

TAXONOMY AND BIOGEOGRAPHY OF *PORPAX*,
A DRAGONFLY GENUS CENTRED IN THE
CONGO BASIN (ODONATA, LIBELLULIDAE)

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The tropical African genus *Porpax* is revised, five species are recognised, including the new species *P. sentipes* from Congo-Kinshasa. All species are fully diagnosed for both sexes and new records are included. A key to the species and illustrations of important characters are provided. The peculiarities of the genus are discussed, but little is known of its ecology. *P. garambensis* and *P. sentipes* sp. n. are confined to the Congo Basin, while *P. asperipes* is also present in the adjacent Lower Guinean forest. *P. risi* is spread out across highlands in south-central Africa. *P. bipunctus* is known from four disjunct rainforest regions from Liberia to eastern Congo and has different markings in each region. This distribution coincides with Africa's main rainforest refugia and is the best example of such disjunction seen in Afrotropical Odonata so far. The species' isolation appears to be linked to an ephemeral habitat, confining it to areas with perennial and predictable rainfall.

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Key words. – Anisoptera; Libellulidae; *Porpax*; systematics; refugia; keys; Africa.

The genus *Porpax* is endemic to tropical Africa. Karsch (1896) based the genus on the single species *P. asperipes*, of which Pinhey (1958) described the subspecies *P. asperipes risi*. He raised *P. risi* to species level when it was found to co-occur with *P. asperipes* in NW Zambia (Pinhey 1964a, b). Pinhey (1966) revised the genus, adding *P. bipunctus* and *P. garambensis*, the latter known only from the holotype. Many specimens in the Musée Royal de l'Afrique Centrale, Tervuren (MRAC), all placed under *P. asperipes*, in fact belonged to four taxa: *P. asperipes*, *P. bipunctus*, *P. garambensis*, and a new species. Fraser (1954) indicated his 'hope to deal with *Porpax* [material in MRAC] later', but his wish never materialised. This paper aims to (re-)describe and compare the five species of this small and highly characteristic genus, and review their ecology and biogeography.

METHODS AND MATERIAL

All available material was compared (table 1), with an emphasis on the extensive Congolese collections in MRAC and primary types in BMNH, MRAC, NMBZ and ZMHB.

Acronyms of collections

BMNH	Natural History Museum, formerly British Museum (Natural History), (London, UK)
CGVL	Collection Graham Vick (Little London, UK)
CJLH	Collection Jochen Lempert (Hamburg, Germany)
ISNB	Institut Royal des Sciences Naturelles de Belgique (Brussels, Belgium)
MNHN	Muséum National d'Histoire Naturelle (Paris, France)
MNMS	Museo Nacional de Ciencias Naturales (Madrid, Spain)
MRAC	Musée Royal de l'Afrique Centrale (Tervuren, Belgium)
NHRS	Naturhistoriska Riksmuseet (Stockholm, Sweden)
NMBZ	Natural History Museum of Zimbabwe (Bulawayo, Zimbabwe)
RMNH	Nationaal Natuurhistorisch Museum Naturalis, formerly Rijksmuseum van Natuurlijke Historie (Leiden, Netherlands)
ZMHB	Museum für Naturkunde der Humboldt-Universität (Berlin, Germany)

Table 1: Comparison of *Porpax* species. Average measurements and vein counts are based on stated samples sizes (range between brackets).

species n ♂ : ♀ =	<i>risi</i> 22 : 2	<i>garambensis</i> 12 : 8	<i>asperipes</i> 21 : 19	<i>bipunctus</i> 17 : 3	<i>sentipes</i> sp. n. 20 : 12
Hw length ♂ (mm)	23.1 (22.0-24.5)	22.4 (21.5-23.0)	26.2 (24.5-28.5)	26.0 (24.5-27.5)	24.2 (22.5-25.5)
Hw length ♀ (mm)	23.8 (23.5-24.0)	23.8 (23.0-25.0)	26.7 (25.0-28.0)	28.0 (27.5-28.5)	25.4 (23.5-26.0)
Labrum (figs. 1-3)	pale, black border	black	black	black, sometimes 2 large pale spots	black, often 2 small pale spots
Pale band on frons (figs. 1-3)	complete	severed	often severed	at most thinly severed	severed
Occipital triangle	largely pale to largely black	largely pale	largely black	largely black	largely black
Postgenae (figs. 4-7)	black, 4 sharp spots	black, 2 sharp spots	black, 2-3 sharp spots	brown to black, 2-3 sharp to vague spots	black, 2 sharp spots
Prothorax above coxa	with spot	at most with small spot	all dark	all dark	with spot
Spiracular dorsum ♂ (figs. 8-9)	large central spot	all dark	large central spot	large central spot	all dark, some with central spot
Postdorsal stripes (figs. 8-9)	slightly oblique, narrow	oblique, wide	parallel, narrow	parallel, narrow	parallel, narrow
Mesokatepisternum (figs. 10-14)	two pale spots	one pale spot	one pale spot	one pale spot	one pale spot
Interpleural stripe (figs. 10-14)	narrow	wide, but enclosing small pale spot	wide	narrow to fairly wide	wide
Metepisternal stripe (figs. 10-14)	wide and broken	narrow, often broken	narrow, often broken	wide	narrow, sometimes broken
Synthoracic venter ♂	all black, or small pale blotches on metepimera	all black, at most small pale blotches on metepimera	black, poststernum and metepimera largely pale	brown to black, pale blotches on poststernum and metepimera	black, poststernum and metepimera largely pale
Costa and subcostal cross-veins	pale	dark	dark	dark	dark
Number of Fw Ax	9.8 (8½-10½)	9.8 (8½-10½)	11.2 (9½-13)	11.1 (9½-14)	10.4 (9½-11½)
% of Hw with >1 Cux	93.8	30.0	96.2	100.0	95.3
Anal loop (figs. 15-16)	closed	closed	closed	open	closed
Fore coxae	with spot	all dark	all dark	all dark	all dark
Hind femur ♂ (figs. 17-25)	thinly hairy, single strong spine row	densely hairy, single weak spine row	quite densely hairy, single spine row	bare, single strong spine row	bare, double spine row
Pruinosity ♂ (figs. 43-45)	on dorsum synthorax and abdomen	on s2-4	on dorsum synthorax and abdomen	none	none
Abdomen shape ♂ (figs. 26-31)	broad	waisted	waisted	waisted	waisted
Hook of hamule (figs. 36-39)	long	short	long	long	long
Lobe of hamule (figs. 36-39)	slightly pointed	pointed	rounded	rounded	rounded

Dorsum S2 basal pale marking ♂ (figs. 26-31)	spot	band	spot or band	spot or band	band
Dorsum S2 apical pale marking ♂ (figs. 26-31)	spot	none	none or spot	spot or band	none
S3 anterior marking ♂ (figs. 26-31)	dorsal and lateral spots	complete or thinly interrupted ring	thinly interrupted ring	complete or thinly interrupted ring	complete or thinly interrupted ring
S3 posterior marking ♂ (figs. 26-31)	dorsal and lateral spots	broadly interrupted ring	broadly interrupted ring	complete to broadly interrupted ring	broadly interrupted ring
S6 marking (figs. 32-35)	dorsal and lateral spots	narrow perpendicular band, seldom black on dorsal carina	narrow perpendicular band, black on dorsal carina	dorso-apically skewed band, not black on dorsal carina	narrow perpendicular band, not black on dorsal carina
Vulvar scale (figs. 41-42)	appressed, concave	projecting, convex	appressed, concave	appressed, concave	appressed, concave
Epiproct ♂	dark	pale	dark	pale to dark	pale

Scanning electron microscopy was used to examine details of leg armature (figs. 22-25) and secondary genitalia (figs. 36-39). Abbreviations. – Ax: antenodal cross-veins, Ax1: first antenodal (counted from base) etc., Cux: cubital cross-veins, Fw: forewing(s), Hw: hindwing(s), Pt: pterostigma, Px: postnodal cross-veins, S1: first abdominal segment, S2-3: second and third abdominal segments etc.

