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## A review of *Daspletis* Loew, 1858 with the addition of a remarkable South African species (Diptera: Asilidae: Stenopogoninae)

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### ABSTRACT

*Microstylum vespertilio* Engel, 1932 is redescribed from the Northern Cape Province of South Africa and transferred to *Daspletis* Loew, 1858, a genus closely related to *Microstylum* Macquart, 1838, that now incorporates eight southern African species. Knowledge of the species is updated and a new identification key is provided.

KEY WORDS: Afrotropical, Asilidae, Stenopogoninae, *Daspletis*, *Microstylum*, new combination, identification key, distribution, phenology.

### INTRODUCTION

*Daspletis* Loew, 1858 is a genus of stenopogonine Asilidae confined to the southern parts of the Afrotropical Region, and although there were only seven described species at the outset of the present study, the taxonomic history of this small but interesting genus is fairly complicated and justifies the following brief summary.

Loew (1858) – Described *Daspletis* on a female collected by Wahlberg from ‘N’ Gami’ (in present day Botswana) to which he assigned the name *vulpes*.

Ricardo (1925) – Redescribed *vulpes* on material from present day Zambia and added a new species, *hirtus*, from Zimbabwe. She also described *Microstylum hermanni* from South Africa as well as the new genus, *Neodysmachus*, founded on a single South African species, *setithoracicus*.

Engel (1932) – Recorded additional material of *Microstylum hermanni* from the present day Eastern Cape (South Africa), describing *vespertilio* as a new variety of the species from the Northern Cape.

Hull (1967) – Described *Daspletis albosetatus* on a single female from Namibia.

Oldroyd (1974) – In reviewing the southern African Asilidae, produced a key to *Daspletis* that included four species—*albosetatus* (Angola, Namibia), *hirtus* (Botswana, South Africa, Zimbabwe), *vulpes* (Botswana, Zambia) and a new species, *salicior* (South Africa).

Oldroyd (1980) – Catalogued the species mentioned above as *Microstylum hermanni*, *M. vespertilio* (as a full species and not as a variety of *hermanni*), *Neodysmachus setithoracicus*, *Daspletis albosetatus*, *D. hirtus*, *D. salicior* and *D. vulpes*.

Londt (1983) – Revised *Daspletis*, presenting a key to six species: *hermanni* (transferred from *Microstylum*), *hirtus*, *setithoracicus* (established within the genus as a consequence of the synonymy of *Neodysmachus*), *vulpes*, and two new species, *placodes* and *stenoura*, both from South Africa. *D. salicior* was synonymised with *hermanni*, while *albosetatus* became the type species of a new genus, *Remotomyia*.

Londt (1985) – Added *lykos* from Namibia and South Africa, bringing the number of species to seven (i.e. *hermanni*, *hirtus*, *lykos*, *placodes*, *setithoracicus*, *stenoura*, *vulpes*).

Londt (1999) – Published a key to Afrotropical Stenopogoninae that included *Daspletis*.

Dikow (2009a) – Included *stenoura* in a major cladistical study of the Asilidae that involved 158 species, representing 140 genera. The analysis supported the close relationship between *Daspletis* and *Microstylum*.

The need for the present contribution emanates partly from the collection of a good series of a rather spectacular species from the Northern Cape Province of South Africa (Fig. 1). This species not only displays the most remarkable sexual dimorphism known for any within the genus, but it has the distinction of being by far the largest species in the group; males possessing a wingspan of some 65 mm. In addition, observations made on both the flight and resting habits of this species suggest an interesting reproductive behaviour worthy of further study. Although I initially believed this Northern Cape giant to be new to science, I subsequently discovered that it represented Engel's (1932) variety of *Microstylum hermanni* called *vespertilio*, subsequently catalogued as a full species (Oldroyd 1980). This paper is devoted to a redescription of *vespertilio* and its transfer to *Daspletis* and the reporting of observations made when collecting the new series. I also use this opportunity to report on significant additional material that has accumulated in the Natal Museum over the last twenty-five years of active collecting, and to provide a new key for the identification of the species.

#### MATERIAL AND METHODS

##### *Specimens*

Material listed in this study is housed in the following institutions: BMNH – The Natural History Museum, London, UK; FMNH – Field Museum of Natural History, Chicago, USA; NMSA – Natal Museum, Pietermaritzburg, South Africa; SMNS – Staatliches Museum für Naturkunde Stuttgart, Germany. A few specimens that are to be used for dissection and molecular studies are in the private collection of Dr T. Dikow.

##### *Label data*

In recognition of the value of detailed lists of material examined (Dikow *et al.* 2009), standard formats have been employed when recording label information. Information is usually restricted to locality, date of collection, collector(s) (initials excluded), altitude (when available) and any other potentially useful information available. Should more detail be required, it may be available from the relevant institution. When material is considered to have special interest (e.g., type specimens), all label data are reproduced as appearing on labels, lines of information being separated by a slash (/). Square brackets are used when useful additional information, not found on labels, or comment, is provided. In this regard, coordinates are usually given when these, or a quarter-degree grid reference, do not appear on a label. Coordinates provided are usually for the populated place or geographic feature mentioned immediately before the added note, no attempt being made to estimate coordinates for places recorded as being a certain distance from a populated place. The use of question marks indicates unknown or questionable information. All specimens are arranged in geographical order according to latitude and within alphabetically ordered countries.

## TAXONOMY

Genus *Daspletis* Loew, 1858

*Daspletis*: Loew 1858: 337; Londt 1983: 285. Type species: *D. vulpes* Loew, 1858: 337, by monotypy.

*Neodysmachus* Ricardo, 1925: 263. Type species: *N. setithoracicus* Ricardo, 1925: 264, by original designation.

**Diagnosis:** The following characters were extracted from Londt's (1999) key to Afrotropical stenopogonine genera and serve as a brief generic diagnosis. Anatergites setose (a character effectively dividing the subfamily into two distinct groups); antennal postpedicel lacking a distinct style, and tipped with a small pit enclosing a sensory spine (this feature is shared only by *Microstylum* Macquart, 1838); facial swelling occupying lower three-quarters of face, entirely setose; presutural dorsocentral macrosetae well developed; vein  $M_1$  not strongly arched anteriorly; postmetacoxal membrane long setose (these last few characters are used to separate the genus from *Microstylum*).

*New combination**Daspletis vespertilio* (Engel, 1932) **comb. n.**

Figs 1–12, 14

*Microstylum hermanni* var. *vespertilio* Engel, 1932: 267.

*Microstylum vespertilio*: Oldroyd, 1980: 365.

Engel's (1932) description of *vespertilio*, ascribed to Hermann, which follows his listing of *Microstylum hermanni*, is short and here reproduced for direct comparison with a full redescription:

**Hermann vespertilio** Herm. in litt. var. nov.

In the collection of the late Prof. Hermann is the ♂ of a very dark variety, under the name from Henkries, Bushmanland (Lightfoot).

The wings are very broad and brown, with lighter spots in the cells of posterior margin, and closed cell  $R_5$ . The femora of all legs and all bristles of body are black, also those of mystax. Occiput, pronotum and mesonotum with dirty yellowish hairs. The designs on mesonotum are identical with such in Hermann, and the whitish middle stripe very conspicuous. The pubescence of abdomen black.

