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ADDITIONS TO THE CHECKLIST OF ODONATA FROM MALAŴI, WITH TAXONOMIC NOTES

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The occurrence of *Gynacantha bullata* (Karsch) in Malaŵi is confirmed, *Umma declivium* Foerst., *Pseudagrion bicoerulans* Martin, *Nepogomphoides stuhlmanni* (Karsch), *Neurogomphus chapini* (Klots) and *Onychogomphus* cf. *supinus* Sel. are added to the national list, and the taxonomy and ecology of each of these are briefly discussed. New records for spp. sparingly documented in past accounts, and an updated checklist of the odon. fauna of Malaŵi (149 spp.) are provided. Some considerations on biogeographical affinities of the regional odon. assemblage are included.

INTRODUCTION

The Odonata of Malaŵi are as well studied as any in southeast Africa. However, recent field work has resulted in new distributional records and additions to the list of species for this country. The Odonata of Malaŵi have been discussed previously by PINHEY (1966, 1979) based on relatively brief collecting expeditions. Further records and seasonal observations were subsequently added by PARR (1983, 1984). The most recent checklist given was by TSUDA (1991).

This account records some Odonata collected by Raymond M u r p h y in Malaŵi from 1990 to 1993. Additional records are presented for species collected by Mr Murphy which had hitherto been sparingly documented. While no attempt is made here to discuss all the Malaŵi species at length, an updated checklist is included. This account places some emphasis on montane stream localities on Mount Mulanje near the Mozambique border, only moderately documented in previous accounts, and the source of several interesting records.

The following previously unrecorded species are now known to occur in Malaŵi: *Umma declivium* Foerst., *Pseudagrion bicoerulans* Martin, *Nepogomphoides stuhlmanni* (Karsch), *Neurogomphus chapini* (Klots), and *Onychogomphus* cf. *supinus* Sel.

In addition, *Gynacantha bullata* (Karsch) is positively confirmed as occurring in Malawi.

The discovery of *Nepogomphoides stuhlmanni* and an *Onychogomphus* near *supinus* are significant additions to the knowledge of Malawi Odonata and to the distribution of these little-known species. *N. stuhlmanni* was known only from its type locality in "South East Africa" (present day Mozambique?) and later from two specific localities in northern Tanzania. *Onychogomphus supinus* is the most widely distributed of the African members of this genus. The nominotypical race is known from South Africa (Transvaal, Natal), a melanic form occurs along the mountainous border of Zimbabwe and Mozambique south of Malawi. The specimens collected in Malawi are taxonomically intermediate between this form and the Zambian *Onychogomphus quirkii* Pinhey, 1964. *Neurogomphus chapini* was originally described from the Congo River with additional records from Kenya and Uganda. The discovery of these species on Mount Mulanje represent range extensions in all cases. The records of *Umma declivium* and *Pseudagrion bicoerulans* in northern Malawi provide range extensions as they were previously known from a few localities in eastern Tanzania and in Kenya.

TAXONOMIC ANNOTATIONS

Unless otherwise noted in the following, all measurements given exclude the abdominal appendages.

Umma declivium Foerster, 1906, *Jber. Ver. Naturk. Mannheim* 71/72: 51 (Usambara Mnts).

The male has head black, thorax black with a metallic purple sheen and two vivid green side stripes which are unique within the genus. The abdomen is jet black and the wings lack pterostigmata. The species was originally described from the Usambara Mountains in Tanzania. Records also exist from the Uluguru Mountains, 250 km to the South. PINHEY (1984) mentioned the discovery of an *Umma* species in Malawi, but offered no specific details beyond this note. I have a pair of *U. distincta* Longfield, 1933 collected at Shiwa Ngandu, Zambia, 170 km W of the Malawi border, which suggests its occurrence in Malawi as well. PINHEY (1969) and LONGFIELD (1933) reviewed the species in this genus.

Malawi records. – Northern Malawi: Chinteche, Chisasira Forest, approx. 2,000 ft, 6-V-1990, 2 ♂.

Pseudagrion bicoerulans Martin, 1906, *Bull. Mus. Hist. nat. Paris* 12: 511 (Kenya).