TAXONOMIC PART

Porpax Karsch

Porpax Karsch, 1896: 17. Type species: *Porpax asperipes* Karsch, 1896 (by monotypy).

Diagnosis

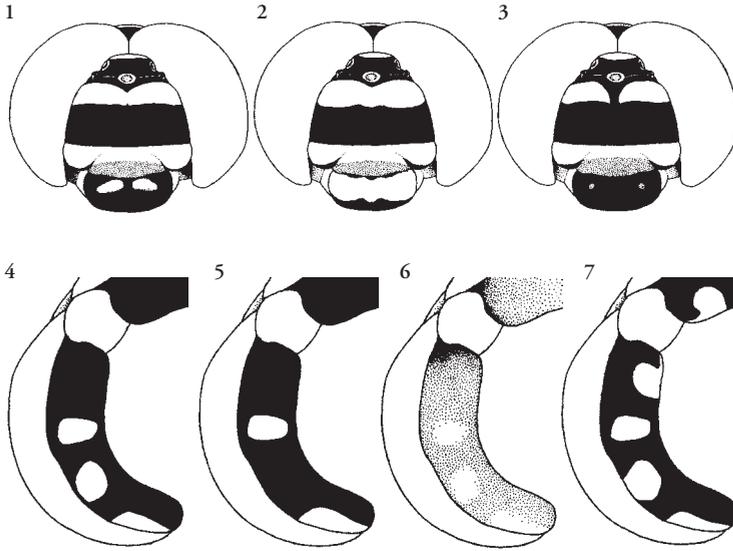
In Africa the following combination of venation characters is found only in *Porpax*: (1) arculus placed between Ax2 and Ax3; (2) distal Fw Ax incomplete; (3) subtriangle normally of three cells (sometimes two); (4) Fw discoidal field of two rows of cells at base (sometimes three cells bordering triangle); (5) Fw with one Cux but Hw with two (occasionally three or four, usually one in *P. garambensis*); (6) all wings with one bridge cross-vein. The genus is further characterized by its small size (Hw 21.5-28.5 mm) and stocky build, black body marked boldly with greenish yellow, the barred face and often banded S6 being especially conspicuous (figs. 1-3, 32-35), and the short legs ornamented with stout spines and often with long bristly hairs (figs. 17-25).

Characters

Males of the various species are similar in structural

characters such as secondary genitalia and appendages (figs. 36-40), differing mainly in colour pattern (figs. 1-14, 26-35) and ornamentation of the legs (figs. 17-25). Especially the uniformity of the secondary genitalia (including anterior lamina, hamule and genital lobe) is atypical within the Libellulidae (figs. 36-39). Another feature unusual for the family, and the Anisoptera as a whole, is the position of the prominent pale marking on the abdomen. All species possess a broad pale ring on S6, with the exception of *P. risi* that lacks a striking subterminal marking altogether (figs. 32-35). Generally in Anisoptera such a 'signal spot' is situated on S7. African examples of a prominently marked S7 are found in most Gomphidae, *Phyllomacromia* Selys, 1878 (Corduliidae) and all *Atoconeura* Karsch, 1899 and some *Zygonyx* Hagen, 1867 species (Libellulidae).

Females appear more washed-out and variable than males, with less contrasting and sometimes more extensive pale markings, which reduces the usefulness of these characters. Pruinosity does not develop and all have thick spindle-shaped abdomens. Hind femur ornamentation is more uniform and although hairy-legged males have relatively hairy-legged females, these differences are hard to quantify and only useful in direct comparison. Mated pairs were unavailable for this study, and females had to be associated with males by locality and resemblance. For *P. risi* and *P. garambensis* this posed few problems, but females of the two most abundant species in the MRAC material, *P. asperipes* and *P. sentipes* sp. n., so different as males, proved quite similar. Nonetheless characters shared with the males, although more weakly expressed, make a correct association possible. The *P. bipunctus* female stands out by her open anal loop.



Figs. 1-3. Head of *Porpax* species in rostral view. – 1, *P. bipunctus* Cameroon; 2, *P. risi*; 3, *P. sentipes*.

Figs. 4-7. Head of *Porpax* species in caudal view. – 4, *P. bipunctus* Côte d'Ivoire; 5, *P. bipunctus* Cameroon; 6, *P. bipunctus* NE Congo-Kinshasa; 7, *P. risi*.

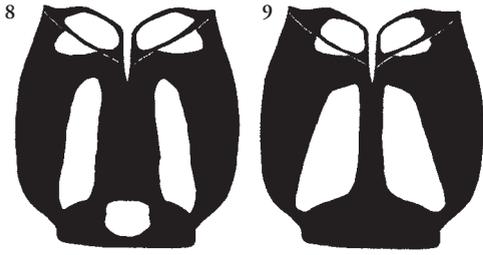
Ecology and biogeography

Porpax species are generally scarce in collections, possibly because they occur locally, and therefore their distributions and habitat preferences are imperfectly known. The scanty ecological data suggest that the species breed in shallow standing and slow-flowing water with bottom substrates of coarse detritus, such as temporary forest pools, muddy streams and grassy swamps. The species have large and widely overlapping ranges and the Congo Basin appears to be the genus' centre of distribution (fig. 46): at Bambesa (NE of basin) all species except *P. risi* have been collected and at Kabongo (SE) all but *P. bipunctus* (fig. 47). Of the three shared species *P. garambensis* and *P. sentipes* sp. n. are as yet unknown outside Congo-Kinshasa, while *P. asperipes* just extends into adjacent Zambia and across to SE Nigeria. *P. risi* is unusual in appearance, range and possibly ecology, occurring well south of the other species. It seems to be the only species that is not associated with forest, occurring in open swamps scattered across highlands from Angola to Katanga and Mozambique. *P. bipunctus* is exclusively associated with forest. It has been found in highly disjunct areas, which correspond with important rainforest refugia in the Upper Guinea (Liberia, Côte d'Ivoire), Lower Guinea (Cameroon, Gabon) and the eastern side of the Congo Basin (NE Congo-Kinshasa) (Clausnitzer 2003, Fjeldså & Lovett 1997, Kingdon 1989). This is the best example of refugial disjunction found in Afrotropical Odonata so far. The pattern is supported by the absence of records from regions in-between and the presence of marked

regional forms (see *P. bipunctus* text). This is in contrast to the other *Porpax* species, which have been collected more widely and are geographically uniform. The isolation of *P. bipunctus* may be linked to the probably ephemeral nature of its reproductive habitat (see range and ecology op p. 82). In his discussion of a Papuan rainforest odonate community, Oppel (2005) remarked on the relative paucity of species inhabiting pools under closed canopy left by temporary streams in Africa. This may be linked to the more seasonal and unstable climatology of African tropical forest. Possibly *P. bipunctus* is confined to areas with perennial and predictable rainfall.