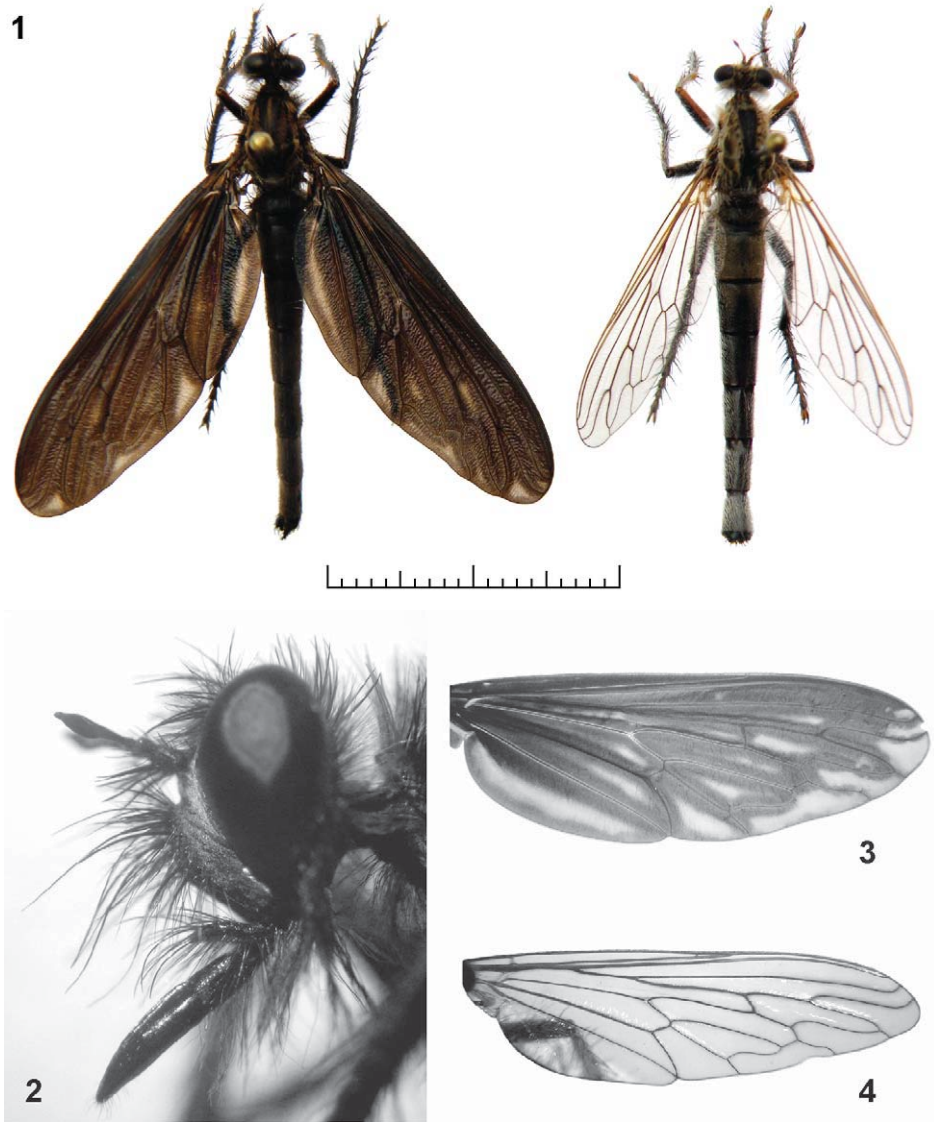
Length of body 30 mm.; length of wing 25 mm.; breadth of wing 8 mm.

**Redescription:** I have not studied Engel's holotype specimen (listed below), apart for seeing a series of digital photographs sent to me for comparison with the recently collected material, upon which this redescription is based. These descriptive passages are based primarily on the male specimens in NMSA, although notes on sexual dimorphism are also provided. Standard abbreviations are used, chiefly in accordance with McAlpine (1981).

**Head** (Fig. 2): Dark red-brown to black, extensively black setose. Face, frons, vertex and occiput grey-red pruinose. Antenna: Scape and pedicel cylindrical, strongly black setose (especially ventral aspect of scape). Postpedicel slightly clavate, asetose except for a few minute dorsal setulae. Style not discernible, postpedicel terminating in obliquely angled pit enclosing a sensory spine-like element. Segmental proportions 1:0.6:3.0. Face with prominent ventral swelling with clearly demarcated dorsal region, occupying three quarters of facial profile. Mystax black, composed of both robust and more slender setae, confined to facial swelling. Frons and vertex black setose; ocellar tubercle with 2 proclinate macrosetae accompanied by some smaller setae. Occipital setae mostly black except for a number of shortish, slightly curved, pale yellow macrosetae dorsocentrally.

Palpi 2-segmented, cylindrical, entirely black setose. Proboscis long, straight, black setose basoventrally, with a group of small pale yellow setulae at tip.

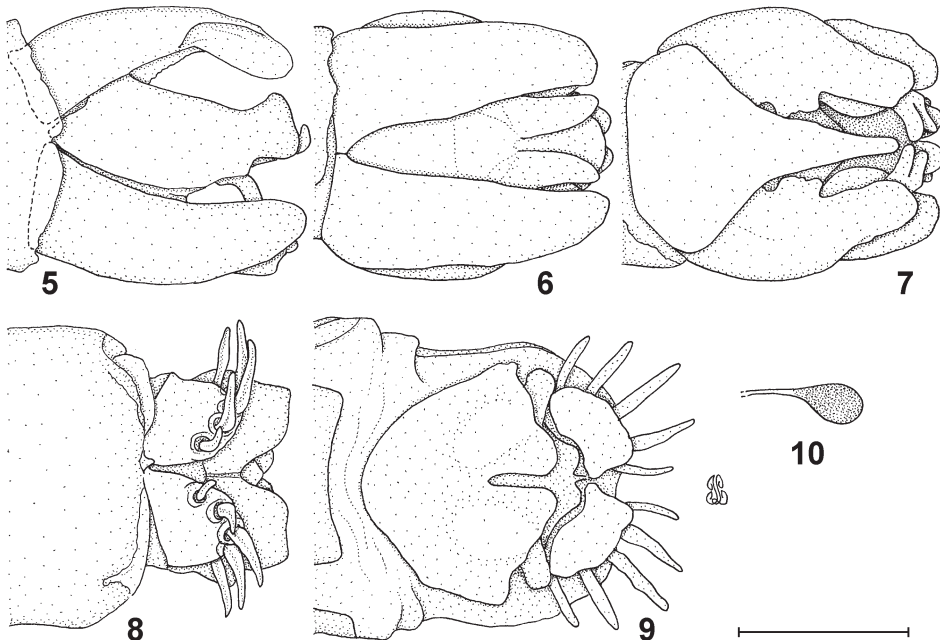
*Thorax*: Dark red-brown to black except for orange-brown postpronotal lobes. Black setose, except for a few pale yellow-white anteprenotal macrosetae and a few small white setae; entirely dull reddish grey pruinose (although parts are only weakly so). Mesonotum with a pair of dorsolongitudinal dark stripes (caused by weak pruinescence).



Figs 1–4. *Daspletis vespertilio* (Engel, 1932): (1) entire male (left) and female (right) showing size and general appearance of the two sexes, scale bar in mm; (2) head; (3) wing of male preserved in ethanol (staining not as extensive as in most other males); (4) female wing. See text for measurements.