A large species, preferring the cooler waters of shaded streams and swamps at high altitudes. This is the largest member of the genus known from Malawi, with abdomen of 36 mm, hindwings of 26 mm. The thoracic dorsum of the juvenile male is black with a single green antehumeral stripe on each side. Laterally, the thorax is light green with the intersegmental and metapleural sutures black. In fully

mature examples these characteristics are often fully obscured by light blue pruinosity. Previously known from Tanzania: Mount Kilimanjaro 8000-8500 feet, and numerous localities in Kenya.

Malawi records. – Northern Malawi: Misuku Hills, Matipa Forest, approx. 6,000 feet. 10-XII-1990, 1 ♂ (juvenile).

Nepogomphoides stuhlmanni (Karsch, 1899), *Ent. Nachr.* 25: 376 (sub *Notogomphus*; South East Africa). – Synonym: *Nepogomphoides pinheyi* Fraser, 1952, *Occ. Pap. Coryndon meml Mus.* 3: 3.

Small gomphines, similar in appearance to the genus *Microgomphus*, and to the oriental *Nepogomphus*, based on appendage morphology according to FRASER (1952). The most striking characteristic of this species is the male epiproct which is approximately a quarter longer than the cerci and sharply upturned. The validity of this species' identity as being of African origin was in doubt for some time. However, PINHEY (1961) parenthetically noted that he examined the type specimen from the Berlin Museum and found it to be conspecific with *Nepogomphoides pinheyi* Fraser. The species has been known previously some 700 miles N of the Malawi locality in the Uluguru and Usambara Mountains of Tanzania. Unfortunately, the actual type locality was not specified in the original description. This is a species of montane forest streams. As the mountains of eastern Africa are separated by deep, broad valleys this species has a highly disjunct distribution.

Malawi records. – Southern Malawi: Mount Mulanje, Ruo River, approx. 3,500 ft, 22-XI-1992, 1 ♂, 1 ♀ (juvenile).

Neurogomphus chapini (Klots, 1944), *Am. Mus. Novit.* 1259: 7, fig. (sub *Oxygomphus*; Congo River).

A moderately large gomphine, with its thorax green between dark brown stripes. The broadly rounded frons, forwardly projecting face, and poorly developed frontal crest of this species are characteristic of the genus. The thorax has distinct antehumeral and humeral stripes, the incomplete antehumeral is not jointed to the mesothoracic collar. This species may be separated from *Neurogomphus wittei* Schouteden, 1934 by the antehumeral stripe which in that species is more robust and jointed at the collar. The cerci are parallel while the epiproct is widely bifurcated. The species was described from the Congo River and has also been recorded from the Broderick Falls in Kenya. Little is known of the ecology of this species.

Malawi records. – Southern Malawi: Mount Mulanje, Sayama Tea Estate, approximately 2,000 ft, 30-I-1993, 1 ♂.

Onychogomphus supinus? Selys, 1854, *Bull. Acad. Belg.* 21(2): 34 (Caffraria).

These two mature male specimens are taxonomically intermediate between *O. supinus* and *O. quirkii* Pinhey, 1964. These specimens were taken on Mount Mulanje at the Mozambique border approximately 350 km N of localities in the Chimanimani and Vumba Mountains of Zimbabwe where a melanic form of *O. supinus* is domi-

nant. These examples are similar but represent a larger and darker form than those of the S. The development of the humeral stripe is inconsistent with examples of the southern form I have examined, being reduced to a small but prominant dorsal dot on either side of the mesanepisternum. The extent of ferruginous coloration is greater than typical in these examples as well; most notably on the cerci which are typically colored yellow to light brown. Most striking is the length of the cerci which are 2.5 mm compared to an average length of 2.1 mm in the southern form. These characters are shared by *O. quirkii* which is known from two localities in Zambia; the nearest being approximately 750 km N along the great rift valley. I am now conducting a thorough analysis of these specimens and others from the Zimbabwe National Museum to ascertain the status of the Malawi examples within this genus. The Malawi occurrence may represent a population isolated from those to the S by the Zambezi River valley and a possible link to *O. quirkii*.