Key to males of *Porpax*

1. Anterior side of hind femur and trochanter bare, at most some scattered very short hairs (figs. 18, 21, 23, 25). Abdomen never pruinose 2
- Anterior side of hind femur and trochanter densely hairy, hairs about as long as femur is wide (figs. 17, 19-20, 22, 24). Abdomen (partly) pruinose when mature 3
2. Anal loop open on wing border (fig. 16). About 15-20 spines in outer anterior row of hind femur, entirely in single file (figs. 18, 23). Pale band across frons often complete (fig. 1). Prothorax usually without pale spot above coxa. Spiracular dorsum with large central pale spot (cf. fig. 8). Interpleural stripe narrower than anteriorly adjacent pale stripe and often narrower than



Figs. 8-9. Synthorax of *Porpax* species in dorsal view. – 8, *P. asperipes*; 9, *P. garambensis*.

- posteriorly adjacent pale stripe (fig. 11). Pale ring on S6 skewed, dorsal part shifted apically (lateral view, fig. 33). Hw 24-27 mm *bipunctus*
- Anal loop closed before wing border (cf. fig. 15). About 30-40 spines in outer anterior row of hind femur, row doubled at base of femur (figs. 21, 25). Pale band across frons broken by black in median groove (fig. 3). Prothorax with large pale spot above coxa. Spiracular dorsum often all black (cf. fig. 9). Interpleural stripe at least as wide as adjacent pale stripes (fig. 14). Pale ring on S6 perpendicular (cf. fig. 34). Hw 22-26 mm *sentipes*
3. Labrum pale with black anterior border; pale band across frons complete (fig. 2). Mesokatepisternum with anterior and posterior pale spots; interpleural stripe narrower than adjacent pale stripes (fig. 13). Costa and subcostal cross-veins pale. S3-9 with pale dorsal spots, S6 without pale ring (figs. 30, 35; not visible when pruinose) *risi*
- Labrum all black; pale band across frons often broken by black in median groove (cf. fig. 3). Mesokatepisternum only with posterior pale spot; interpleural stripe at least as wide as adjacent pale stripes (figs. 10, 12). Costa and subcostal cross-veins black. S3-9 black dorsally, S6 with pale ring (figs. 26, 29, 32, 34; not visible when pruinose) 4
4. Postdorsal stripes converging dorsally, black area between them narrower than stripes; spiracular dorsum all black (fig. 9). Less than half of occipital triangle black (dorsal view). Venter of synthorax largely to entirely black. Abdomen only becomes pruinose on S2-4. Hamules with pointed lobe and short hook (fig. 37). Hw 21-23 mm. 8½-10½ Fw Ax. 1 Hw Cux (30% of wings have 2-3) *garambensis*
- Postdorsal stripes parallel, black between them at least as wide as stripes; spiracular dorsum with large central pale spot (fig. 8). More than half of occipital triangle black. Venter of synthorax with

extensive pale areas enclosed by black. Entire abdomen pruinose when mature. Hamules with rounded lobe and long hook (fig. 36). Hw 23-29 mm. 10½-12½ Fw Ax. 2-3 Hw Cux (4% of wings have 1) *asperipes*

Key to females of *Porpax*

1. Labrum pale with black anterior border (fig. 2). Mesokatepisternum with anterior and posterior pale spots; pale metepisternal stripe wider than interpleural stripe and broken (fig. 13). Costa and subcostal cross-veins pale. S6 with dorsal and lateral pale streaks, rather like S5 and S7 (fig. 35) *risi*
- Labrum black, sometimes with two central pale dots (figs. 1, 3). Mesokatepisternum only with posterior pale spot; pale metepisternal stripe either entire or narrower than interpleural stripe (figs. 10-12, 14). Costa and subcostal cross-veins black. S6 with pale ring, unlike darker S5 and S7 (figs. 32-34) 2
2. Postdorsal stripes converging dorsally, black area between them narrower than stripes (fig. 9). Occipital triangle less than half black (dorsal view). 7-8 spines in outer anterior row of hind femur. Vulvar scale projecting (lateral view), its border bare and convex (ventral view, fig. 42). 1 Hw Cux (30% of wings have 2-3) *garambensis*
- Postdorsal stripes parallel, black between them at least as wide as stripes (fig. 8). Occipital triangle more than half black. 10-14 spines in outer anterior row of hind femur. Vulvar scale appressed, its border concave with two lateral hairy swellings (fig. 41). 2-3 Hw Cux (4% of wings have 1) 3
3. Anal loop open on wing border (fig. 16). Pale metepisternal stripe entire, often wider than interpleural stripe (fig. 11). Pale band across frons often complete (fig. 1). Pale ring on S6 skewed, dorsal part shifted apically (lateral view, fig. 33) *bipunctus*
- Anal loop closed before wing border (fig. 15). Pale metepisternal stripe often broken, narrower than interpleural stripe (figs. 10, 14). Pale band across frons normally interrupted by black in median groove (fig. 3). Pale ring on S6 perpendicular (figs. 32, 34) 4
4. Prothorax at most with slight pale spot above coxa. Pale ring on S6 interrupted by black along dorsal carina (fig. 32). Hind femur with some long hairs. Hw 25-28 mm *asperipes*
- Prothorax with large pale spot above coxa. Pale ring on S6 continuous across pale dorsal carina (cf. fig. 34). Hind femur rather bare. Hw 23-26 mm *sentipes*



Figs. 10-14. Synthorax of *Porpax* species in lateral view. – 10, *P. asperipes*; 11, *P. bipunctus* NE Congo-Kinshasa; 12, *P. garambensis*; 13, *P. risi*; 14, *P. sentipes*.

Porpax asperipes Karsch

(figs. 8, 10, 15, 17, 22, 26, 32, 36, 41, 43)

Porpax asperipes Karsch, 1896: 18. Syntype ♀: CAMEROON: 'Kamerun, Hinterland. Jaunde-Stat., Zenker S.' (ZMHB); syntype ♀; with identical labels and '16/3 [1895]' (ZMHB) [examined].