Mesonotal setae mostly black (some small, pale yellow and white setae occur posteriorly). Macrosetae: Acrostichals absent. Dorsocentrals well developed black, extending full length of mesonotum. Postpronotals well developed, 2 posthumeral, 4 notopleurals, 4 supra-alars, 4 postalars. Scutellum entirely dull grey-red pruinose, disc weakly setose, 6 black apical scutellars. Pleura uniformly grey-red pruinose, fine black setose except for *ca* 6 black katatergal macrosetae. Anatergites black setose. Halteres dark red-brown with slightly orange base. Legs: Slender, dark red-brown to black (distal parts of prothoracic femora and proximal parts of tibiae may be slightly orange), bases of claws orange-brown, pulvilli brown-orange. All setae dark red-brown to black. Claws about as long as tarsomere 5, empodia as long as claws, pulvilli about three quarters length of claws. Wings: Length (measured from humeral vein to tip) ranges from 25.0–26.6 mm ( $\bar{x}$ =26.1,  $n$ =6), breadth (measured at widest level) ranges from 8.4–9.6 mm ( $\bar{x}$ =8.9 mm,  $n$ =6). Venation (Fig. 3): Cells  $r_5$  and  $m_3$  closed and stalked ( $M_2$  and  $M_3$  may show traces of rudimentary 'crossveins'), *cup* may be narrowly open on wing margin or closed on wing margin (but never stalked). Membrane almost entirely blackish stained, central parts of some cells being only weakly-stained (largest specimen demonstrates the least degree of staining), microtrichia not evident.

**Abdomen:** Dark red-brown to black, hind margins of T2–5 slightly brownish. Segments 1–7 entirely dull reddish pruinose, terminalia apruinose. T1 with some black macrosetae laterally, other terga with tiny black setulae only. Sterna (S) with longish, fine, black setulae. Terminalia (Figs 5–7 – illustrated genitalia are those of a specimen preserved in 96 % ethanol): Rotated clockwise through 180°. S8 well developed, slightly indented



Figs 5–10. *Daspletis vespertilio* (Engel, 1932) terminalia: (5–7) male, preserved in ethanol: (5) lateral, (6) dorsal, (7) ventral; (8–10) female: (8) dorsal, (9) ventral, (10) spermathecal reservoir. Scale = 1 mm.



posteromedially and with somewhat undulating hind margin. Epandrial lobes simple, in 'dorsal' view (Fig. 6) deeply incised medially resulting in two lobes, weakly attached basally, in lateral view lobes project distally slightly beyond levels attained by other genital components. Proctiger simple, cerci deeply incised medially with weakly sclerotized basal parts. Gonocoxite well developed, distal end somewhat truncate (lateral view) and broadly bifurcate (ventral view); gonostyle well developed, curved toward epandrium (lateral view). Hypandrium well developed, in ventral view (Fig. 7) broad proximally, tapering fairly rapidly to narrowly-rounded distal lobe; laterally, hypandrial lobe almost parallel sided (although somewhat laterally compressed and consequently appearing paler in colour than surrounding structures), with smoothly rounded distal end. (Note: Londt (1983) incorrectly referred to the hypandrium as 'fused gonocoxites'.)

Description of female: While females (Fig. 1) share many features with males, there is significant sexual dimorphism, especially with respect to the coloration, size and shape of wings. For this reason the following notes relating to females are provided.

*Head:* Orange-brown to dark red-brown, macrosetae predominantly yellowish, smaller setae white (a few black setae may occur on scape, vertex, ocellar tubercle and palpal tip). Antenna: Red-brown, white setose (some macrosetae situated ventrally on scape may be yellowish or dark brown). Mystax and occiput with yellowish macrosetae accompanied by smaller white setae.

*Thorax:* Less extensively dark red-brown when compared to males, posterior parts of mesonotum somewhat orange. Some pleura (e.g. katepisternum) somewhat orange. Setae mostly fine white, macrosetae yellowish except for dorsocentrals and some laterally situated macrosetae that may be black (there is great variation and no pattern can be established). Scutellar macrosetae also variable in colour, being either yellow or black. Haltere yellow with darker stalk. Legs: Mostly dark red-brown (prothoracic femora and tibiae may be somewhat orange). Almost all minor setae white, macrosetae variable white or dark red-brown. Wings: Mean length (L) and breadth (B) 17.6×5.7 mm (n=6). Female wings shorter and narrower (L/B=3.1) than in males (L/B=2.7). Venation (Fig. 4) similar to males, but little or no remnants of 'crossveins' on veins  $M_2$  and  $M_3$ . Membrane transparent, almost entirely lacking staining except narrowly along interior cell margins (this slight staining gives veins a characteristic 'shaded' appearance).

*Abdomen:* Dark red-brown, but posterior margins of terga (T) somewhat orange. Apart from yellow macrosetae laterally on T1 all terga minutely white setose. Except for setae of T1 and anterolateral parts of T2 all abdominal setae directed anteriorly. Terminalia (Figs 8–10): T8 (epigynium) well developed, T9 not evident (reduced and membranous or fused with T10), T10 (acanthophorites) well developed, divided into two halves medially, each half bearing 5 well developed, dorsoventrally compressed macrosetae; cerci broad, well developed, fairly broadly fused basally. S8 (hypogynium) broadly rounded posteriorly, distally broad with medially incised anterior region. Three swollen, bladder-like spermathecal reservoirs visible on dissection, each with a long, narrow, weakly sclerotized duct (Fig. 10) (details of all internal structures could not be clearly seen).

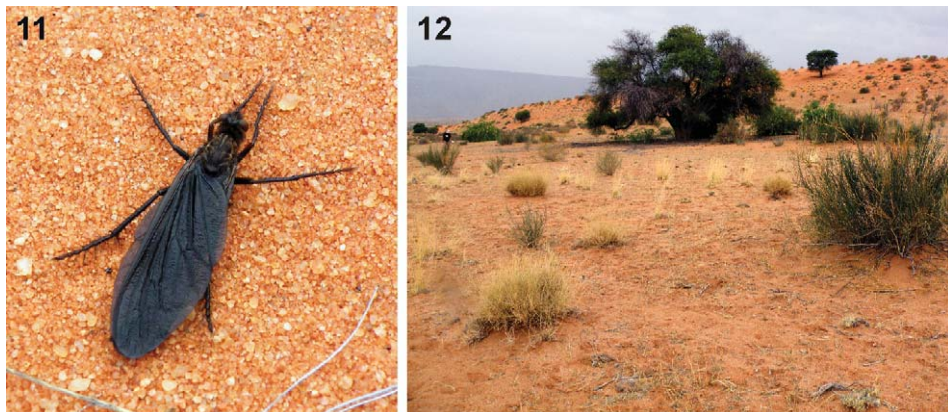
Holotype: SOUTH AFRICA: ♂ 'Bushmanld. [Bushmanland] / Henkries [28°58'S:18°09'E]. / Lightfoot' [White], 'Sammlung / F. Hermann', [Red label without writing], 'Capland / *Microstylum / vespertilio* / Type Hrm [Hermann]' [Pink with black frame], '*Microstylum / vespertilio* ♂ / Hrm. [Hermann] / det. E.O. Engel'

[White with black frame] [SMNS]. *Note:* Digital photographs show that the unique holotype is in excellent condition and that new material is conspecific.

New material: SOUTH AFRICA: 6♂ 4♀ 'South Africa: N Cape / 11km SW Aggeneys 785m / 29°18.26'S: 18°47.85'E / J.G.H. Londt & T. Dikow / 3.x.2009 Red dune. Grass / & woody vegetation' (NMSA); 7♂ 4♀ 'South Africa, Northern Cape, / 11 km SW Aggeneys N14, 785 / m, 29°18'04"S 018°47'27"E, / 3.x.2009, T. Dikow & J. Londt, / red vegetated sand dune (at / powerline crossing)' (FMNH); 2♀ 'South Africa: N Cape / ca 5 km S of Pella 570 m / 29°04.38'S:19°08.19'E / J.G.H. Londt & T. Dikow / 3.x.2009 Red sand dune / Dry grass & bushes' (NMSA). *Note:* Although all the Aggeneys material was collected on the same occasion, the FMNH specimens, which are slightly differently labelled, were not available to me when the redescription was drafted. There is, however, no doubt that these are correctly assigned to this taxon. In addition, the following specimens were also obtained and are available for DNA sequencing and dissection: 1♂ 1♀ in 95 % ethanol (Dikow coll.), 1♂ 2♀ Kahle's solution (Dikow coll.), 1♂ in 95 % ethanol (NMSA).

