Sudan), this species is found at reed-fringed rivers, streams or large reedy pools in most parts of the Continental Ethiopian region. It is not a palustrine species and in the Okavango system it is seen on reeds in the larger stretches of water. It was taken at Andara, W. Caprivi, March 1974.

Botswana records.

NMC: Maun Dec. 1968 (FC); Nghabe River, 16 km S. of Maun Febr. 1967 (NME); Sepopa Febr. 1967 (NME); Shakawe Febr. 1967 (NME) & Mboma (Moremi) Febr. 1969 (T. Liversedge); Four Rivers and Xugana Lagoon Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe Rapids March 1976 (NME).

RHYOTHEMIS Hagen (1867)

The three species mentioned here are typically palustrine and easily recognized by the short black bodies, the blackish-brown wing patterns and their slow, fluttering, papilionoid flight.

Key to *Rhyothemis*

1. Forewing, radial supplement with 2 rows of cells. Both wings tinted with brown and metallic sheens more or less as far as pterostigma, with hyaline post-nodal spot. *R. fenestrina* (Rambur)
 — Forewing, radial supplement with 1 row. Brown areas with sheens extending to or beyond nodus of hindwing, but absent or only to nodus in forewing 2
2. Basal half of forewing brown with yellow marking *R. mariposa* Ris
 — Basal half of forewing hyaline *R. semihyalina* (Desjardins)

103. **Rhyothemis fenestrina** (Rambur) Plate 3: 12

Libellula fenestrina Rambur, 1842: 40

Rambur's ♀ type lacked locality data. It is a very local, usually gregarious species, known from Damaraland and N.W. Botswana in swamps, northwards to Uganda and West equatorial Africa. Where it occurs it may be in great numbers, fluttering on the verge of forests, thick bush or woodland, near swamps. When the sun is obscured it may take refuge among trees, then when the sun reappears I have seen it flutter down in small clouds to rest on tall grasses or on twigs. It is, at such times, easily captured in numbers with one sweep of a net. Sometimes, as at Four Rivers, it may appear in smaller numbers, resting on low plants and can momentarily be mistaken for dark Satyridae. In 1975 it was partial to dead twigs on a stretch of burnt ground. The majority are sometimes females. It was collected in the W. Caprivi near Mashi River, 20 km S. of Kongola Sept. 1970 (H. D. Brown). One was captured at Four Rivers as prey: Four Rivers 1♂ 4 Dec. 1975 (prey of *Promachus* spec., Asilidae).

Botswana records.

NMC: 16 km S. of Maun Dec. 1968 (FC); Sepopa Febr. 1967, March 1974 (NME); Shakawe Jan. 1970 (NME); Four Rivers Dec. 1973, Dec. 1975 (abundant) (FC); Meakome Dec. 1973 (FC); Xugana Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Savuti Channel West March 1976 (NME); Chobe River (Kasane) Dec. 1965 (E. Pinhey); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams).

104. **R. mariposa** Ris, 1913b 15: 961

Described from S.W. Africa, this is a very local swamp species found in Angola, Zambia and Shaba (Katanga). The S.W. African record was at "Otiembora" (Nov. 1887, A. W. Eriksson), and other records from neighbouring territories suggest that this is likely to occur in the northern part of the delta but I have not yet seen it there. Otiembora is a misspelling of Ochimbora (Otjimbora).

105. **R. semihyalina** (Desjardins)

Plate 3: 11

Libellula semihyalina Desjardins, 1835: iii, 1

Described from Mauritius, this is distributed over most of the African continent (except in forest), neighbouring islands and western Asia. It is seen at reed-fringed rivers and streams, grassy or reedy pools and swamps. It is not so gregarious as the previous two species and in the Okavango it is much less common than *fenestrina*. Single specimens, for instance, may be seen in woodland at Four Rivers amongst large numbers of *fenestrina*.

Botswana records.

NMC: Botletle River 90 km E. of Maun Febr. 1967 (NME); Toromoja, Botletle River Apr. 1975 (N. Tett); Maun Febr. 1967 (NME), Dec. 1968, Dec. 1975 (FC); Tsau March 1974 (sight record: E. Pinhey); Shakawe Jan. 1970 (NME); 14 km N. of Maun Febr. 1967 (NME); 80 km N. of Maun Dec. 1968 (FC); Khwaai River Dec. 1968 (FC); Moremi S. Gate Dec. 1975 (NME); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Savuti Channel Camp March 1969 (T. Liversedge), Savuti Channel West March 1976 (NME); Linyati Explor. Camp March 1976 (NME).