Other material. – 1♂, 'S. Leone', undated, Rutherford (ISNB) [origin doubted]. – CAMEROON, 3♂, 2♀, undated, Rutherford (ISNB); 2♂, 1♀, South-west Province, Lake Edib (4°57.495'N 9°39.157'E), 23.vi.1998, G.S. Vick (CGVL). – CONGO-BRAZZAVILLE: 1♂, Kingoyi, undated, Laman (NHRS). – CONGO-KINSHASA: 1♂, Boma Sundi, undated, P. Rohn (ISNB); 1♂, Mayumbe, undated, R. Mayné (MRAC); 1♂, Bumbuli, 19.iv.1915, R. Mayné (MRAC); 1♂, Banana, viii.1920, H. Schouteden (MRAC); 1♂, Katombe, 9.ii.1929, Ch. Seydel (MRAC); 2♂, Lulua, Kapanga, i.1933, G.F. Overlaet (MRAC); 1♂, Dingila, 1.vii.1933, J.V. Leroy (MRAC); 9♂, Uele, Bambesa, iv.1933-1934, J.V. Leroy (MRAC); 2♂, 1♀, Uele, Bambesa, ix.1933-viii.1934, H.J. Brédo (MRAC); 1♂, Ubangi, Terr. Giri, Bomboma, Gulukulu, ii.1935, A. Bal (MRAC); 1♀, Kapanga, i-ii.1936, G.F. Overlaet (MRAC); 1♂, Elisabethville (= Lubumbashi), iii.1936, Ch. Seydel (MRAC); 1♂, 1♀, Likete, xi.1936, J. Ghesquière (MRAC); 49♂, 11♀, Uele, Bambesa, vi.1937-iii.1939, J.M. Vrijdagh (MRAC); 5♂, Uele, Bambesa, vii-x.1938, P. Henrard (MRAC); 11♂, 4♀, Lualaba, Kabongo, xi.1952-x.1953, Ch. Seydel (MRAC); 1♂, 1♀, Orientale, Territoire de Basoko, Lokutu, between Lukumete and Lunua (1°16-17'N 23°23-28'E), 375-400 m, forest with streams and clearings, 1-4.xi.2004, K.-D.B. Dijkstra (RMNH). – NIGERIA, 1♂, Old Calabar, undated, Rutherford (ISNB); 3♂, Old Calabar, undated, leg. unknown (ISNB).

Diagnosis

The largest of the pruinose, hairy-legged species. Males are most easily separated from *P. garambensis* and *P. risi* by the lack of their unique characters. Females are very close to *P. sentipes* sp. n. but both sexes (males when not pruinose) can usually be distinguished by the marking of S6: the pale ring is interrupted by black along the dorsal carina (figs. 32, 43).

Remarks

Karsch (1896) diagnosed the genus and species on

the basis of two females from Cameroon. Ris (1911) described males from the Selys collection. The latter material largely originates from Cameroon and adjacent Nigeria. Because the variable *P. bipunctus* also occurs in this area and Karsch's description is brief, it is conceivable that Karsch's females and Ris' males were not conspecific. However, now all the involved material has been re-examined it can be stated that it belongs to a single species.

Variation

Sometimes a third pale spot is present between the two usual spots on the postgenae (cf. figs. 4-5).

Range and ecology

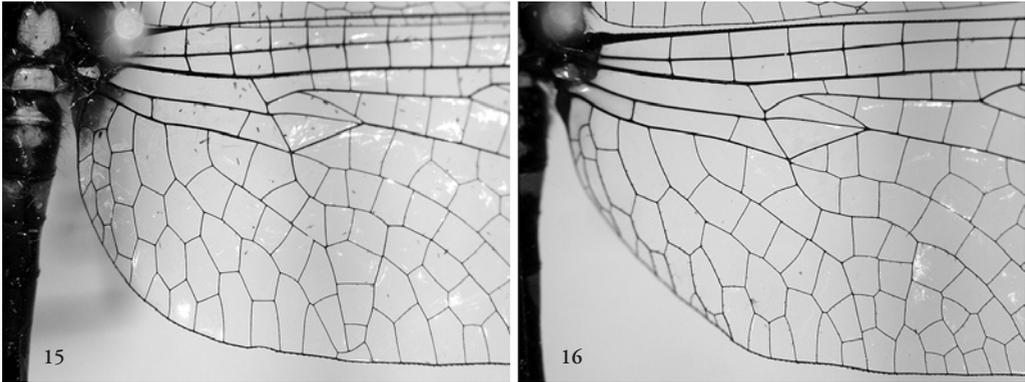
Most material was from sites throughout Congo-Kinshasa, from where the species ranges west through Congo-Brazzaville (Aguesse 1966), Gabon (seen in MNHN), Rio Muni (in MNMS) and Cameroon to SE Nigeria, and south into the extreme NW Zambia (Pinhey 1984). The species' presence in Sierra Leone is doubted: like a number of species not found recently in West Africa, the only record pertains to material in the Selys collection (own observations). This material probably originated in Cameroon or adjacent Nigeria and was mislabelled by Rutherford, an important supplier to Selys. The habitat is poorly known. Pinhey (1964a, 1984) mentioned 'swamp' and 'swampy grassland' for NW Zambia, I found it at a half-sunny muddy stream in rainforest in the central Congo Basin and G.S. Vick (pers. comm.) at a lake edge with floating vegetation, especially grass and mosses, in Cameroon.

Porpax bipunctus Pinhey

(figs. 1, 4-6, 11, 16, 18, 23, 27-28, 33, 44)

Porpax bipunctus Pinhey, 1966: 49. Holotype ♂: CAMEROON: 'Porpax bipunctus Pinhey ♂', 'Holotype ♂ Porpax bipunctus Pinhey 1963', 'MAMFE BRITISH CAMEROONS II - 1958 Nat. Museum S. Rhodesia' (NMBZ) [examined].

Porpax bipunctatus de Moor, 1976: 102. – Misspelling.



Figs. 15-16. Hw base of *Porpax* species. – 15, *P. asperipes*, 16, *P. bipunctus*.

Other material. – 1♂, no data, leg. unknown (MNHN). – CAMEROON: 1♀, 16.iv.1891, Y. Sjöstedt (NHRS); 2♂ (paratypes), Mamfe, ii.1958, E. Pinhey (NMBZ); 1♂ (paratype), Mamfe, Gorilla Mountains, ii.1958, E. Pinhey (NMBZ). – CAMEROON (SW): 1♂, Tombel, Ebonji, Sandwater Falls, 200m, 6.iv.1995, G.S. Vick (CGVL); 1♂, Meme Tombel, Lala, R. Ndibe, 400m, 29.vii.1995, O. Mesumbe (CGVL); 1♂, Matene Camp (6°11.029'N 9°20.596'E), 16.iv.2001, O. Mesumbe (CGVL); 1♂, Takamanda Camp (6°03.181'N 9°14.483'E), 25.iv.2001, O. Mesumbe (CGVL); 1♂, Kekpane Village (6°05.841'N 9°23.929'E), 26.vi.2001, O. Mesumbe (CGVL). – CONGO-KINSHASA (UELE): 6♂, 1♀, Bambesa, iv.1937-ii.1939, J.M. Vrijdagh (MRAC); 1♂, Bambesa, v.1937, P. Henrard (MRAC); 1♂, Bambesa, xii.1938, J.M. Vrijdagh (BMNH). – COTE D'IVOIRE: 2♂, Forêt de Taï, 8.v.-3.vi.1980, G. Couturier (MNHN). – GABON (MAKOKOU): 3♂, 1♀, Ipassa, 14.x.-17.xi.1976, J. Legrand (MNHN); 1♂, Ebieng, 11.i.1978, J. Legrand (MNHN); 1♂, Mezale, 3.ii.1978, J. Legrand (MNHN). – LIBERIA (SE): 1♂, Sinoe River, 19.i.1987, J. Lempert (CJLH); 1♂, Jalay Town, 24.ii.1987 (CJLH) [both examined by J. Lempert]. – NIGERIA (SE): 1♂, 1♀ (paratypes), Ajassor-Ikom, ii.1958, E. Pinhey (NMBZ).