**Comparison:** Species of *Daspletis* can be segregated into two species groups (see key – couplet 2). *D. vespertilio* clearly belongs to the *hermanni* group by virtue of its short dorsal occipital macrosetae, lack of macrosetae on abdominal terga (other than T1), and generally slender abdomen. In these respects *vespertilio* differs from species in the *vulpes* group (*hirtus*, *placades*, *stenoura* and *vulpes*). Although the males of *vespertilio* share the feature of darkly stained wings possessed by both *hermanni* and *lykos* their wings are much blacker and larger than in these species. Species in the *hermanni* group also share similar male genital characteristics (as do those in the *vulpes* group). The similarities are best appreciated through a comparison of published illustrations. The illustrations of the terminalia of *vespertilio* provided in this paper (Figs 5–7) should be compared with those of *hermanni* (figs 8–10 in Londt (1983)), *setithoracicus* (figs 19–21 in Londt (1983)) and *lykos* (figs 1–3 in Londt (1985)). Perhaps the most obvious differences displayed by *vespertilio* males are to be found in the somewhat reduced hypandrium which lacks the broad appearance of the laterally compressed distal lobe seen in the other species.

**Distribution** (Fig. 14), **phenology** (Table 1) and **biology:** *D. vespertilio* has only been collected at three localities. The date of collection has not been recorded for the holotype, while all the other specimens were collected early in October. Both newly recorded sites were similar in that they feature poorly vegetated and fairly extensive red sand dune systems (Fig. 12). Although little biological information is available, some insights



Figs 11, 12. *Daspletis vespertilio* (Engel, 1932): (11) male resting on red sand, (12) general view of habitat type, 5 km S Pella.



may be inferred from field observations made by both Dr Dikow and me, as well as from their general morphology. Male individuals were first encountered after they had been disturbed and had taken to flight. Their highly characteristic, fairly slow, flapping flight was intriguing and reminiscent of some large antlions (e.g., species of *Palpares*). When pursued, often over considerable distances, they appeared to take evasive action by flying in an erratic manner. The fact that *vespertilio* males have large, broad, black, and therefore highly visible wings (as well as a long, slender, stabilizing abdomen), when compared with many other asilids, and that their flight is slow but sustained, strongly suggests that they probably perform an aerial display, presumably designed to attract the attention of females. Aerial displays are fairly well documented for Asilidae and include a number of species within the Stenopogoninae (Lavigne 2003). Females, with their smaller, narrower, and almost transparent wings, flew more rapidly, and in a relatively unsustained manner when compared with their male counterparts. Both sexes rested on the ground, wings folded one upon the other over their abdomens, and with their legs outstretched (Fig. 11).

Meteorological data indicate that much of the Northern Cape, including the localities recorded for *vespertilio*, receives most of its rain between February and April, and virtually no rain falls between July and October. *D. vespertilio*, therefore, flies at a time when the vegetation is parched and relatively little invertebrate life is evident. This probably accounts, in part, for the fact that this large species has been overlooked until now. Temperatures during October may be cool at night and relatively mild during the day. The dark coloration of males is almost certainly an adaptation to generally cool weather conditions and is reminiscent of insects associated with the winter rainfall areas of the Western Cape. This is in stark contrast with species in the *vulpes* species group (*hirtus*, *placodes*, *stenoura* and *vulpes*) that are mostly late summer active, and pale yellowish in colour.

#### *Annotated checklist of other Daspletis species*

Londt's (1983) revision of *Daspletis* was based on 139 listed specimens, a further three being added with the description of *lykos* (Londt 1985). In order to more adequately define the distributions of the species, I list below all the material known to me, previously recorded and new (amounting to 317 specimens), and provide comments concerning distribution, phenology and biology of each species.

#### *Daspletis hermanni* (Ricardo, 1925)

Fig. 13

*Microstylum hermanni*: Ricardo 1925: 249.

*Daspletis salicior* Oldroyd, 1974: 37.

*Daspletis hermanni*: Londt 1983: 288, figs 6–10.

Londt (1983) recorded material: SOUTH AFRICA: 1♂ Nelspoort, Hopetown [29°37'S:24°05'E], 19.ix.1940, Van Son (NMSA); 1♂ 1♀ (lectotype & paralectotype), Willowmore [33°17'S:23°29'E], 25.x.1916, Brauns (BMNH); 3♂ 5♀ [not 2♂ 6♀ as recorded in 1983] Willowmore, 20.x.1921, Brauns [includes ♂ holotype and 2♀ paratypes of *salicior*] (NMSA).

New material (all NMSA): SOUTH AFRICA: 1♂ N Cape Spitskop Nat. Res., 28°22'10"S:21°10'01"E, 30.viii.2002, Londt, 870 m, sandy area; 1♂ 30 km S Kimberley, 2924DC, 18.ix.1982, Schoeman; 1♀ 18 km E Sutherland (Observatory), 3020BD, 1700 m, rocky hillside bush, 18.xi.1986, Quickelberge & Londt; 1♂ Britstown, 3023DA, 30.x.1981, Schoeman; 2♀ 40 km SE Calvinia, Middelpoos Rd, 3120CA, 1240 m, dry woody scrubland, 17.xi.1986, Londt & Quickelberge; 2♂ 3♀ 31 km S Loxton, 3122CB, 1540 m, flat sandy

scrubland, 13.xi.1986, Londt & Quickelberge; 4♂ 5♀ Molteno Pass, 35 km NW Beaufort West, 3222AB, 1500 m, low hilltop macchia, 11.xi.1986, Londt & Quickelberge; 2♂ 2♀ 3 km W Cradock, 32°10'02"S: 25°40'09"E, 956 m, *Acacia* scrubland with many wild flowers, 29.x.2004, Londt; 17♂ 23♀ Willowmore [33°17'S:23°29'E], various dates as follows: x.1916 (4♂ 1♀), 10.x.1916 (2♂ 1♀), 1.xi.1916 (2♂ 1♀), xi.1916 (3♀), 25.x.1916 (1♂ same data as types), 10.xi.1916 (1♂ 2♀), 1.xi.1917 (1♂ 3♀), 12.x.1920 (3♂), 18.x.1920 (1♂), 20.x.1920 (1♀), 25.x.1920 (1♂ 5♀), 27.x.1920 (1♀), 1.xi.1920 (1♀), 25.x.1921 (3♀), [no date] (1♂ 1♀), Brauns.

Other records: Ricardo (1925), when listing her material, mentions a female from Kimberley [28°45'S: 24°46'E]. I have not seen this specimen, which Ricardo suggests is in the South African Museum, Cape Town, but accept the record for distributional purposes.

Remarks: On rechecking the Natal Museum's holdings of *Microstylum* I found, under the name *M. floccosum* Hermann, a long series (17♂ 23♀) of *hermanni* from Willowmore, all collected by Dr Brauns. These are listed above and it will be noted that 1♂ carries the same label data as the lectotype and paralectotype, housed in the BMNH. There is also 1♀ with the same label data as the 3♂ and 5♀ previously listed by Londt (1983). Hermann did not describe a *Microstylum* with the name *floccosum* and so this is at best a manuscript name without standing. Of further interest is the fact that, together with these newly discovered *hermanni* specimens, were 5♂ and 5♀ specimens that do not represent *hermanni*, but appear to truly represent a species of *Microstylum* that is very similar in general appearance to *hermanni*. The identity of these specimens will only become known after the publication of a much needed modern revision of *Microstylum*.