Malawi records. – Southern Malawi: Mount Mulanje, Ruo River, approx. 3,600 ft, 22-XI-1992, 2♂. These specimens were taken flying with *Nepogomphoides stuhlmanni* (discussed above), *Ictinogomphus ferox* (Ramb.), *Phyllogomphus latifascia* Pinhey, *Macromia monoceros* Foerst., and *M. picta* Sel.

Gynacantha bullata Karsch, 1891, *Ent. Nachr.* 17: 305 (West Africa).

PINHEY (1979) expressed doubt regarding the single Malawi record of this species (Chinteche, May, 1924) and questioned whether the record was actually attributable to *G. zuluensis* (BALINSKY, 1961). This is a small species for its genus, distinctly recognizable from *G. zuluensis* by the black band at the junction of the femora and tibiae. The species is widely distributed and known from Cameroon, Congo, Tanzania, Uganda, and Nigeria. Two specimens of *G. bullata* were taken among several *G. vesiculata* Karsch and *G. zuluensis*. FRASER (1962) discussed the taxonomy and distribution of this genus in Africa.

Malawi records. – Northern Malawi: Chinteche, Chisasira Forest, "at dusk", approx. 2,000 ft, 18-V-1990, 1♂, 1 ♀.

ADDITIONAL RECORDS AND COMMENTS

Four species listed in previous accounts were documented only sparingly. PINHEY (1979) provided a list of species for which no additional records were found to augment his 1966 checklist. Included in that list were the following species. It seems appropriate, therefore, to briefly discuss some of those species for which current records are now available.

Notogomphus dendrohyrax (Foerster, 1906), *Jb. nassau. Ver. Naturk.* 59: 326 (sub *Podogomphus*; Usambara Mtns).

A distinctive species which belongs to a genus closely related to the oriental *Anisogomphus*. Previously noted only from the Mkuwadzi Forest, May 1966. Included in the various collections studied have been numerous specimens from two other localities in the northern and central parts of Malawi. Several examples were

collected 16 May 1992 at the Chisasira Forest near Chinteche in northern Malawi. Further examples were collected on 11 April 1993 at Kasitu Rock in the Dzelanyama Forest, central Malawi.

Paragomphus cognatus (Rambur, 1842), *Névroptères*, p. 167 (sub *Gomphus*; locality not stated). – Synonym: *Mesogomphus nguelicus* Foerster, 1906, *Jb. nassau. Ver. Naturk.* 59: 523 (Usambara Mtns).

A widely occurring species in Africa. PINHEY (1966) listed a vague reference to this species having been previously taken at Fort William; no date was given. Typical examples of this species were collected 24 December 1990 at the Juniper Forest in northern Malawi and 22 November 1992 at the Ruo River on Mount Mulanje. Examples of the melanic form *nguelicus* Foerster were collected in northern Malawi at the Chisasira Forest near Chinteche on 6 May 1990 and at the Muloza River on Mount Mulanje on 27 October 1984 (Carl Cook leg.). The Fort William record is referrable to the melanic form as well (PINHEY, 1961). The latter examples are unusually large and in my opinion require further study. Another questionable specimen was collected at the Misuki Hills, Mughese Forest, 12 December 1987 (John Wiltshire leg.). This specimen, according to Graham Vick (pers. comm.) is taxonomically close to *Paragomphus atratus* based on appendage morphology. The accessory genitalia are, however, close to *P. cognatus*. Further study will be needed to classify this specimen with confidence.

Aeshna rileyi Calvert, 1892, *Trans. Am. ent. Soc.* 19: 164 (Kilimanjaro).

Previously known from Mount Zomba in southern Malawi; further examples have been collected here at the Kuche Stream, 25 June 1990. This species is apparently quite widespread in Malawi as it has also been collected at the Mughese Forest in northern Malawi (14 December 1990), the Ruo River in southern Malawi (22 November 1992), and at Mt Dedza in central Malawi (April 1990). This and related species, *A. ellioti usambarica*, are apparently confined to high elevations.

Bradinopyga cornuta Ris, 1911, *Collns zool. Selys* 13: 547 (Portuguese East Africa, Tanganyika).