Diagnosis

Large, bare-legged species with three unique structural features: the anal loop is poorly defined distally and therefore open on the posterior wing border (fig. 16); the hind femora are plump and bare with a saw-like single row of large denticles (figs. 18, 23); the cerci have 8-10 rather scattered ventral denticles (in others 8-12 denticles are placed on a slight, sinuous ridge). Maculation is variable, especially on the head, thorax and abdomen base, but with two distinctive features: the pale lateral synthoracic stripes are relatively broad and straight, with the black interpleural stripe narrower than the anteriorly adjacent pale stripe and often that posteriorly adjacent (fig. 11); the dorsal portion of the pale band on S6 is shifted apically (fig. 33).

Remarks

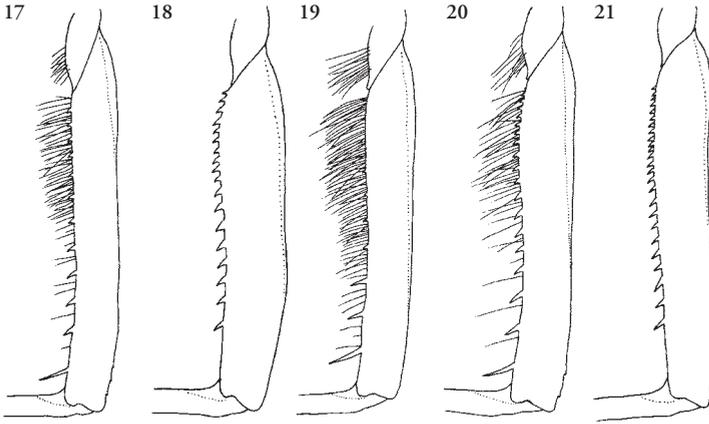
The open anal loop is a remarkable species character, because the loop's shape is typically constant within libellulid genera. An open anal loop characterises some genera that are highly distinct from *Porpax*, like *Thobymis* Hagen, 1867 and *Zyxomma* Rambur, 1842. In all mentioned cases the feature is remarkably stable, although an open loop only requires a slight reconfiguration of cells (figs. 15-16).

Pinhey's (1966) brief description of the holotype unfortunately does not cover the variable features of *P. bipunctus* in detail. It seems apt to provide a fuller description of the species, for which I chose the most disparate form, from NE Congo-Kinshasa.

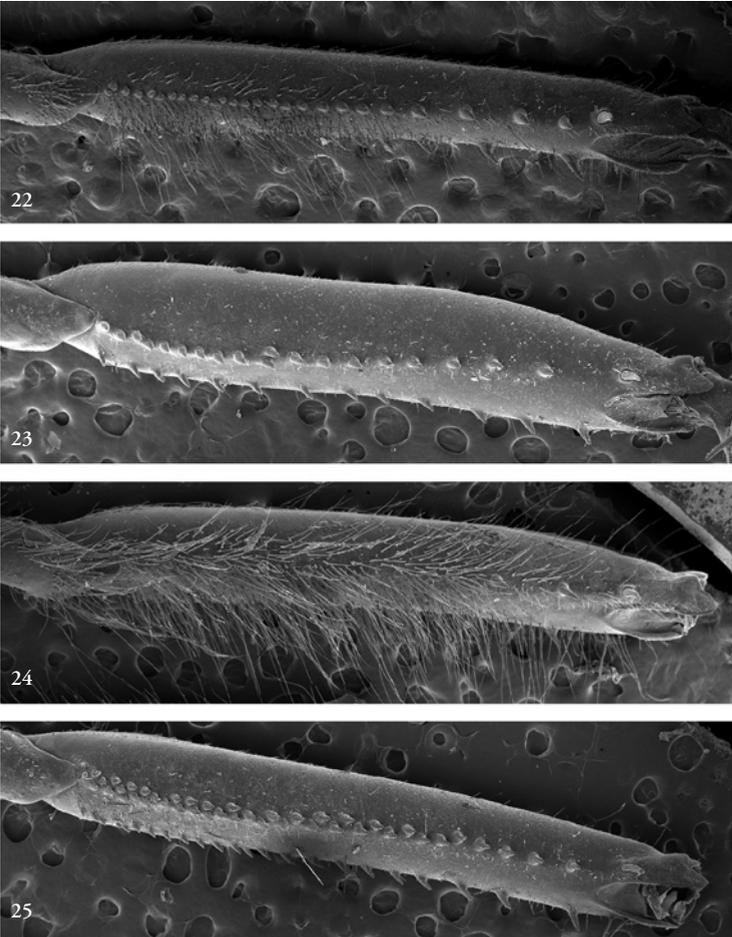
Redescription

Bambesa male. – Measurements (mm): entire length: 32, abdomen length (without appendages): 20, Fw length: 28, Hw length: 27, Fw Pt: 2.2.

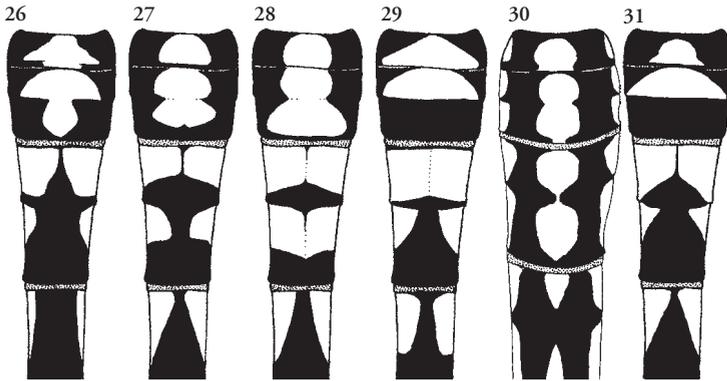
Prementum dark brown, labial palps including squames yellow with inner third black, this central black area widening anteriorly and extending broadly along anterior border. Mandibles yellow, genae brown. Labrum glossy black, becoming deep brown at centre of base. Anteclypeus dark brown, postclypeus greenish yellow with anterior border narrowly black laterally. Frons broadly glossy brown-black anteriorly, narrowly black bordering vertex, enclosing broad pale green band on dorsum. Vertex black, dorsally with large pale green spot. Anterior two-thirds of occipital triangle brown-black, posterior part and down occiput pale green. Postgenae deep brown (slightly rusty), blacker where bordering occiput, with vaguely outlined roundish greenish yellow spots subdorsally, a similar yellow streak along eye border at ventral end and a smaller yellow spot in-between (fig. 6). Antennae and their bases black. Labrum,



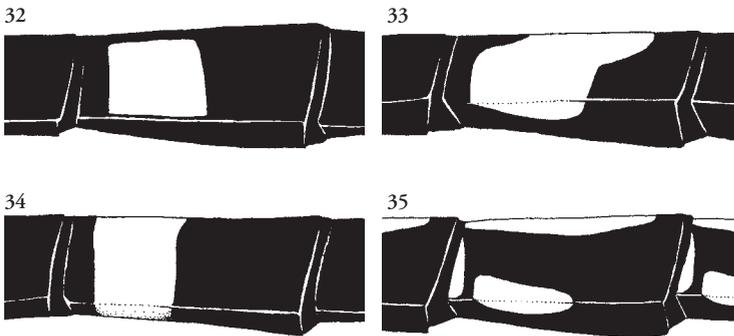
Figs. 17-21. Male hind femur of *Porpax* species in lateral view. – 17, *P. asperipes*; 18, *P. bipunctus*; 19, *P. garambensis*; 20, *P. risi*; 21, *P. sentipes*.