Distribution, phenology and biology: *D. hermanni* is fairly widely distributed within the central region of South Africa (Fig. 13), occurring in both the Northern Cape, and Eastern Cape provinces. The species is active in the adult phase from August through to November (Table 1). NMSA prey records include (sex of predator in brackets): Hymenoptera (2): Sphecidae, *Ammophila* sp. (♂); Apidae, *Apis mellifera* (♀). Araneae (1): Salticidae (♀).

### *Daspletis hirtus* Ricardo, 1925

#### Fig. 14

*Daspletis hirtus*: Ricardo 1925: 263; Londt 1983: 289, figs 11–15.

Londt (1983) recorded material: SOUTH AFRICA: 3♂ 7♀ Kalahari Gemsbok Park, Nossob R., 35 km N camp, 2620BD, dry river bed veget., 21.iii.1982, Londt & Schoeman (NMSA); 4♂ 1♀ 15 km S Twee Rivieren, 2620DA, 21.iii.1982, dry roadside veget., Londt & Schoeman (NMSA); 1♀ [*salicior* paratype] Twee Rivieren [26°27'S:20°34'E], 11–20.ii.1958, Kalahari Gemsbok Park Expedition (NMSA); 1♀ 20 km N Noenieput, 2720AC, roadside vegetation, 20.iii.1982, Londt & Schoeman (NMSA); 1♀ 25 km N Noenieput on road to Koopan-Suid, 2720AC, thick veget./trees, 20.iii.1982, Londt & Schoeman (NMSA); 1♂ ca 65 km SE Noenieput, 2720DC, kloof/green shrubs, 20.iii.1982, Londt & Schoeman (NMSA); 2♂ 4♀ 85 km W Van Zylsrus, 2721AB, dry area scrub/sand, 22.iii.1982, Londt & Schoeman (NMSA). ZIMBABWE: ♂ [defective] holotype, 1♀ paratype, Sawmills [19°35'S:28°01'E], 12.ii [or xi].1920, Rhodesian Museum (BMNH); 1♂ Sawmills, 23.ii.1922, Rhodesia Museum (NMSA); 1♂ 1♀ Sawmills, 14.xi.1924, Stevenson (NMSA).

New material (all NMSA): SOUTH AFRICA: 8♂ 7♀ 10 km W Bloubos farm, 28°07'S:20°45'E, 900 m, 17.iii.1991, Londt & Whittington, red dunes; 3♀ 15 km S Swaarmodder, 28°10'S:20°37'E, 850 m, 17.iii.1991, Whittington & Londt, red dunes.

Distribution, phenology and biology: *D. hirtus* has been collected in the northern parts of the Northern Cape province of South Africa and at Sawmills in Zimbabwe. It must be assumed that the species also occurs in the intervening area of Botswana where the species has not yet been recorded (Fig. 14). Adults have been collected in November, February and March (Table 1), the November records need confirmation as labels carry '11' which may need to be read as 'II' (i.e. February). NMSA prey records include (sex

of predator in brackets): Diptera (1): Asilidae, *Neolophonotus* sp. (♀). Hemiptera (1): Pentatomidae (♂). Hymenoptera (1): Formicidae (♀), Halticidae (♂). Lepidoptera (4): Pieridae, *Colotis agoye* (♀), unidentified moths (1♂ 2♀).

*Daspletis lykos* Londt, 1985

Fig. 13

*Daspletis lykos*: Londt 1985: 68, figs 1–3.

Londt (1985) recorded material (all NMSA): NAMIBIA: ♂ holotype, 50 km NW Karasburg, 2718DA, in Karasberg Mts, 28.viii.1983, Londt & Stuckenberg; 1 ♀ 15 km E Karasburg, 2818BB, arid roadside vegetation, 27.viii.1983, Londt & Stuckenberg. SOUTH AFRICA: 1 ♀ 60 km WNW Upington, 2820BA, broken veld/very dry, 27.viii.1983, Londt & Stuckenberg. *Note*: Although Londt (1985) did not give type status to the two female specimens as he was uncertain that they truly represented the species, there is little doubt that they should now be considered conspecific as the sexual dimorphism displayed by the closely related *vespertilio* is similar to that present in *lykos*.

Distribution, phenology and biology: Knowledge of the distribution of *D. lykos* is based only on three specimens from three localities, two in the Karasberg region of Namibia and one in the Northern Cape Province of South Africa (Fig. 13). All three specimens were taken on two successive days in August. The holotype was collected with prey: Hymenoptera: Anthophoridae.

*Daspletis placodes* Londt, 1983

Fig. 13

*Daspletis placodes*: Londt 1983: 293, figs 16–18.

Londt (1983) recorded material (all NMSA): SOUTH AFRICA: 1♂ 1♀ paratypes, 6 km N Vivo, 2229CC, bushveld veget. & old lands, 23–24.ii.1980, Londt & Schoeman; ♂ holotype, 5♂ 6♀ paratypes, Soutpansberge,

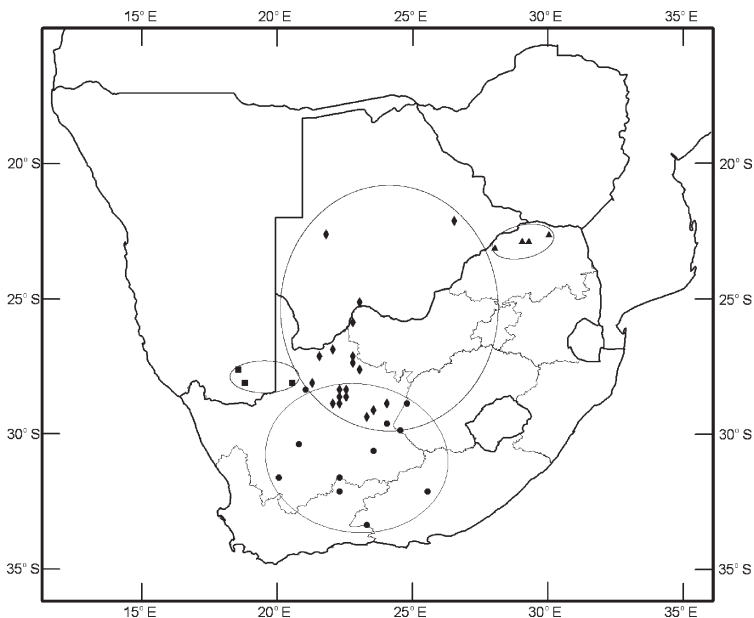


Fig. 13. The distribution of *Daspletis* Loew, 1858 species in southern Africa: *hermanni* (circles), *lykos* (squares), *placodes* (triangles), *stenoura* (diamonds).

Soutpan, 2229CD, bushveld vegetation, 23–24.ii.1980, Londt & Schoeman; 1♂ paratype, Soutpansberg, Saltpan, 10.iv.1979, Schoeman; 1♀ ‘SE2328Aa’, 21.xii.1981, v. d. Berg, Dept. of Entomology, University of Pretoria.

New material (all NMSA): SOUTH AFRICA: 1♀ Tshipise [22°36'S:30°10'E], 22.i.1998, Griffiths; 1♀ Langjan, 22°59'S:29°15'E, 26.ii.1988, Language, Department of Entomology, University of Pretoria; 1♀ Vivo, 22°59'S:29°15'E, 27.ii.1988, v. Niekerk, Department of Entomology, University of Pretoria.

Distribution, phenology and biology: *D. placodes* appears to have a distribution restricted to the north-western parts of the Limpopo Province of South Africa (Fig. 13). The species is active in the adult phase from December through to April (no records for March) (Table 1). A single NMSA prey record is (sex of predator in brackets): Diptera (1): Mydidae (♀).

### *Daspletis setithoracicus* (Ricardo, 1925)

Fig. 14

*Neodysmachus setithoracicus*: Ricardo 1925: 264.

