

Dragonflies (Odonata) of Mulanje, Malawi

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Abstract

65 species of Odonata are recorded from Mulanje and its slopes. Only eight species dominate on the high plateau. Among them are two relict species of conservation concern: The endemic *Oreocnemis phoenix* (monotypic genus) and the restricted-range species *Chlorolestes elegans*. The absence of mountain marsh specialists on the plateau is noteworthy. Mulanje's valleys, of which Likabula and Ruo are best known, have a rich dragonfly fauna. The Eastern Arc relict *Nepogomphoides stublmanni* is common here.

Introduction

Mulanje, at about 3000 m the highest peak between Kilimanjaro and Drakensberg, is an isolated massif in Southern Malawi. From a plain at about 700 m altitude it rises almost vertically to a plateau with an average altitude of 2000 m. The plateau (including peaks) has a surface of about 220 km², being approximately 24 km across at its widest point. The plain surrounding the massif was originally dominated by miombo (*Brachystegia* woodland), but is now largely under cultivation. The valleys are characterised by lowland and submontane forest, the plateau by montane forest, grasslands, bracken fields, scrub and rocky slopes, interspersed with countless streams (Dowsett-Lemaire 1988; Eastwood 1979).

Surveys have shown that the Mulanje Massif contains over 30 million metric tonnes of bauxite, with an estimated excavation life of 43 years. In 2001 the government of Malawi announced to take action to exploit these reserves. Bauxite is an erosion mineral, which has been deposited superficially on the plateau. Because it has to be extracted from the surface, bauxite mining is very damaging to the landscape. Moreover, the creation of infrastructure for mining on the plateau (which now can only be reached by steep foot paths) would lead to further human impacts, particularly deforestation. Therefore an odonatological survey of Mulanje was undertaken in November 2001 and January 2002.

The survey focused on assessing the range, habitat and conservation status of *Oreocnemis phoenix* on the mountain, to locate possible populations elsewhere, and to describe basic ecology and behaviour of the species. The species was discovered on Mulanje by Philip Mhlanga in December 1970, and consequently described by Pinhey (1971). The generic name refers to its mountainous home (the Greek *oros* like *mulanje* means mountain), the specific name to the bright red colour of the male. All published records stem from the 1970s (Parr 1983; Pinhey 1979). The absence of records from other highlands in Malawi and Africa (despite a relatively high collecting intensity and deliberate searching for the species) and the isolated and unique nature of Mulanje have led to the conclusion the species and genus is entirely restricted to the mountain (Barlow 1996; Parr 1983; Pinhey 1966; Pinhey 1971). With a distribution range estimated to have an area of only about 20 km² by Parr (1983), *O. phoenix* would come under severe threat by bauxite mining.

Methods

Fieldwork was undertaken in the Mulanje Forest Reserve from 7 to 18 and 26 to 28 November 2001 and from 13 to 15 January 2002. 13 days were spent on the plateau, the remaining 5 on the lower slopes. All parts of the plateau accessible by paths were visited. Over 50 stream sites on the plateau were examined, as were the Likabula and Ruo Valleys across a wide altitudinal range. At each site details of habitat and dragonfly fauna were noted, with particular reference to *O. phoenix*. Special attention was given to finding exuviae and larvae. For comparison visits were made to the following highlands: Zomba and Thyolo (both South Malawi), Nyika (North Malawi) and Namuli (adjacent Mozambique).

Results

Table 1 summarises the occurrence of dragonflies (Odonata) on Mulanje and compares it with that of the two closest, biogeographically most similar mountains, Zomba and Namuli. The species of *Neurogomphus* and *Onychogomphus* remain unnamed due to taxonomic confusion. 65 species of Odonata are known from Mulanje and its direct surroundings, approximately 42% of the Malawi fauna. A review of Malawi Odonata is in preparation by Allen Barlow and the author. A full report of the status, habitat and behaviour of *Oreocnemis phoenix* is in preparation by the author.