Reported previously by PINHEY (1966) from the Mpatamanga Gorge on 25 April and 17 May 1966. Several pairs of this species were collected on the Shire River at the same locality on 21 March and 3 May 1992. PARR (1984) reported the occurrence of Odonata in the Liwonde National Park which lies approximately 75 mi N of this locality and is dominated by this river. It is interesting to note that this river species was not recorded as part of that detailed survey. As noted by Parr, the river is affected by the irregular opening and closing of the Kamuzu Barrage, located just S of the park boundary. These fluctuations may explain the absence of this species. Parr further noted the absence of *Trithemis kirbyi ardens* Gerst. from this segment of the Shire River within the parks boundary. This absence may result

from the same disturbance to the river as the species was collected in the Mpatamanaga Gorge during March of 1992.

COMMENTS ON FLIGHT SEASONS

PARR (1984) provided the first detailed documentation of the flight seasons of Odonata in Malawi and related these to the dry and rainy seasons of that region. Comparison of this data collected in the lowlands to recent data from higher elevations show discrepancies however. These differences are thought to be significant and may result from the effect of altitude on the well-defined wet and dry seasons.

ANACIAESCHNA TRIANGULIFERA McL. – This species was collected by Parr only in April and was classified by him as a species occurring "only in the wet season - short flight period". Of several specimens collected in southern Malawi, only a single female was collected in April (Mt Mulanje, elev. 3,500 ft). Several males were collected, however, on Mt Zomba (30-XI-1990, elev. 5,500 ft) and Limbe (14-XI-1991, elev. 4,000 ft). PINHEY (1966) noted the May occurrence of this species at Monkey Bay on Lake Malawi.

HEMIANAX EPHIPPIGER (Burm.). – This migratory species was noted by Parr in March and June only. Recent collections at Limbe on 2 December 1991 have produced numerous specimens however. In addition, two male specimens were collected at Karonga (North Malawi) on 2 January 1992.

MACROMIA PICTA Hag. – This river species was documented by Parr during March and June. It has been collected recently in Limbe on 2 December 1991 indicating, at least, a more disjunct flight season than previously known.

CURRENT CHECKLIST OF THE ODONATA OF MALAWI

What follows is a list of the 149 species recorded to date from Malawi. There are three taxonomically doubtful species included. First, the *Onychogomphus* species near *supinus* requires more detailed study to ascertain its relationship within the genus. Second, the record of *Macromia africana* is based on a teneral female which PINHEY (1979) thought more likely attributable to *M. picta*. Third, *Orthetrum guineense* was hitherto included based on a female specimen in the Royal Scottish Museum which was not examined by Pinhey or myself. This taxonomically difficult species is retained but requires confirmation.

Zygoptera

CHLOROLESTIDAE
- *Chlorolestes elegans* Pinhey, 1951*

LESTIDAE
- *Lestes amicus* Martin, 1910
- *L. ictericus* Gerstaecker, 1869**
- *L. o. ochraceous* Selys, 1862
- *L. pallidus* Rambur, 1842
- *L. pinheyi* Fraser, 1955
- *L. plagiatus* (Burmeister, 1839)
- *L. uncifer* Karsch, 1899

L. virgatus (Burmeister, 1839)
PROTONEURIDAE
Chlorocnemis m. marshalli Ris, 1921
C. montana maccleeryi Pinhey, 1969
Elattoneura glauca (Selys, 1860)
E. tropicalis Pinhey, 1974
PLATYCNEMIDIDAE
Oreocnemis phoenix Pinhey, 1971
Mesocnemis singularis Karsch, 1891
COENAGRIONIDAE
Aciagrion africanum Martin, 1908
A. gracile (Sjöstedt, 1909)
A. g. attenuatum Fraser, 1928
Agriocnemis exilis Selys, 1869
A. gratiosa Gerstaecker, 1891
Ceriagrion bidentatum Fraser, 1941
C. glabrum (Burmeister, 1839)
C. kordofanicum Ris, 1924*
C. suave Ris, 1921
Enallagma elongatum (Martin, 1906)**
E. glaucum (Burmeister, 1839)
E. nigridorsum Selys, 1876
E. sinuatum Ris, 1921
E. subfurcatum Selys, 1876
E. subtile Ris, 1921
Ischnura senegalensis (Rambur, 1842)
Pseudagrion acaciae Foerster, 1906
P. bicoerulans Martin, 1906
P. coelestis Longfield, 1945**
P. gamblesi Pinhey, 1978
P. glaucescens Selys, 1876
P. hageni tropicanum Pinhey, 1966
P. hamoni Fraser, 1955
P. helenae Balinsky, 1964*
P. inconspicuum Ris, 1931
P. kersteni (Gerstaecker, 1869)
P. massaicum Sjöstedt, 1909
P. nubicum Selys, 1876
P. salisburyense Ris, 1921
P. s. sjoestedti Foerster, 1906
P. spernatum natalense Ris, 1921*
P. sublacteum (Karsch, 1893)
P. sudanicum rubroviride Pinhey, 1956**
Teinobasis malawiensis Pinhey, 1966
CALOPTERYGIDAE
Phaoni iridipennis (Burmeister, 1839)
Umma declivium Foerster, 1906
CHLOROCYPHIDAE
Chlorocypha consueta (Karsch, 1899)
Platycypha c. caligata (Selys, 1853)