*Daspletis setithoracicus*: Londt 1983: 294, figs 19–21.

Londt (1983) recorded material: SOUTH AFRICA: 1♀ Bloemfontein [29°10'S:26°00'E], 31.x.1920, Irving (NMSA); 2♂ 2♀ Meiringspoort, 3322BC, rocky hillside & stream edge, 11–12.xii.1979, Londt & Stuckenberg (NMSA); 1♂ Diepkloof, ca 20 km E De Rust, 3322BD, dry rocky hillside & stream, 12.xii.1979, Londt & Stuckenberg (NMSA); ♂ lectotype 1♂ 3♀ paralectotypes, Willowmore [33°17'S:23°29'E], 25.xii.1922 (2♂) xi.1922 (3♀), Brauns (BMNH); 15♂ 7♀ Willowmore, various dates: 1.xii.1907, xii.1909, 20.xii.1909, 15.xii.1912, i.1914, xi.1916, 25.xii.1917, i.1918, xi.1918, 20.xii.1919, 25.xii.1919, 1.i.1920, 20.xi.1920, 18.i.1922, 18.v.1922, 3.i.1926, xi.1926, Brauns (NMSA).

New material (all NMSA): SOUTH AFRICA: 2♂ 1♀ 56 km N Beaufort West (Loxton Rd), 3122CD, 1520 m, flat Karoo scrubland, 13.xi.1986, Londt & Quickelberge; 1♂ 10 km S Sutherland, Swaarweeberg, 3220BC, 1600 m, rocks woody macchia, Londt & Quickelberge, 19.xi.1986; 1♀ 10 km SW Sutherland, 32°27'S: 20°36'E, 1650 m, S slope Swaarweeberg, 28.xi.1990, Whittington & Londt.

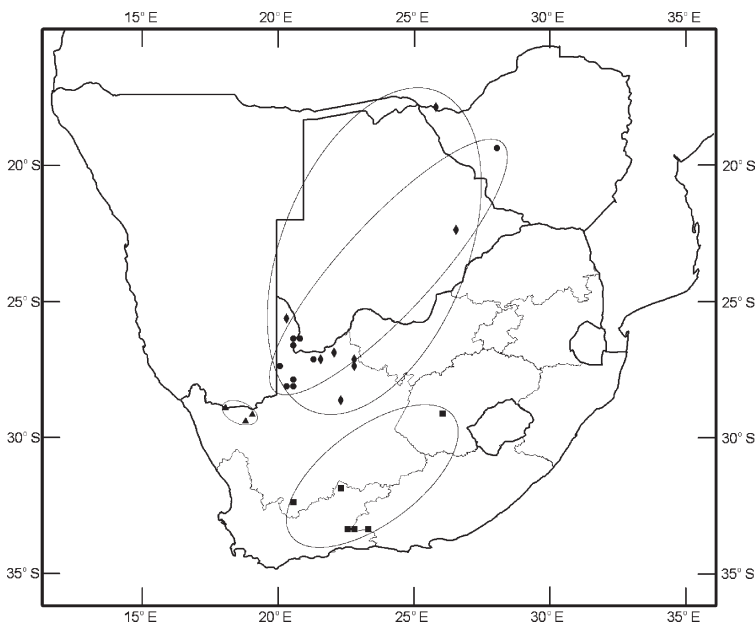


Fig. 14. The distribution of *Daspletis* Loew, 1858 species in southern Africa: *hirtus* (circles), *setithoracicus* (squares), *vespertilio* (triangles), *vulpes* (diamonds).

Other records: Ricardo (1925), when listing her material mentions a female from Sawmills. Although I have not seen the specimen, I can not accept the record as truly representative of the species as Sawmills is so far removed from valid records.

Distribution, phenology and biology: *D. setithoracicus* is fairly widely distributed in the southern parts of South Africa (Fig. 14), occurring in the Northern Cape, Eastern Cape and Free State provinces. The species is active in the adult phase from October through to January, and there is a single record for May (which seems doubtful) (Table 1). There is a single NMSA prey record (sex of predator in brackets): Hymenoptera (1): Apidae, *Apis mellifera* (♀).

### *Daspletis stenoura* Londt, 1983

Fig. 13

*Daspletis stenoura*: Londt 1983: 295, figs 22–24.

Londt (1983) recorded material (all NMSA): SOUTH AFRICA: 4♀ paratypes, 15 km SE Van Zylsrus, 2622CC, Acacias/grass/shrubs, 22.iii.1982, Londt & Schoeman; 2♂ paratypes, 55 km W Van Zylsrus, 2721BA, Acacias/dry grass, 22.iii.1982, Londt & Schoeman; 1♀ paratype, 50 km SW Kuruman, 2723CA, *Acacia* woodland area, 24.iii.1982, Londt & Schoeman; ♂ holotype, 9♂ 2♀ paratypes [not 3 – 1♀ differently labelled – see section below], 30 km E Groblershoop, 2822CD, roadside vegetation, 19.iii.1982, Londt & Schoeman; 3♂ 4♀ paratypes, Padkloof Pass ca 20 km S Witsand, 2822DA, dry river course grass/Acacias, 17.iii.1982, Londt & Schoeman.

New material (all NMSA): BOTSWANA: 1♀ Takatswane Pan [22°33'30"S:21°52'00"E], 14.xii.1984, Johnson; 2♀ 50 km NNW Serowe, 2226BA, 19.xi.1984, Forchhammer, Bush day; 1♀ 50 km NNW Serowe, 2226BA, 21.xi.1984, Malaise trap, Forchhammer. SOUTH AFRICA: 2♀ Bray, Graupner farm guest camp, 25.35545°S:23.35738°E, 1050 m, Kalahari sandveld, 15.i.2001, Slotow & Hamer; 1♀ Bray, Graupner farm guest camp, 25.35545°S:23.35738°E, 1058 m, Kalahari sandveld, 17.i.2001, Slotow & Hamer; 1♂ 4♀ Molopo Game Reserve, Phiri Camp area, 25°46'43"S:22°55'53"E, 990 m, *Acacia-Eragrostis* savannah, 14.iii.2003, Londt; 2♂ 1♀ Molopo Game Reserve, Phephane R. area, 25°47'26"S:22°51'08"E, 990 m, *Acacia-Grewia* savannah, 15.iii.2003, Londt; 1♂ 1♀ Molopo Game Reserve, 25°52'36"S:22°53'58"E, 990 m, *Acacia-Ziziphus* savannah, 13.iii.2003, Londt; 2♂ 4♀ 20 km N Hotazel, 27°07'S:22°59'E, 1050 m, Kuruman R. banks, 14.iii.1991, Whittington & Londt; 1♂ 14 km S Hotazel, 27°19'S:22°54'E, 1050 m, Ga-Mogara R. bed, 14.iii.1991, Londt & Whittington; 1♀ paratype [wrongly allocated – see section above], 'Sth Africa Cape Prov / 12km E. Groblershoop / 2822CC 19.iii.1982 / J. Londt & L. Schoeman / Banks of Orange Riv.'; 2♀ 26 km E Upington, 28°23'S:21°29'E, 950 m, permanent dunes, 16.iii.1991, Whittington & Londt; 3♂ 4♀ Witsand Nat. Res., ca 28°32'15"S:22°30'30"E, 1200 m, red sand *AcaciaGrewia* grassland, 6.iii.2001, Londt; 2♀ Witsand Nat. Res., 28°33'29"S:22°29'36"E, 1230 m, red sand rocky *Acacia* scrubland, 8.iii.2001, Londt; 2♂ Witsand Nat. Res., ca 28°33'45"S:22°28'40"E, 1200 m, red sand *Acacia* grassland area, 5.iii.2001, Londt; 4♂ 6♀ Witsand Nat. Res., 28°33'54"S:22°29'39"E, 1200 m, red sand *AcaciaRhigosum* scrub, 5–8.iii.2001, Londt; 1♂ 5♀ Witsand Nat. Res., 28°33'57"S:22°29'19"E, 1200 m, red sand *AcaciaBoscia* grassland, 6.iii.2001, Londt; 2♂ 3♀ Witsand Nat. Res., 28°34'49"S:22°28'43"E, 1200 m, red sand *AcaciaZiziphus* grassland, 6.iii.2001, Londt; 1♀ 45 km NE Douglas, 28°56'S:24°13'E, 1150 m, mixed *Acacia* woodland, 19.iii.1991, Whittington & Londt; 4♂ 6♀ 4 km SE Groblershoop, 28°57'S:22°01'E, 900 m, red dune grassland, 18.iii.1991, Londt & Whittington; 2♀ 7 km SW Douglas, 29°07'S:23°44'E, 1100 m, open *Acacia* woodland, 19.iii.1991, Londt & Whittington; 2♂ 4♀ 64 km SW Douglas, 29°23'S:23°20'E, 1070 m, open grassland, 19.iii.1991, Whittington & Londt.