PARAZYXOMMA Pinhey (1961)

The single species here has a superficial resemblance to *Brachythemis leucosticta*, the body black, the wings of the male with a more or less formed brown transverse band. It is, however, very different in habits, seeking the shade of dense bushes or trees near sluggish waters or swamps and it is very wary.

106. **Parazyxomma flavicans** (Martin)

Zyxomma flavicans Martin, 1908f: 657

Described from Guinea Bissau this is a very local species from the Zambezi River to equatorial West Africa. As stated above it is a shy species only found in the shade of trees. It was discovered near Maun on the 1967 expedition. In that locality it sometimes flies more readily on dull days and occasionally in light rain, amongst the trees. The eye markings, in life, are distinctive: in ♂ olive with brown vertical ring and behind this a brown reticulation; in ♀ olive dorsally, greyish white ventrally, with the same ring and reticulation.

Botswana records.

NMC: Maun Dec. 1968 (FC), March 1974 (NME); Xaro, 25 km S. of Shakawe March 1974 (NME); 8 km N. of Maun Febr. 1967 (NME); Four Rivers woodland Dec. 1973 (FC); Xugana woodland camp 1973 (FC); Chobe Game Park (Kasane) Apr. 1974 (NME).

THOLYMIS Hagen (1867)

A solitary crepuscular species in this genus in Africa, red-bodied with broad hindwings which, in the male, have brown and white fasciae. It is considered a migrant.

107. **Tholymis tillarga** (Fabricius)

Libellula tillarga Fabricius, 1798: 285

Described from east Asia, it is found in most parts of Ethiopian Africa and some islands, as well as Asia and, apparently, Australia. It flies actively at dusk or dawn, or on cloudy days; and in stormy weather the male flies swiftly and erratically. It was first found in the Okavango in 1965. In March 1974 most of the specimens seen were teneral. It was collected at Andara, W. Caprivi, March 1974.

Botswana records.

NMC: Maun March 1974 (NME); Gumare March 1974 (NME); Gumare-Shakawe Febr. 1965; Sepopa Febr. 1967, March 1974 (NME); Shakawe Apr. 1970 (A. Archer); Khwaai River Dec. 1968 (FC); Four Rivers (and 8 km E.) Dec. 1973, Dec. 1975 (FC); Chobe Game Park (Kasane) Apr. 1974 (NME); Chobe River (Kasane) Febr. 1966, Dec. 1974 (E. Pinhey); Chobe Rapids (Kasane) March 1976 (NME).

PANTALA Hagen (1861)

The single African species is a circumtropical migrant, known from all continents except Antarctica.

108. **Pantala flavescens** (Fabricius)

Libellula flavescens Fabricius, 1798: 285

Described from India, this is abundant throughout Africa and in other continents. It is generally a sun-lover but on stormy days it will fly back and forth, often just ahead of an approaching storm, possibly to locate the temporary rain-pools in which the female oviposits. It will, however, breed in most calm fresh waters.

It is undoubtedly to be seen at some time or other throughout Botswana and the following records do not reflect every evidence of its presence on our expeditions. On the 1975 expedition this was the only species collected by bird mist-nets other than *Anax bangweuluensis*.

Botswana records.

NMC: Nathane Jan. 1974 (D. & C. Tett); Mosetse River, N. of Francistown Febr. 1967 (NME); Makgadikgadi Pan Dec. 1973 (FC); Nxai Pan Apr. 1971 (Philip); Toromoja, Botletle River Apr. 1975 (N. Tett); Makala-ma-Bedi, Botletle River Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana-Gadikwe Dec. 1973 (FC); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams); between Notwane River and Gaborone March 1976 (G. Bailey); Nata Apr. 1976 (Peterhouse Exp.).
Schultze: pans in S. Botswana (Ris, 1908).

TRAMEA Hagen (1861)

Two large migrants belong here, both with characteristic dark fasciae near the base of the hindwing.