Anisoptera

GOMPHIDAE
Crenigomphus hartmanni (Foerster, 1898)
Gomphidia g. quarrei (Schouteden, 1934)
Ictinogomphus ferox (Rambur, 1842)
Lestinogomphus angustus Martin, 1912
Microgomphus nyassicus (Grunberg, 1902)
Nepogomphoides stuhlmanni (Karsch, 1899)
Neurogomphus chapini (Klots, 1944)
Notogomphus dendrohyrax (Foerster, 1906)
N. zernyi (St Quentin, 1942)
Onychogomphus supinus? Selys, 1854
Paragomphus cognatus (Rambur, 1842)
P. elpidius (Ris, 1921)
P. genei (Selys, 1870)
P. nyassicus Kimmins, 1955
Phyllogomphus latifascia Pinhey, 1961
AESHNIDAE
Aeshna ellioti usambarica Foerster, 1906
A. rileyi Calvert, 1892
Anaciaeschna triangulifera McLachlan, 1895
Anax chloromelas Ris, 1911
A. imperator Leach, 1815
A. speratus Hagen, 1867
A. tristis Hagen, 1867
Gynacantha bullata Karsch, 1891
G. manderica Grunberg, 1902
G. ochraceipes (Pinhey, 1960)*
G. vesiculata Karsch, 1891*
G. villosa Grunberg, 1902
G. zuluensis Balinsky, 1961
Heliaeschna trinervata Fraser, 1955
Hemianax ephippiger (Burmeister, 1839)
CORDULIIDAE
Hemicordulia asiatica Selys, 1878
?Macromia africana (Selys, 1871)
M. bifasciata (Martin, 1912)
M. monoceros Foerster 1906
M. picta Selys, 1871
LIBELLULIDAE
Tetrathemis polleni (Selys, 1869)
Notiothemis j. jonesi Ris, 1919
Hadrothemis scabrifrons Ris, 1910
Aethiothemis bequaerti Ris, 1919
A. diamangae Longfield, 1959
A. discrepans, Lieftinck, 1969
Orthetrum a. abbotti Calvert, 1892