Note: Female specimens not associated with males are difficult to identify and so a few erroneous identifications may have been made.

Distribution, phenology and biology: *D. stenoura* is fairly widely distributed in the central region of South Africa (Fig. 13), occurring at many places in the northern parts of the Northern Cape Province. Three ♀ specimens are recorded for Botswana, two from Serowe and one from Takatswane. This species flies at the same time as *vulpes* and can be found sympatrically. The species is active in the adult phase from November through to March (no records for February) (Table 1). NMSA prey records include (sex of predator in brackets): Diptera (3): Asilidae, *Laphystotes ariel* (♂), *Laxenecera* sp. (♀), Sarcophagidae (♀). Hemiptera (2): Cicadellidae (♀), Lygaeidae (♀).



*Daspletis vulpes* Loew, 1858

## Fig. 14

*Daspletis vulpes*: Loew 1858: 337; Londt 1983: 296, figs 25–27.

Londt (1983) recorded material (all NMSA): BOTSWANA: 2♂ 3 miles [ca 5 km] W Ramboekas Pan [?], part of K.G.N.P. [Kalahari Gemsbok National Park, 25°41'S:20°20'E], i.v.1970, Lamoral. SOUTH AFRICA: 2♀ 15 km SE Van Zylsrus, 2622CC, Acacias/grass/shrubs, 22.iii.1982, Londt & Schoeman; 1♀ 55 km W Van Zylsrus, 2721BA, Acacias/dry grass, 22.iii.1982, Londt & Schoeman; 6♂ 8♀ ca 5 km W Hotazel, 2722BB, Acacias/grass/shrubs, 23.iii.1982, Londt & Schoeman; 1♀ Roaring Sands Resort nr Witsand, 2822CB, *Acacia* woodland/sandy area, 17–18.iii.1982, Londt & Schoeman.

New material (all NMSA): BOTSWANA: 1♂ Serowe [22°25'S:26°44'E], v.1988, [Forshhammer], Bush Day. SOUTH AFRICA: 2♂ 1♀ 20 km N Hotazel, 27°07'S:22°59'E, 1050 m, Kuruman R. banks, 14.iii.1991, Whittington & Londt; 1♂ 14 km S Hotazel, 27°19'S:22°54'E, 1050 m, Ga-Mogara R. bed, 14.iii.1991, Londt & Whittington; 3♂ 2♀ Witsand Nat. Res., 28°32'09"S:22°30'18"E, 1200 m, white sand *Stipagrostis amabilis* dune, 6.iii.2001, Londt; 1♂ Witsand Nat. Res., 28°33'29"S:22°29'36"E, 1230 m, red sand rocky *Acacia* scrubland, 8.iii.2001, Londt; 1♀ Witsand Nat. Res., 28°33'37"S:22°29'05"E, 1200 m, white sand low vegetation, few trees, 5–8.iii.2001, Londt.

Other records: Loew's (1858) holotype was collected by Wahlberg from 'N'Gami'. Although it is not known exactly where the specimen was collected it was probably in the Ngamiland District of present day Botswana that incorporates the Okavango Delta (ca 20°S:23°E) and so, to further add to the known distributional information this point is plotted in Fig. 14. Ricardo (1925) records 'A male from Livingstone [17°45'S:25°59'E], N.W. Rhodesia [Zambia] (Dr A. Douglas), in poor preservation, and a female from the same locality in Brit. Mus. Coll. [BMNH]'. This record is repeated by Oldroyd (1974). Although I have not studied these specimens, I accept the identifications as correct.

Distribution, phenology and biology: *D. vulpes* appears to be fairly widely distributed in the central region of Southern Africa (Fig. 14), records occurring mainly from the northern parts of the Northern Cape Province of South Africa. One male is known from Botswana (Serowe) and a male was recorded by Ricardo (1925) from Livingstone (Zambia), that I have not studied. This species flies at the same time as *D. stenoura* and can be found sympatrically. It is active in the adult phase from November through to March (no records for February) (Table 1). Natal Museum prey records include (sex of predator in brackets): Orthoptera (2): Acrididae (♀), ? Lentulidae (♂); Hymenoptera (1): Sphecidae (♀).

## DISCUSSION

*Taxonomy*

*Microstylum* and *Daspletis* form a distinctive pair within the Stenopogoninae and are not easily confused with other Afrotropical genera in the subfamily (see key in Londt 1999). Dikow (2009a) established the sister-group relationship between these two genera within the Enigmomorphini based on a world-wide sample of Asilidae species and seven morphological characters (maxillary palpus one-segmented; sensory pit in distal palpomere absent; prementum laterally compressed proximally; labella reduced, fused entirely to prementum; lacinia same height throughout; anatergal setae composed of regular setae only; and superoposterior anepimeron with regular setae only). Unfortunately Dikow's (2009b) 'total evidence' study excluded the *Daspletis* species as no ethanol preserved specimens were available, so we do not know exactly where it would have been placed in that particular analysis.

Unfortunately *Microstylum*, with about 80 catalogued Afrotropical species (Oldroyd 1980) has not been adequately revised and so the validity of the characters used to differentiate these genera from one another have not been fully tested (see key in Londt 1999). The four main features used to separate *Daspletis* from *Microstylum* were as

follows. All *Daspletis* species possess (1) a facial swelling (gibbosity) that occupies about three-quarters of the face and is entirely setose (i.e. occupied by the mystax); (2) well developed presutural dorsocentral macrosetae; (3) a vein  $M_1$  that is not strongly arched anteriorly; and (4) a postmetacoxal membrane that is covered with long setae. While I have looked at many *Microstylum* specimens and can testify that most have less developed facial swellings, poorly developed presutural dorsocentral macrosetae, strongly arched  $M_1$  veins, and largely asetose postmetacoxal membranes, I have to report having seen specimens that do not fully conform with all these characters.

As already mentioned above, when comparing *vespertilio* with other *Daspletis* species, there are two species groups within *Daspletis*, each with four species, and these are separated in the key to species that follows. The *vulpes* species group appears to be quite distinctive while the *hermanni* species group appears to represent a cluster of species that has more in common with species of *Microstylum*. What is needed is a detailed cladistic analysis that incorporates a much wider range of species from both genera and other Enigmomorphini in order to better establish the relationships that exist between these taxa.

#### Key to *Daspletis* species

While this key allows for the identification of both males and females it must be noted that identification of males may require detailed examination of terminalia. Females that are not directly associated with males are sometimes difficult to identify with any certainty.