Figs. 22-25. Male hind femur of *Porpax* species in ventro-lateral view. – 22, *P. asperipes*; 23, *P. bipunctus*; 24, *P. garambensis*; 25, *P. sentipes*.



Figs. 26-31.
Male S1-4 of *Porpax* species in dorsal view. – 26, *P. asperipes*; 27, *P. bipunctus* Côte d'Ivoire; 28, *P. bipunctus* NE Congo-Kinshasa; 29, *P. garambensis*; 30, *P. risi*; 31, *P. sentipes*.



Figs. 32-35.
Male S6 of *Porpax* species in lateral view. – 32, *P. asperipes*; 33, *P. bipunctus*; 34, *P. garambensis*; 35, *P. risi*.

clypeus, frons, vertex, occiput and genae with long black hairs.

Prothorax dark brown with pale green hindlobe and anterior half forelobe. Hindlobe with fringe of long black hairs. Synthorax dark brown with yellowish green markings (fig. 11): postdorsal stripes linear, closer to middorsal carina than humeral suture, parallel to carina, dark area between the two postdorsal stripes about 1.5x as broad as one stripe. Antealar sinuses each with large oval spot, bordered anteriorly by similar-sized roughly triangular spots on mesepisternum, which are almost fused with postdorsal stripes. Mesepimeron and metepisternum both with broad, unbroken, rather straight pale stripe, both of similar width and slightly widened dorsally, latter enclosing brown-rimmed metastigma (and the thin brown sutural line connecting it to metapleural stripe). These stripes so broad that interpleural dark stripe is very thin, less than a quarter as wide as one of the pale stripes. Metepimeron largely pale, dark brown on borders, a dark smudge extending from ventral side towards centre of metepimeron. Metapleural dark stripe about as wide as interpleural

stripe. Mesokatepisternum and metakatepisternum with pale spot on ventral corner. Synthoracic venter brown with large faint yellow blotches on metepimeron and small ones on sides of poststernum. Antealar sclerites blackish brown with greenish yellow central spots, interalar plates greenish yellow narrowly outlined with blackish brown.

Venation blackish. Wing membrane clear, narrowly and faintly yellow at base of subcostal and cubital spaces and along membranule in all wings. Membranule dark brown, pale at base. Pt brown. 11-11½ Ax in Fw (complete distal antenodal in left Fw is aberrant in genus), 9 in Hw. 10 Px in Fw, 9 in Hw. Arculus roughly midway Ax2-3 in all wings. 1 Cux in both Fw, 2-3 in Hw. Fw triangles just over 3x as long as wide, with single cross-vein, supratrangles without cross-veins, subtriangles of 3 cells. Discoidal field of 2 rows at base (for 6 cells), becoming 3 rows just proximal of nodus, Mspl scarcely defined. Hw triangle uncrossed. IR3 and Rspl enclosing single row of 7 cells in Fw, 6 in Hw. Anal field of 2 rows near rounded tornus. Anal loop of 18-20 cells, but veins enclosing them ill-defined and not confluent

Table 2. Comparison of regional variation in males of *P. bipunctus*, ordered from west to east.

	Côte d'Ivoire & Liberia	SW Cameroon	NE Gabon	NE Congo-Kinshasa
Squamae of labial palps	black	black	black	pale
Labrum	unspotted	two large central pale spots (fig. 1)	unspotted	unspotted
Pale frontal band	at most thinly interrupted	at most thinly interrupted	at most very thinly interrupted	complete
Postgenae	black, 3 sharp spots (fig. 4)	black, 2 sharp spots (fig. 5)	brown, 3 vague spots (cf. fig. 6)	brown, 2-3 vague spots (fig. 6)
Interpleural stripe : metepisternal stripe	slightly broader	slightly narrower	equal	much narrower (fig. 11)
Dorsum S2	2 equal spots (fig. 27)	2 equal spots (cf. fig. 27)	2 equal spots (cf. fig. 27), 2nd wider in some specimens	spot preceding band (fig. 28)
Dorsum S3	1st (rather narrow) ring thinly interrupted, 2nd widely (fig. 27)	2 thinly interrupted rings	1st ring thinly interrupted, 2nd thinly or widely	2 complete or thinly interrupted rings (fig. 28)
Epiproct	pale (fig. 44)	dark	pale	often dark

before posterior wing border, leaving anal loop open (cf. fig. 16). Bridge spaces with 1 cross-vein.

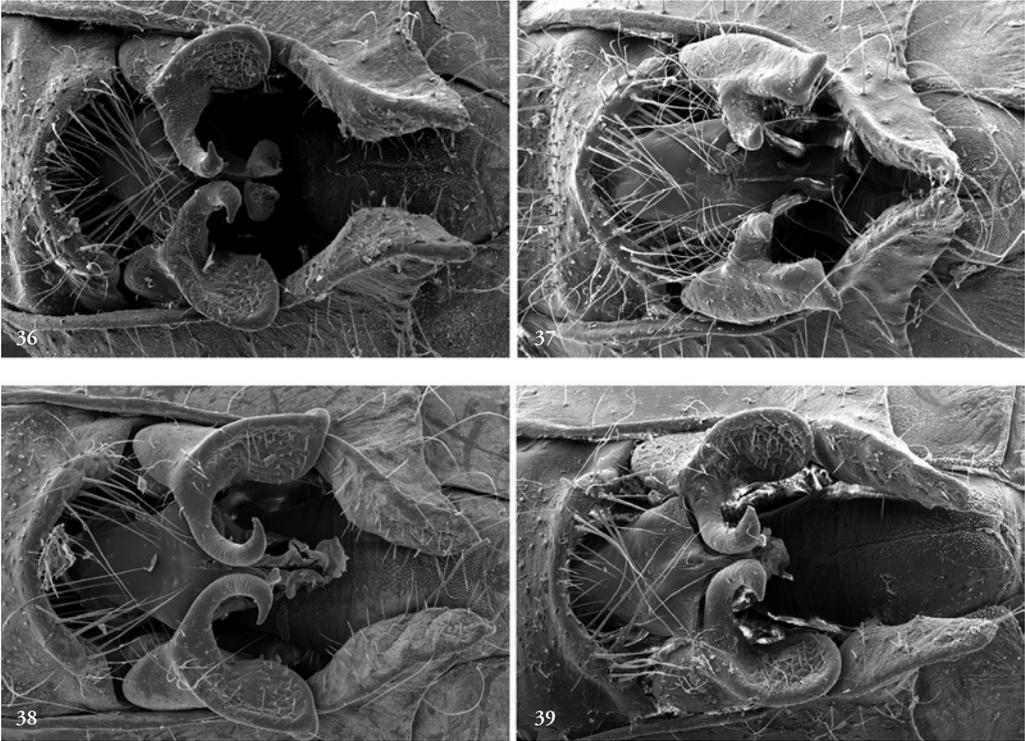
Legs black except posterior yellow spots on mid and hind coxae and greenish yellow interior side of fore femora and trochanter. Hind femora and trochanters with only scattered hairs. Hind femur thicker than in other species, with 16-19 spines in outer anterior row placed in single but somewhat irregular file (fig. 18, 23). These spines quite stout, closely and evenly spaced, diminishing in size only slightly towards base, in lateral view appearing like the serrations of a saw. The spine closest to apex is the longest, about as long as half-width of femur, remaining spines much shorter, third or less as long as apical spine, most basal spine only about a tenth of femoral width long.

