International Journal of Odonatology 6 (1): 17-21, 2003

Fooled by the double: *Brachythemis liberiensis* is *Parazyxomma flavicans*, with a note on the Zyxommatini (Odonata: Libellulidae)

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Received 19 August 2002; revised and accepted 04 December 2002.
Key words: Odonata, dragonfly, *Brachythemis*, *Parazyxomma*, *Tholymis*, *Zyxomma*, taxonomy, synonym, Africa.

Abstract

A comparison of the description of *Brachythemis liberiensis* with material of *B. leucosticta* and *Parazyxomma flavicans* has shown that *B. liberiensis* is a synonym of *P. flavicans*. *B. liberiensis* should be removed from the list of threatened African Odonata. The relationships between the genus *Brachythemis* and the Zyxommatini are briefly discussed. Further arguments for a close relationship between the two are provided. The genus *Parazyxomma* should be retained for *flavicans*, which combines characters of *Brachythemis* and typical Zyxommatini, such as *Tholymis* and *Zyxomma*.

Introduction

Six species are normally assigned to *Brachythemis* Brauer, 1868: *B. contaminata* (Fabricius, 1793) from tropical Asia, *B. fuscopalliata* (Selys, 1887) from South-west Asia and *B. lacustris* (Kirby, 1889), *B. leucosticta* (Burmeister, 1839), *B. liberiensis* Fraser, 1949 and *B. wilsoni* Pinhey, 1952 from Africa. Among them are some of the most successful species in the Old World tropics, favouring open stagnant water bodies, with *B. leucosticta* extending even beyond the African continent into adjacent Europe, Asia and Madagascar. The notable exception is *B. liberiensis*, which has remained unrecorded since its description and was even put on the list of "little known or vanishing" Afrotropical Odonata by Pinhey (1982). The species was described from a single male from Guinea-Bissau by Fraser (1949), not from neighbouring Liberia as the name suggests. As Pinhey (1982) noted about *B. liberiensis*: "species of this genus are so gregarious and usually distinctive that it is difficult to account for the absence of further records".

The puzzling lack of mention of *B. liberiensis* suggests that it may be based on an aberration or misidentification. Fraser (1949) compares the species with *B. leucosticta*. Ris (1913) was the first to remark on the deceptive similarity between *B. leucosticta* and *Parazyxomma flavicans* (Martin, 1908). The latter occurs throughout tropical Africa,

although it is much less frequently recorded than *B. leucosticta*, and by coincidence the holotype also comes from Guinea-Bissau. Following suggestions by Ris (1913) and by Fraser in personal communication, Pinhey (1961) created the genus *Parazyxomma* Pinhey, 1961 for *Zyxomma flavicans*. This was largely on account of characters that made it look more like *B. leucosticta* than a typical *Zyxomma* Rambur, 1842.

In my experience, specimens of *P. flavicans* can be mistaken for *B. leucosticta*, and therefore I carefully compared the description of *B. liberiensis* with both species.

Brachythemis liberiensis: a comparative analysis of its description

The holotype of *B. liberiensis* is in the Institut Fondamental d'Afrique Noire, Dakar, Senegal (Kimmins 1966), but for practical reasons I did not examine it. Therefore I have closely compared the description of *B. liberiensis* with specimens of *B. leucosticta* and *Parazyxomma flavicans* from Benin and Ghana (coll. Nationaal Natuurhistorisch Museum Naturalis (RMNH), Leiden).

The comparison in Table 1 reveals five characters that show that the male of *B. liberiensis* must indeed belong to *P. flavicans*: the larger size, the single row of cells above the radial supplement, the double dark-ended Pt, the faintness and reduced extent of the postnodal wing bands, and the pale epiproct.

Discussion

Based on its venation, *Brachythemis* is traditionally classified as a member of the Sympetrinae (e.g. Fraser 1957; Davies & Tobin 1985). Miller (1988) drew attention to the great similarity in the male and female genitalia of that genus and the genitalia of *Parazyxomma* and *Tholymis* Hagen, 1867. The latter two genera are placed in the tribe Zyxommatini of the Trameinae. In fact these genera and *Zyxomma* are the only genera in the extensive study of libellulid penes by Miller (1991) that possess a bifurcated flagellum. The four genera also share a transverse ridge on S4, which in African Libellulidae is otherwise present only in *Acisoma* Rambur, 1842 (Sympetrinae), *Palpopleura* Rambur, 1842 (Palpopleurinae), *Pantala* Hagen, 1861 and *Tramea* Hagen, 1861 (both Trameinae). Corbet (1957) reported that the larvae of *Brachythemis lacustris*, *B. leucosticta* and *Parazyxomma flavicans* are almost identical. Miller (1988) noted similarities in reproductive behaviour of *B. lacustris*, *B. leucosticta* and *Tholymis tillarga* (Fabricius, 1798), but lacked data for the other two Zyxommatini of continental Africa, *P. flavicans* and *Zyxomma atlanticum* Selys, 1889. These are supplied by Lempert (1988). All are most active in the hours before sunset, have brief copulations (10 to less than 60 s), and females oviposit epiphytically in flight while being non-contact guarded by the male (although male behaviour during oviposition has not been documented for *Z. atlanticum*). These features support Miller's (1988) conclusion that *Brachythemis*, *Parazyxomma* and *Tholymis* (as well as *Zyxomma*, not considered by that author) are closely related.