Table 1: Odonata of Mulanje, Zomba and Namuli mountains and their foothills. Records collected by the author (○) and other recorders (x) are shown. The latter are published (Barlow 1996; Parr 1983; Pinhey 1966; Pinhey 1979) or communicated privately by Allen Barlow, Klaus Reinhardt and John Wilson. The three mountains Mulanje (M), Zomba (Z) in Malawi, and Namuli (N) in Mozambique are compared, as are the valleys (below 1500 m) and plateaux (above 1500 m) of Mulanje, C: Chambe, Lc: Lichenja, Lk: Likabula, M: Madzeka, Ml: Maloza, R: Ruo/Lujeri, S: Sombani and T: Thuchila. Altitude range is based on the records from three named mountains (most by the author), habitat on the author's experience in Malawi.

Species	Mountain			Valley				Plateau					Altitude	Habitat
	M	Z	N	Lc	Lk	Ml	R	C	Lc	T	S	M		
Zygoptera:														
Calopterygidae														
<i>Phaon iridipennis</i>	○	x	○	x	○		○						610-1130	streams
Chlorocyphidae														
<i>Chlorocypha consueta</i>	○	x	○	x	○		○						610-1630	forest streams
<i>Platycypha caligata</i>	○	x	○		○								690-1130	streams
Synlestidae														
<i>Chlorolestes elegans</i>	○		○					x	○	○			1630-2050	montane forest streams
Lestidae														
<i>Lestes plagiatus</i>	○	x			○				○				690-1865	marsh and pools
<i>Lestes virgatus</i>	○	○	○		○		x						690-1890	marsh and pools
Coenagrionidae														
<i>Aciagrion gracile</i>		x											-	marsh and pools
<i>Africallagma sinuatum</i>			○										1860-1890	montane marsh
<i>Africallagma subtile</i>	○	x			○		○						800-1000	?
<i>Agriocnemis exilis</i>	x	○					x						1835-1835	marsh and pools
<i>Azuragrion nigradorsum</i>		x											-	marsh and pools
<i>Ceriagrion glabrum</i>		x											-	marsh and pools
<i>Ceriagrion suave</i>			○										1860-1890	marsh and pools
<i>Ischnura senegalensis</i>	x									x			2000	marsh and pools
<i>Proischnura subfurcatum</i>		○	○										1735-1890	montane marsh
<i>Pseudagrion glaucescens</i>	○				○		○						690-940	?
<i>Pseudagrion hageni</i>	○				○								690-1200	forest streams
<i>Pseudagrion inconspicuum</i>		○											1735-1835	montane marsh
<i>Pseudagrion kersteni</i>	○	x	○		○		x	x		x			730-2000	streams
<i>Pseudagrion spernatum</i>	○	x	○		○	x		○	○	○	○	○	730-2230	montane streams
Platycnemididae														
<i>Chlorocnemis marshalli</i>	○	x	○		○		○						800-1350	forest streams
<i>Oreocnemis phoenix</i>	○							○	○	○	○	○	1780-2230	montane streams
Protoneuridae														
<i>Elattonneura glauca</i>	○	x	○		○	x	○						680-1350	streams