Abdomen slender, S3 about 2x as long as wide with posteriorly slightly converging sides, S4 about 3x as long as wide and parallel-sided. Abdomen brown-black, marked with pale green (figs. 28, 33): S1 with largely latero-apical marking and roughly semicircular spot on dorsum. Ventral half S2 largely pale, black on genital lobe and ventral border, with dorsal spot anterior of subbasal transverse ridge, of similar size and shape as S1 spot, and posterior of ridge a dorsal bar that is about twice as broad as the two preceding spots. S3 largely pale, with dark apical ring and dark transverse bar lying anterior of transverse ridge (unlike the ring, the bar is laterally interrupted), resulting in a pattern of four bands in dorsal view: two basal and subapical pale ones and two slightly narrower subbasal and apical ones, the

pale bands traversed by slight darkening on dorsal carina. S4 with large triangular latero-basal spots, which extend along two-thirds of lateral carina and are quite narrowly separated by black on dorsum. S5 with oval subbasal spot on lateral carina. S6 with yellow subbasal band occupying about three-fifths of segment. Basal dark area and subbasal band extend somewhat posteriorly along dorsal carina, thus the band appears skewed in lateral view. S7-10 all dark. Cerci dull greenish yellow, with about eight black denticles scattered on ventral side and black denticle on apex, epiproct dark brown but yellowish in centre and black at apex. Paler appendages hardly contrasting with S10. Venter of abdomen (sternites and ventral portions tergites) brownish black, tergites largely greenish or yellowish where pale lateral markings extend below lateral carinae. Secondary genitalia similar to *P. asperipes*, with round lobe and long curved hook of hamule (cf. fig. 36).

Bambesa female. – Measurements (mm): entire length not taken (too fragmented), abdomen length (without appendages): 16.5, Fw length: 30, Hw length: 28.5, Fw Pt: 2.5.

More robust and stouter than male, S3 as long as wide, S4 about 1.5x as long as wide, both almost parallel-sided. Marked similarly to male but dark areas much browner, there hardly being any black on body. Head especially pale, only blackish on inner third of labial palps, anterior third of labrum and on postgenae against occiput. Head markings thus very ill-defined, especially on postgenae where only



Figs. 36-39. Secondary genitalia of *Porpax* species in ventral view. – 36, *P. asperipes*; 37, *P. garambensis*; 38, *P. risi*; 39, *P. sentipes*.

ventral yellow streak is distinguishable. Thoracic pale markings on the other hand crisp, pale green on rusty brown background, less extensive than in male: postdorsal stripes well-separated from spots against antealar sinus, interpleural stripe as broad as posteriorly adjacent pale stripe on metepisternum. Unlike male, prothorax with small lateral spot above coxa. Abdomen marked like that of male, but contrast so weak that potential differences are hard to make out especially on S6 where the pale band can barely be distinguished. Wings similar to those of male, including open anal loop, differing as follows: Faint yellow at bases more extensive, about to Ax1 and Cux1. $11\frac{1}{2}$ Ax in both Fw. 10-11 Px in Fw, 10 in both Hw. 2 Cux in both Hw. Discoidal field of 3 cells bordering triangle, then 2 rows for 3-4 cells. Anal field of 3 rows at tornus. Open anal loop of 23 or more cells (damaged in left wing). Legs black, save basal two-thirds mid and hind femur, interior side of fore and mid femur yellowish for their entire and half-length respectively. Hind femora and trochanters with only scattered hairs. 10-11 rather long spines in outer anterior row

of hind femur widely spaced and in single file. Most apical spine almost as long as width of femur, most basal spine only about a tenth as long as apical one. Vulvar scale appressed, extending just beyond tergite S8, with two round lateral swellings densely set with short hairs, the swellings separated by a shallow round concavity that is slightly wider than one swelling (fig. cf. 41). Cerci and epiproct brown, not contrasting with S10, cerci with black denticle on apex.

Variation

This species is uniform in morphology, but the specimens studied from four disjunct areas showed slight but discrete differences in markings, mainly of the head (table 2). Although the eastern- and westernmost forms are the palest and darkest respectively, the variation is not perfectly clinal: at least the extent of pale marking on the labrum, postgenae, synthoracic sides, dorsum S3 and epiproct does not increase linearly eastwards. Because of the clear geographic pattern, it might seem appropriate to consider the forms as subspecies. Unfortunately that category

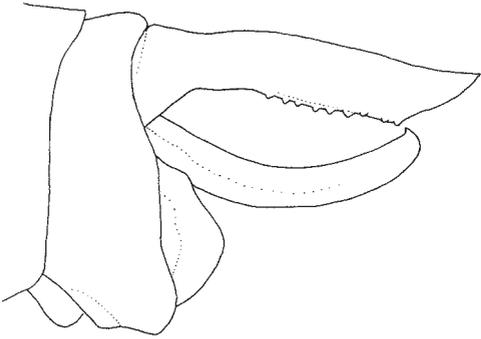
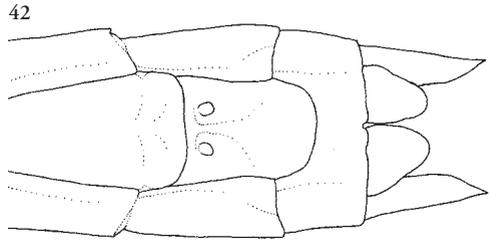
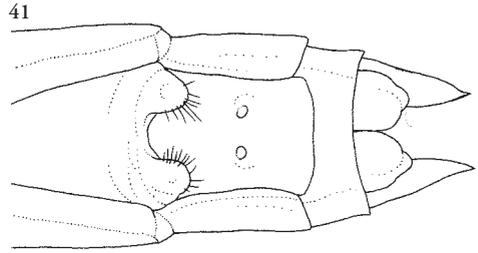


Fig. 40.
Male appendages of *Porpax sentipes* in lateral view.



Figs. 41-42.
Female S8-10 with vulvar scale of *Porpax* species in ventral view. – 41, *P. asperipes*; 42, *P. garambensis*.

has lost most of its value, having been loosely and haphazardly applied in odonate taxonomy, generally without consideration of geography and intraspecific variation. With only small samples to study, I therefore prefer not to name the variation. The pale easternmost variety is most distinctive, dark areas being brown rather than black, which includes the postgenae marked with faint spots (fig. 6). The Gabonese variety shares the brown postgenae but is otherwise quite black and most similar to the Liberian-Ivorian variety. Both have conspicuous entirely pale appendages, but broad black markings on thorax and abdomen (fig. 44). The distinguishing feature of the westernmost variety is the black postgenae with three distinct pale spots (fig. 4). The Cameroonian variety has only two such spots (fig. 5) and – uniquely – also has two pale spots on the labrum (fig. 1), the feature for which the species is named. Some variation is also observed within regions. In the Bambesa specimens the upper postgenal spot may be reduced or missing and the middle one is then also small. The extent of dark markings varies, for instance on the posterior border of the labium, the dorsal carina of S3 and the synthorax.