Key to *Tramea*

1. Hindwing with broad yellow basal area reaching to second or third Ax and to tornus, enclosing dark red-brown or brown bars or spots *T. basilaris* (Beauvois)
— Hindwing with scarcely any yellow marking but with a dark red-brown band extending from base of cubital zone along anal margin but not reaching tornus *T. continentalis* (Selys)

109. ***Tramea basilaris*** (Beauvois)*Libellula basilaris* Beauvois, 1805: 171

Described from Nigeria, this species, with variable pattern on hindwing is found in most parts of the Ethiopian region and across Asia. I think the first Botswana record was in 1957. It may frequently be seen hovering over water or in and near woodland, often settling on low twigs. One female collected at Nathane on the Peterhouse School expedition, 1974, was taken from the beak of a White Billed Lake Tern. The records below do not record all the occasions and localities when it has been observed.

Botswana records.

NMC: Francistown Dec. 1973 (FC); Madkgadikgadi Pan 1957 (? collector), Dec. 1973 (FC); Nathane Jan. 1974 (D. & C. Tett); Toromoja, Botletle River Apr. 1975 (N. Tett); Tsau March 1974 (NME); Sepopa Febr. 1967, March 1974 (NME); 80 km N. of Maun Dec. 1968 (FC); Four Rivers Dec. 1973, Dec. 1975 (FC); Goha Hills Apr. 1974 (NME); Savuti Channel West March 1976 (NME); Chobe R., Kazungulu Nov. — Dec. 1975 (K. Adams); Nata Apr. 1976 (Peterhouse Exp.).

110. ***Tramea continentalis*** Selys, 1878: 299

Described from Senegal, *continentalis* is known from Natal to equatorial Africa. It is chiefly found along the coastal regions or inland along the major river valleys.

This taxon has usually been considered a subspecies of *T. limbata* (Desjardins) described from Mauritius but I have been rather doubtful of this connection. The Mauritian taxon (and Rodriguez), have much broader basal brown fasciae on the hindwings than *continentalis*, and particularly in the females. In the male this fascia is 5 mm or wider at its narrowest portion in *limbata*, 3 mm or less in *continentalis*; in the female the fascia is much wider overall in *limbata* and not wider than male in *continentalis*, sometimes broken. Single males from Madagascar and Seychelles in the National Museum agree with *continentalis*, not *limbata*; and a male from Tampon, Réunion, has the band nearer *continentalis* but slightly wider than average and indented on its anal side more like the normal female. From this insular distribution of available examples it would appear that Madagascar and Seychelles specimens are *continentalis*, Réunion, a form or race of this; Mauritius and Rodriguez are *limbata*. More material is required to confirm these suggestions. There seems to be little difference in the genitalia.

The only record from Botswana is the following one collected by David Tett. It is surprising to find it so far inland as this.

Botswana record.

NMC: Nathane 8 Jan. 1974 (D. Tett).

UROTHEMIS Brauer (1868)

Also large insects but without noticeable tendencies to migrate. Their venation is more open than in *Tramea*.

Key to *Urothemis*

1. Frons in mature ♂ red; thorax and abdomen blood-red. ♂ and ♀ with narrow brown dorsal stripe on abdominal segments 4-6, wider on 7-9. Basal fascia hindwing ♂ and ♀ yellow with reddish brown markings (or obsolete in ♀) *U. assignata* (Selys)

— Frons in mature ♂ blue-black; thorax and abdomen blackish brown with blue pruinosity; in ♀ and juvenile ♂ the abdomen brownish yellow with broad black dorsal band on 4-10. Basal fascia on hindwing black in ♂, broadly yellow with reddish brown markings in ♀ *U. edwardsi* (Selys)

111. ***Urothemis assignata*** (Selys)

Libellula assignata Selys, 1872: 176

Described from Madagascar, this red-bodied species is widespread on reedy margins of streams or pools from Natal to equatorial Africa. It is not a true palustrine but since it occurs on the Zambezi River near Katambora and Kazungulu it will surely be found on the Chobe River. The only Botswana record I have is from the South.

Botswana record.

NMC: Notwane River, 23 km S. of Gaborone Febr. 1976 (G. Bailey).