- 1 Male ..... 2
- Female ..... 9
- 2 Dorsal occipital macrosetae short, slightly curved and proclinate; abdominal T3 lacking macrosetae along posterior margins (with small setae only); abdominal segments slender (T3 longer than broad in dorsal view) (*hermanni* species group) ..... 3
- Dorsal occipital macrosetae long, wavy and not obviously proclinate; abdominal T3 with macrosetae along posterior margins; abdominal segments not particularly slender (T3 shorter than broad in dorsal view) (*vulpes* species group) ..... 6
- 3 Mystax yellow; cell  $r_5$  open, closed on wing margin or closed with short stalk; laterally situated mesonotal macrosetae predominantly yellowish ..... 4
- Mystax dark red-brown to black; cell  $r_5$  closed and stalked; laterally situated mesonotal macrosetae predominantly dark red-brown to black ..... 5
- 4 Dorsocentral macrosetae predominantly yellow;  $r_5$  widely open, wing membrane transparent, unstained; pulvilli reduced (approx. half the length of claws); genitalia as in figs 19–21 (Londt 1983) ..... **setithoracicus** (Ricardo, 1925)
- Dorsocentral macrosetae predominantly dark red-brown to black;  $r_5$  narrowly open, closed on wing margin or closed with short stalk, wing membrane brown stained; pulvilli not reduced (approx. three-quarters the length of claws); genitalia as in figs 8–10 (Londt 1983) ..... **hermanni** (Ricardo, 1925)
- 5 Antennal postpedicel yellowish; metathoracic femur bicoloured (brown-orange dorsally and dark red-brown to black ventrally); anteprenotal macrosetae entirely black; genitalia as in figs 1–3 (Londt 1985) ..... **lykos** Londt, 1985

- Antennal postpedicel dark red-brown to black; metathoracic femur uniformly dark red-brown to black; anteprenotal macrosetae predominantly pale yellowish, but some black; genitalia as in Figs 5–7 ..... **vespertilio** (Engel, 1932)
- 6 Metathoracic femora fairly uniformly dark red-brown to black (proximal and distal tips may be slightly orange-brown) ..... 7
- Metathoracic femora bicoloured orange-brown ventrally and dark red-brown to black dorsally ..... 8
- 7 Antennae uniformly yellow-orange; genitalia as in figs 22–24 (Londt 1983) ..... **stenoura** Londt, 1983
- Antennal scape and pedicel dark red-brown postpedicel yellow-orange; genitalia as in figs 16–18 (Londt 1983) ..... **placodes** Londt, 1983
- 8 Antennae uniformly yellow-orange; general setation usually pale yellowish; genitalia as in figs 13–15 (Londt 1983) ..... **hirtus** Ricardo, 1925
- Antennal scape and pedicel dark red-brown postpedicel yellow-orange; general setation commonly bright orange; genitalia as in figs 25–27 (Londt 1983) ..... **vulpes** Loew, 1858
- 9 Dorsal occipital macrosetae short, slightly curved and proclinate; abdominal tergum 3 lacking macrosetae along posterior margins (equipped with small setae only) (*hermanni* species group) ..... 10
- Dorsal occipital macrosetae long, wavy and not obviously proclinate; abdominal T3 with macrosetae along posterior margins (*vulpes* species group) ..... 12
- 10 Cell  $r_5$  widely open; pulvilli reduced (approx. half the length of claws) ..... **setithoracicus** (Ricardo, 1925)
- Cell  $r_5$  narrowly open, closed on wing margin or closed with short stalk; pulvilli not reduced (approx. three-quarters the length of claws) ..... 11
- 11 Metathoracic femora uniformly dark red-brown to black ..... **vespertilio** (Engel, 1932)
- Metathoracic femora bicoloured, orange-brown and dark red-brown to black ..... **hermanni** (Ricardo, 1925), **lykos** Londt, 1985
- 12 Abdominal T4 with setulae pointing anteriorly (a few on anterior margin may be differently orientated) ..... **hirtus** Ricardo, 1925
- Abdominal T4 with setulae pointing in all directions ..... 13
- 13 Anterior faces of femora predominantly dark red-brown to black ..... **vulpes** Loew, 1858
- Anterior faces of femora predominantly yellowish ..... 14
- 14 Antennae uniformly yellow-orange ..... **stenoura** Londt, 1983
- Antennal scape and pedicel darker in colour than postpedicel ..... **placodes** Londt, 1983

### *Distribution*

The generic distribution appears to be centred in the northern parts of the Northern Cape Province of South Africa where six of the eight species may be found (Figs 13, 14). The two species not found in this general area are however found in adjacent areas – *setithoracicus* primarily in the Eastern Cape Province, and *placodes* in a fairly limited

part of the Limpopo Province of South Africa. At least three species, *hirtus*, *stenoura* and *vulpes*, all members of the *vulpes* species group, probably have much more extensive distributions that will only be more fully appreciated when more sampling has been undertaken, especially in the generally poorly sampled central parts of Botswana. There does not appear to be any correlation with any of the better known centres of plant endemism (Van Wyk & Smith 2001).

### Phenology

The seasonal occurrence of *Daspletis* species is shown in Table 1. Although more records would clarify the position, it is suspected that the species having dark-winged males (*hermanni*, *lykos* and *vespertilio*) are active in the adult stage during spring and early summer (around August – November). Other species are summer active (around October – May).

### Biology

*Daspletis* is a genus associated mainly with the Nama-Karoo and Savannah biomes of southern Africa (see map of biomes in Van Wyk & Smith 2001). Personal experience suggests that these flies prefer dry, sandy habitats and many specimens have been collected at localities dominated by extensive sand-dune systems, particularly in the Northern Cape Province of South Africa. Personal experience also suggests that all *Daspletis* rest on open ground (habitat category 1c of Londt 1994), a behaviour that appears to be different from that of the closely related genus *Microstylum*, whose species tend to rest off the ground on rocks, or the tips of grass culms or bushes (habitat categories 3, 4b & 5b of Londt 1994). Being typical members of the Stenopogoninae, females possess acanthophorites and so oviposit in shallow scrapes in loose sand. Although most of the recorded prey items possess wings, indicating that *Daspletis* can capture flying prey, at least two items are wingless (an acridid nymph and a spider) which suggests that they can also capture ground-inhabiting prey. Although reproductive behaviour has not been observed, the males of some species may practice aerial displays designed to attract the attention of females (see comments under *vespertilio*).

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TABLE 1

The phenology of *Daspletis* Loew, 1858 species. Months abbreviated and beginning with July.

| Species                       | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun |
|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <i>hermanni</i> species group |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>hermanni</i>               | –   | •   | •   | •   | •   | –   | –   | –   | –   | –   | –   | –   |
| <i>lykos</i>                  | –   | •   | –   | –   | –   | –   | –   | –   | –   | –   | –   | –   |
| <i>setithoracicus</i>         | –   | –   | –   | •   | •   | •   | •   | –   | –   | –   | •   | –   |
| <i>vespertilio</i>            | –   | –   | –   | •   | –   | –   | –   | –   | –   | –   | –   | –   |
| <i>vulpes</i> species group   |     |     |     |     |     |     |     |     |     |     |     |     |
| <i>hirtus</i>                 | –   | –   | –   | –   | •   | –   | –   | •   | •   | –   | –   | –   |
| <i>placodes</i>               | –   | –   | –   | –   | –   | •   | •   | •   | –   | •   | –   | –   |
| <i>stenoura</i>               | –   | –   | –   | –   | •   | •   | •   | –   | •   | –   | –   | –   |
| <i>vulpes</i>                 | –   | –   | –   | –   | •   | •   | •   | –   | •   | –   | –   | –   |

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