Species	Mountain			Valley				Plateau					Altitude	Habitat
	M	Z	N	Lc	Lk	Ml	R	C	Lc	T	S	M		
Anisoptera:														
Aeshnidae														
<i>Aeshna ellioti</i>	○	○	○	x				○	○	○	○	○	610-2055	montane pools
<i>Aeshna rileyi</i>	○	x	○		○		○	x	○	○		○	850-2020	montane streams
<i>Anaciaeschna triangulifera</i>	x	x			x								1070-1680	?
<i>Anax chloromelas</i>	○									○			1560	?
<i>Anax ephippiger</i>	○		○		○								740-1360	marsh and pools
<i>Anax imperator</i>	○	○			○			○		○			730-1800	marsh and pools
<i>Anax speratus</i>	○	○	○				x	○	○	x	○	○	640-2080	streams
<i>Gynacantha villosa</i>	x	○						x					1000-2000	pools
Gomphidae														
<i>Crenigomphus hartmanni</i>	○	x			○								690-1680	streams
<i>Gomphidia quarrei</i>	x						x						-	streams
<i>Ictinogomphus ferox</i>	x	○		x		x	x						610-1070	pools
<i>Lestinogomphus angustus</i>	○				○								690-730	streams
<i>Nepogomphoides stublmanni</i>	○		○		○		○						690-1315	forest streams
<i>Neurogomphus sp.</i>	x												610	rivers
<i>Notogomphus dendrohyrax</i>	○				○								690-730	streams
<i>Notogomphus zernyi</i>		x											-	montane(?)
<i>Onychogomphus sp.</i>	○				○		x						690-1070	forest streams
<i>Paragomphus cognatus</i>	○		○		○	x	○						680-1470	streams
<i>Paragomphus sabcicus</i>	○						○						850-890	streams
<i>Phyllogomphus latifasciae</i>	x						x						1070	streams and lakes
Corduliidae														
<i>Phyllomacromia monoceros</i>	○	x	○		○		○						670-1225	forest streams
<i>Phyllomacromia picta</i>	x						x						1070	streams and lakes
Libellulidae														
<i>Atoconeura biordinata</i>	○	○	○		○		○	○	○	○	○	○	1000-2100	montane streams
<i>Brachythemis leucosticta</i>	x						x						-	pools
<i>Bradinopyga cornuta</i>	○		○		○								680-950	rock pools
<i>Crocothemis divisa</i>	○				○								800	pools
<i>Crocothemis erythraea</i>		○											1735	marsh and pools
<i>Crocothemis sanguinolenta</i>	○	○	○		○		○						680-1360	streams
<i>Crocothemis saxicolor</i>	○				○		○						800-940	rock(?) pools
<i>Diplacodes lefebvrii</i>	○	○					○						850-1735	marsh and pools
<i>Hemistigma albipunctum</i>	○		○				○						800-1070	marsh and pools
<i>Nesciothemis farinosa</i>	○				○				○	○			800-1890	marsh and pools
<i>Notiothemis jonesi</i>	○				○								690-930	forest pools
<i>Orthetrum abbotti</i>	○	x					○		○	x			850-2000	marsh
<i>Orthetrum brachiale</i>	x	x		x				x					-	marsh and pools

Species	Mountain			Valley				Plateau					Altitude	Habitat
	M	Z	N	Lc	Lk	Ml	R	C	Lc	T	S	M		
<i>Orthetrum cafferum</i>	○	○	○						○	○	○	○	1735-2100	montane marsh
<i>Orthetrum chrysostigma</i>	○	x			○			x					800-1070	pools
<i>Orthetrum guineense</i>	○		○		○								1200-1350	?
<i>Orthetrum hintzi</i>		○	○										655-1735	marsh
<i>Orthetrum julia</i>	○	x	○	x	○	x	○	○	○		○		610-2070	streams, marsh
														pools
<i>Orthetrum machadoi</i>	○		○		○								975-1350	?
<i>Orthetrum macrostigma</i>			○										655	marsh
<i>Orthetrum trinacria</i>	x						x						-	marsh and pools
<i>Palpopleura jucunda</i>		x	○										655-1070	marsh and pools
<i>Palpopleura lucia</i>	○		○	x			○						610-1090	marsh and pools
<i>Pantala flavescens</i>	○		○		○				○	○		○	730-1930	pools
<i>Rhyothemis semihyalina</i>	x	○	○										1000-1735	marsh
<i>Tramea basilaris</i>	○		○		○				○			○	690-1950	pools
<i>Tramea limbata</i>			○										1860-1890	pools
<i>Trithemis arteriosa</i>	○	x	○		○								800-1070	marsh and pools
<i>Trithemis furva</i>	○		○		○	x			○				680-1865	streams
<i>Trithemis kirbyi</i>	○		○		○								800-950	rock pools
<i>Trithemis pluvialis</i>	○		○		○	x							680-1130	forest streams
<i>Trithemis stictica</i>		○											1735	marsh
<i>Zygonyx natalensis</i>	○		○		○	x	○	○					680-1715	streams
<i>Zygonyx torridus</i>	○	○	○		○								690-730	streams
total	65	41	41	7	42	9	31	13	15	15	7	9		