The question arises whether *P. flavicans* is not so close to *Brachythemis* that it should be included in that genus. As noted by Fraser (1949) for *B. liberiensis*, the "genitalia

Table 1. Comparison of mature males of *Parazyxomma flavicans* and *Brachythemis leucosticta* from Ghana and Benin (numbers of studied specimens stated) with the relevant quote from Fraser's (1949) description of *B. liberiensis*. Abdominal length is stated without and with (between brackets) appendages, as Fraser does not state how he took his measurement. Note that at emergence both species still lack the wing band.

Character	Relevant quote Fraser (1949)	*Parazyxomma flavicans*	*Brachythemis leucosticta*
		6 ♂, 2 ♀	8 ♂, 8 ♀
Dimensions	"abd. 22 mm, hindwing 26 mm"	larger and more slender, abdomen: 21.0-22.5 (22.5-24.0) mm, Hw: 26.0-27.5 mm	smaller and more stout, abdomen: 16.5-19.0 (18.0-20.5) mm, Hw: 21.5-23.5 mm
Eyes	-	large, distance over which eyes touch is much greater than the length of the occipital triangle and the vertex	small, distance over which eyes touch is about equal to the length of the occipital triangle and the vertex
Venation	"1 row of cells Rs-Rspl"	Fw triangle 2, subtriangle 3 cells, all wings with 0 cell-doublings before Rspl (sometimes 1), anal loop closed on hind margin	Fw triangle and subtriangle 1 cell, all wings with 2-6 cell-doublings before Rspl (sometimes 0-1), anal loop closed well before hind margin
Pt	"pterostigma bright chrome yellow, black at both ends"	pale with both distal and proximal ends darkened, may become all dark	pale with only distal end darkened
Postnodal wing band	"a moderately narrow golden brown or dark amber coloured fascia crossing the wings from costa nearly to posterior border, with diffuse borders, situated about midway between nodus and pterostigma in forewings... rather wider in the hindwings, extending right up to the proximal end of pterostigma"	hazy and narrow, fading at all sides and not reaching nodus or posterior border, separated by 1 or 2 cells from Pt in Fw, but (nearly) touching it in Hw	sharp and broad, at full extent complete between wing borders and touching nodus in both wings, separated by about 1 cell from Pt in both wings
Appendages	"anal appendages yellow, the superiors tipped with black and black beneath"	cerci pale, blackening apically and ventrally, epiproct pale	cerci pale, darkening somewhat apically, epiproct dark

[are] scarcely differing from that of *B. leucosticta*". It is true that the external secondary genitalia of the two are very alike, the hamule and genital lobe being only slightly more drawn-out in *P. flavicans*. Also, the short, strongly arched cerci and the pointed, triangular femoral spines are very similar. *T. tillarga* and *Z. atlanticum* have secondary genitalia similar to the foregoing, although the anterior lamina is bulbous. Their cerci are straight and elongate, and *Z. atlanticum* is unique by the squarely truncated femoral spines. Males of *P. flavicans*, like those of *T. tillarga* and *Z. atlanticum*, are 'fliers' (see Corbet 1999: 283) which fly incessantly without perching, although they frequently hover to inspect potential oviposition substrates. They are largely crepuscular, keeping to the shade during the day and hanging vertically in the vegetation. In contrast, members of the genus *Brachythemis* are 'perchers', and are often found resting on the ground or on twigs in full sun with abdomen held in a horizontal or raised position. The large eyes and venation of *P. flavicans* are more like those of *T. tillarga* and *Z. atlanticum*, hence its original description in *Zyxomma*. These traits seem to be related to the crepuscular 'flier' behaviour of the species. Unlike the typical condition in the Zyxommatini, where the anal loop is open on the hind margin of the wing, it is closed on the margin in *P. flavicans*.

With the information at hand the case can be argued both ways, either placing *flavicans* within a more broadly defined genus *Brachythemis* or in a genus of its own, *Parazyxomma*. For the sake of stability it seems best to retain the genus *Parazyxomma*, and there are sufficient characters to separate it from *Brachythemis*. Only a phylogenetic study that places *flavicans* within *Brachythemis* can disrupt the present classification. That scenario is possible, because of the similarities in coloration that *P. flavicans* shares with *B. leucosticta* but not with other *Brachythemis* species. It has been suggested that *B. leucosticta* mimics a sphecid wasp (Corbet 1999: 335). If *P. flavicans* mimics the same model, this might explain convergence in general appearance, but it seems unlikely that mimicry of the same model would be compatible with the different behaviour of the mimics. In conclusion, it seems justifiable to retain the genus *Parazyxomma* as an intermediate between *Brachythemis* and typical Zyxommatini.

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