112. ***U. e. edwardsi*** (Selys)

Libellula edwardsi Selys, 1849: 124

Described from Algeria, this blue-bodied species is widespread in most of the warmer parts of Africa. It has a tendency at times to prefer large rivers, rather than pools, but in some areas, like the Okavango delta it is abundant on pools or streams, or in the surrounding bush where it persistently settles on the same low stems or twigs. Sometimes, in fact, it is one of the dominant Libellulidae in the swamps. It was taken at Andara, W. Caprivi, March 1974.

Botswana records.

NMC: Toromoja, Botletle River Apr. 1975 (N. Tett); Maun March 1974 (NME), Dec. 1975 (FC); Sepopa Febr. 1967, Jan. 1970 (NME); Tsodilo Hills Jan. 1970 (NME); Shakawe Febr. 1967 (NME); 14 km N. of Maun Febr. 1967 (NME); Khwaai River Dec. 1968 (FC), 1969 (T. Liversedge); Four Rivers Dec. 1973, Dec. 1975 (FC); Xugana Dec. 1973 (FC); Xugana-Gadikwe Dec. 1973 (FC); Linyati Explor. Camp March 1976 (NME); Parakarungu Apr. 1974 (NME); 22 km E. of Kachikau Apr. 1974 (NME).

BC: Moremi Game Res. Dec. 1963 — Jan. 1964.

AETHRIAMANTA Kirby (1889)

A single red species related to *Urothemis* but much smaller.

113. ***Aethriamanta rezia*** Kirby, 1889: 298

Described from Madagascar, this small species is known also from Mozambique to equatorial Africa. It favours reedy low-altitude pools and swamps or the reedy margins of streams and rivers. It was found in Botswana at Kasane December 1965 (E. Pinhey). Immature examples of both sexes may be found in woodland in the swamps resting on twigs, but the mature male rests on tall grasses or reeds in the water. One pair was collected *in copula* at Four Rivers 7th December 1973 and two were taken at an ultra-violet light trap at 21.00 hrs on 4th. In December the specimens are immature; many are mature by January.

Botswana records.

NMC: Maun Jan. 1970 (NME); Sepopa Febr. 1967, March 1974 (NME); Xaro, 25 km S. of Shakawe March 1974 (NME); Four Rivers Dec. 1973, Dec. 1975 (FC); Meakome Dec. 1973 (FC); Xugana woodland Dec. 1973, Dec. 1975 (FC); Xugana-Gadikwe Dec. 1973 (FC); Chobe River (Kasane) Dec. 1965 (E. Pinhey).

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GAZETTEER

- Andara, Okavango R. (Caprivi) 18° 00S, 20° 30 E
 Andowa, Kaokoveld, S.W.A. 17° 17S, 13° 12 E
 Botletle R. — vide Makala-ma-Bedi, Toromoja
 Chief's Island — vide Jugu Jugu
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 Chobe rapids, Kasane 17° 50 S, 25° 12 E
 Chobe River — vide Kasane
 Four Rivers camp 19° 03 S, 23° 10 E
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 Mababe Depression or Flats c. 18° 50 S, 24° 15 E
 Mafeking-Ramatlabane road c. 25° 50 S, 25° 40 E
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 Mohembo (border post) 18° 20 S, 21° 45 E
 Moremi Game Res. (South gate) 19° 26 S, 23° 39 E
 Mosetse R. (Nata road) 20° 40 S, 26° 37 E
 Musu — vide Nthane
 Nata, Nata R. 20° 17 S, 26° 08 E
 Nathane — vide Nthane
 Nghabe (Nkomane) R. 20° 06 S, 23° 20 E
 Ngoma 17° 48 S, 24° 37 E
 Nkomane R. — vide Nghabe R.
 Nokaneng 19° 39 S, 22° 12 E
 Nthane — Musu (Nathane), Orapa road 21° 20 S, 26° 00 E
 Nxai Pan (Nat. Park) c. 19° 55 S, 24° 40 E
 Orapa 21° 06 S, 25° 25 E
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 Savuti Channel camp 18° 33 S, 24° 18 E
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ADDENDUM

Footnote p. 544

No. 28. *rubroviride*: ♂ taken with Ephemeroptera prey at Moremi, Sept. 1976.

Footnote p. 558

New species record for Botswana: 49a. *Ceratogomphus pictus* Selys, Gaborone, Nov. 1976 (G. Bailey).