Discussion

Plateau Odonata

Only 21 (32%) of Mulanje's 65 species have been found above 1500 m (some have been found higher elsewhere). Some of these species, like *Anax chloromelas* (only a single sight record of this scarce species), *Anax imperator*, *Gynacantha villosa*, *Pantala flavescens*, *Tramea basilaris* and possibly *Pseudagrion kersteni* and *Ischnura senegalensis*, probably only occur on the plateau to siccitate (i.e. overstay the dry season). Eleven species have been proven to reproduce on the plateau. Of them, *Nesciothemis farinosa*, *Ortbetrum abbotti* and *Trithemis furva* probably do so only sporadically. What remains is a core of only eight species that dominate aquatic habitats on the plateau. *Pseudagrion spernatum* is the most abundant species, found principally along streams, especially where there is aquatic vegetation. *Atoconeura biordinata* is the most common anisopteran along streams (forested and open), while *Ortbetrum cafferum* dominates open, marshy conditions.

Chlorolestes elegans larvae live among coarse leaf-litter in stream pools, and is therefore confined to forest. The species is the only African representative of this relict family outside South Africa (other genera occur in Australia, the South-Asian mountains and the Caribbean Island of Hispaniola). It is known from only four highland areas world-wide, in North-eastern South Africa, on the Mozambique-Zimbabwe border, Mulanje and Namuli. *Aeshna ellioti* and *A. rileyi* prefer standing and running waters respectively. Males of the huge red *Anax speratus* are often seen patrolling low over open mountain streams.

The most remarkable odonate on the plateau is the red damselfly *Oreocnemis phoenix*. This monotypic genus is endemic to Mulanje and may be found on almost all streams on the plateau, also those in forest and burnt grassland. Its entire range covers about 50 km². The species oviposits in plants about half a metre above the water-surface, sometimes in places where the streambed is dry. All records of adults are from the dry season and early rainy season. Larvae have not been found. The observations suggest that the eggs lay dormant in the plant tissue until they are wetted, hatching at the end of the rainy season. This may limit displacement of larvae off the plateau by torrential streams at the height of the rains.

Valley Odonata

As many as 59 (91%) of Mulanje's 65 species have been found below 1500 m. Some like *Pseudagrion spernatum*, *Aeshna ellioti* and *Atoconeura biordinata* are much more common on the plateau than lower down. The dragonfly fauna in the valleys is typical of South-east African forest streams with characteristic species like *Chlorocypha consueta*, *Chlorocnemis marshalli*, *Notogomphus dendrobyrax*, *Paragomphus sabicus*, *Phyllogomphus latifasciae*, *Phyllomacromia monoceros* and *Trithemis pluvialis*. Most of the other species are widespread in Africa, and more species may be expected to be found in the future. The most interesting species is *Nepogomphoides stublmanni*, which is known only from Mulanje, Thyolo, Namuli and the highlands of East Tanzania. It is common along forest streams in the Likabula and Ruo Valleys. This monotypic genus is regarded an Eastern Arc relict, related to the rainforest genus *Tragomphus* of West and Central Africa (Camaerts 1978). The *Onychogomphus* species found may be new to science (pers. comm. Allen Barlow). Exuviae likely to belong to this taxon were found during the survey.

Comparison of highlands

The odonate faunas of the three highlands compared in table 1 are very similar, differences mainly being the result of chance factors, i.e. by groups that are difficult to collect (e.g. most Gomphidae) or by ubiquitous species that are likely to occur at a particular site despite the absence of records (e.g. most Libellul-

idae). Besides the unique presence of *O. phoenix* on Mulanje, the most remarkable difference is the absence on Mulanje's plateau of mountain marsh species like *Africallagma sinuatum*, *Proischnura subfurcatum*, *Pseudagrion inconspicuum* and *Porpax risi* and widespread palustrine species like *Orthetrum hintzi* and *Rhyothemis semihyalina* is noteworthy. These species are known from herbaceous, bog-like marshes on Zomba, Namuli and the Nyika Plateau, such as Mlunguzi Marsh on Zomba. Such habitat is absent on Mulanje's plateau with its coarse, gravel-like soils. The stream-dwelling *Notogomphus zernyi* may require a bottom substrate that is absent for similar reasons.

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