O. brachiale (P. de Beauvois, 1817)
O. c. caffrum (Burmeister, 1839)
O. c. chrysostigma (Burmeister, 1839)
?O. guineense Ris, 1909
O. hintzi Schmidt, 1951
O. icteromelas cinctifrons Pinhey, 1970
O. julia falsum Longfield, 1955
O. j. julia Kirby, 1900
O. machadoi Longfield, 1955
O. s. stemmale (Burmeister, 1839)
O. t. trinacria (Selys, 1841)
Nesciothemis farinosa (Foerster, 1898)
Palpopleura lucia (Drury, 1773)
P. deceptor (Calvert, 1899)
P. jacunda Rambur, 1842
Chalcostephia flavifrons Kirby, 1889
Thermochoria equivocata Kirby, 1889
Hemistigma albipuncta (Rambur, 1842)
Acisoma panorpoides ascalaphoides Rambur, 1842
?Diplacodes diminuta Lieftinck, 1969
D. lefebvrei (Rambur, 1842)
Crocothemis divisa Karsch, 1898
C. sanguinolenta (Burmeister, 1839)
C. saxicolor Ris, 1919
C. erythraea (Brullé, 1832)
Bradinopyga cornuta Ris, 1911
Brachythemis lacustris (Kirby, 1889)
B. leucosticta (Burmeister, 1839)
Philonomon luminans (Karsch, 1893)
Atoconeura b. biordinata Karsch, 1899
Sympetrum fonscolombei (Selys, 1840)
S. navasi Lacroix, 1921*
Trithemis aconita Lieftinck, 1899
T. a. annulata (P. de Beauvois, 1807)
T. a. arteriosa (Burmeister, 1839)
T. furva Karsch, 1899
T. hecate Ris, 1912
T. kirbyi ardens Gerstaecker, 1891
T. monardi insuffusa Pinhey, 1970
T. pluvialis Foerster, 1906
T. stictica (Burmeister, 1839)
T. werneri Ris, 1912
Zygonyx natalensis (Martin, 1900)
Z. torrida (Kirby, 1889)
Olpogastra (O.) lugubris (Karsch, 1895)
O. (Zygonoides) fuelleborni Grunberg, 1902
Rhyothemis notata fenestrina (Rambur, 1842)
R. semihyalina (Desjardins, 1832)
Tholymis tillarga (Fabricius, 1798)
Pantala flavescens (Fabricius, 1798)
Tramea basilaris (P. de Beauvois, 1817)
Urothemis assignata (Selys, 1872)
U. edwardsi (Selys, 1849)
Aethriamanta rezia Kirby, 1889

* As per PINHEY (1984)
** As per PARR (1984)

Orthetrum kalai Longfield, 1936 was recorded in the Liwonde National Park by PARR (1984). This species was shown by PINHEY (1979b) to be conspecific with *O. stemmale*. As there is apparently much disagreement regarding the taxonomy of this group, the former species is conservatively excluded from the present check-list. Based on my own comparison of examples of the two forms, I am inclined to agree with Pinhey's assessment. Further study and discussion is needed however to better understand the relationships within this complex.

In addition, *Diplacodes diminuta* is included in the present list with some doubt. PINHEY (1979) stated that the only record for the species was from Grunberg's 1903 account of *D. exilis* Ris (junior syn.) from Njassa-See. Pinhey thought this was more likely from the Tanzanian NE section of Lake Malaŵi. *Trithemis dorsalis* was included by PINHEY (1966, 1979) as a probable member of the fauna, but in fact it has never been collected in Malaŵi. The species is therefore omitted.

TSUDA (1991) presented a list of the Odonata of southern Africa in which he included Malaŵi. Of this list of 146 species 7 are omitted from the present check-

list based on corrections made by PINHEY (1979, 1984). They are *Pseudagrion s. spernatum, Macromia nyanzana, Aethiothemis mediofasciata, Trithemis basitincta, T. m. monardi, T. risi* and *Rhyothemis n. notata.* This list also included *Trithemis dorsalis.* Based on the previous discussion of the species it is also omitted from the list. *Ceriagrion bidentatum* and *Enallagma sinuatum* were erroneously omitted in Tsuda's list and are therefore reinstated. Species recorded by PARR (1984) but excluded from Tsuda's list are *Lestes ictericus, Enallagma elongatum, Pseudagrion sudanicum rubroviride,* and *P. coelestis.* These species are now included as well.

The assemblage profile is consistent with those of South Africa and Zimbabwe. The Anisoptera, with 96 species comprises 66% of the total published fauna. Of this the Libellulidae, is the most speciose family and accounts for 42% of the total. *Orthetrum* and *Trithemis* are the dominant genera within this family. Of the Zygoptera, the Coenagrionidae is the dominant family comprising 23% of the total. *Pseudagrion* is the dominant genus within this family.

There are few known endemics. *Oreocnemis phoenix* and *Teinobasis malawiensis* are the only ones on record. Two other species, *Chlorolestes elegans* and *Hemicordulia asiatica* indicate biogeographical affinities with the South African fauna. The occurrence of *Umma declivium* and *Nepogomphoides stuhlmanni* indicate affinities with the Usambara and Ulugura mountains of Tanzania where these species occur sporadically.

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