Range and ecology

Studied material originates from four discrete areas: around the Liberia-Côte d'Ivoire border, SW Cameroon and adjacent Nigeria, NE Gabon, and Bambesa in NE Congo-Kinshasa, which lies on the northernmost edge of the Ituri Forest. Lempert (1988) stated 'Kongo' as part of this species' range. Although Pinhey

(1966) described *P. bipunctus* as part of the treatment of a Congolese collection, his specimens were all from Cameroon and Nigeria. Legrand & Couturier (1985) found the species on standing water on the upper courses of rainforest streams in Taï Forest, Côte d'Ivoire. In Liberia, Lempert (1988) observed several males perching near a dry side-arm of such a stream; teneral emerged from moist leaf litter on the stream bank at the beginning of the relatively dry season and adults were subsequently seen along forest roads. Labels of the Gabonese males read 'bord inondée' and 'ruisseau'. The larvae may live among leaf litter in rainforest pools when these are temporarily filled by small streams; adults surviving drier periods.

Porpax garambensis Pinhey
(figs. 9, 12, 19, 24, 29, 34, 37, 42)

Porpax garambensis Pinhey, 1966: 53. Holotype ♂: CONGO-KINSHASA: Parc National de la Garamba, 7.v.1952, H. De Saeger (MRAC) [examined].

Other material. – CONGO-KINSHASA: 1 ♀, Lulonga, Lukolenge, 18.vi.1927, J. Ghesquière (MRAC); 1 ♂, Lubonga, 24.iii.1929, R. Geldof (MRAC); 1 ♀, Nioka, ii.1934, J.V. Leroy (MRAC); 2 ♂, 2 ♀, Ubangi, Bomboma, ii.1934-x.1935, A. Bal (MRAC); 1 ♀, Ubangi, Terr. Giri, Banza, ii.1935, A. Bal (MRAC); 6 ♂, 1 ♀, Uele, Bambesa, i-xii.1938, J.M. Vrijdagh (MRAC); 2 ♂, ♀, Uele, Bambesa, v.1939, P. Henrard (MRAC); 2 ♀, Lualaba, Kabongo, xi.1952, Ch. Seydel (MRAC).

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Figs. 43-45.

Porpax species. – 43, female *P. asperipes* near Lokutu, Congo-Kinshasa; 44, male *P. bipunctus* near Jalay Town, Liberia; 45, male *P. risi* on the Nyika Plateau, Malawi. Photographs by K.-D.B Dijkstra (43, 45) and J. Lempert (44).

44



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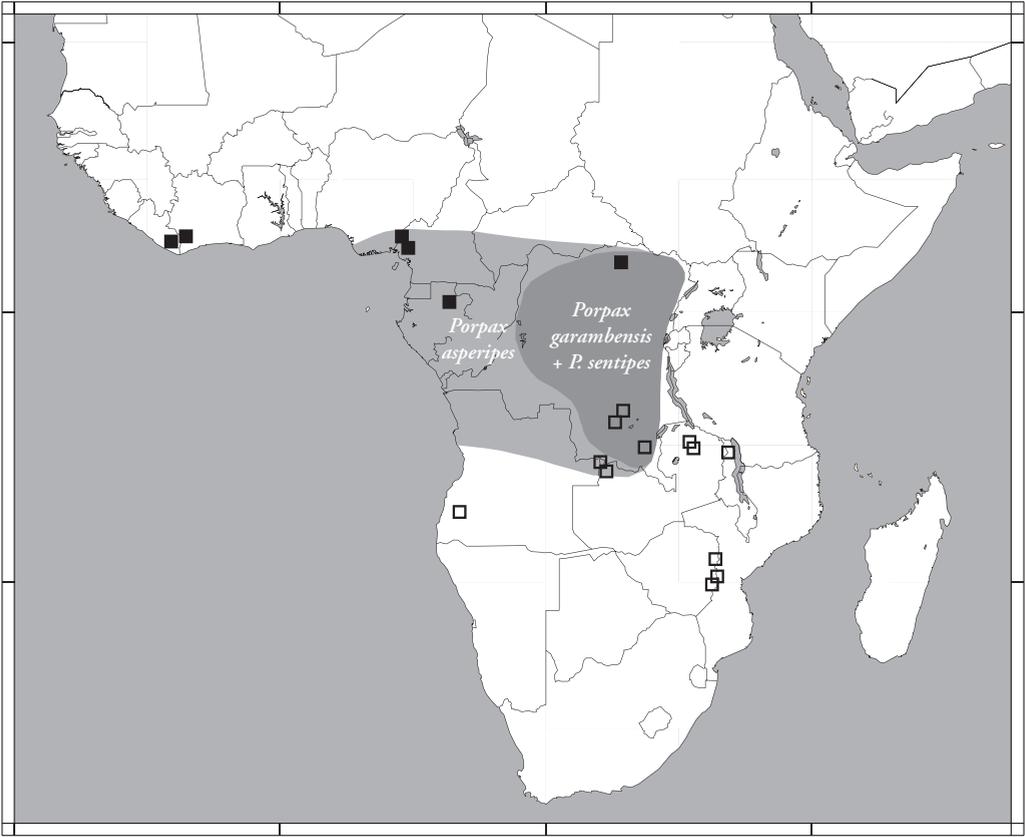


Fig. 46. Distribution of the genus *Porpax*. Legend. – dark grey: approximate range of *P. garambensis* and *P. sentipes* (see fig. 47); pale and dark grey: *P. asperipes*; filled squares: *P. bipunctus*; open squares: *P. risi*.

Diagnosis

The smallest species, easily identified by its dark synthoracic venter and spiracular dorsum, and the shape of the postdorsal stripes (fig. 9). The only species with distinctive hamule and vulvar scale morphology (figs. 37, 42), and usually single Hw Cux; the hair on the male's hind femora is especially long and dense (figs. 19, 24). Males appear to become pruinose only on S3 and sometimes on adjacent parts of S2 and S4.

Female

Not described by Pinhey (1966). Head similar to male but thorax and abdomen generally pale, and rather variable in this respect. Although the pale markings are identically configured, these may be so extensive and weakly contrasting with the darker surrounding that they become fused. There may also

be large pale areas where these are not seen in males, e.g. often on synthoracic venter and spiracular dorsum. Hind femora and trochanters are distinctly hairy. The outer anterior row of hind femur has 7-8 rather long spines that are widely spaced and in a single file. The most apical spine is almost as long as the width of the femur. Wings are distinctly brown at bases, almost to Cux1 in Hw. The vulvar scale is bare, curved ventrad, its distal border at a 45° angle to abdominal axis, and extends along about a third of tergite S9, its distal border smooth and round. Cerci and epiproct are yellowish, contrasting with S10, cerci with black denticle on apex.

Range and ecology

Previously known only from the fragmented and rather teneral holotype, but widespread in Congo-Kinshasa (fig. 47). The habitat is unknown.

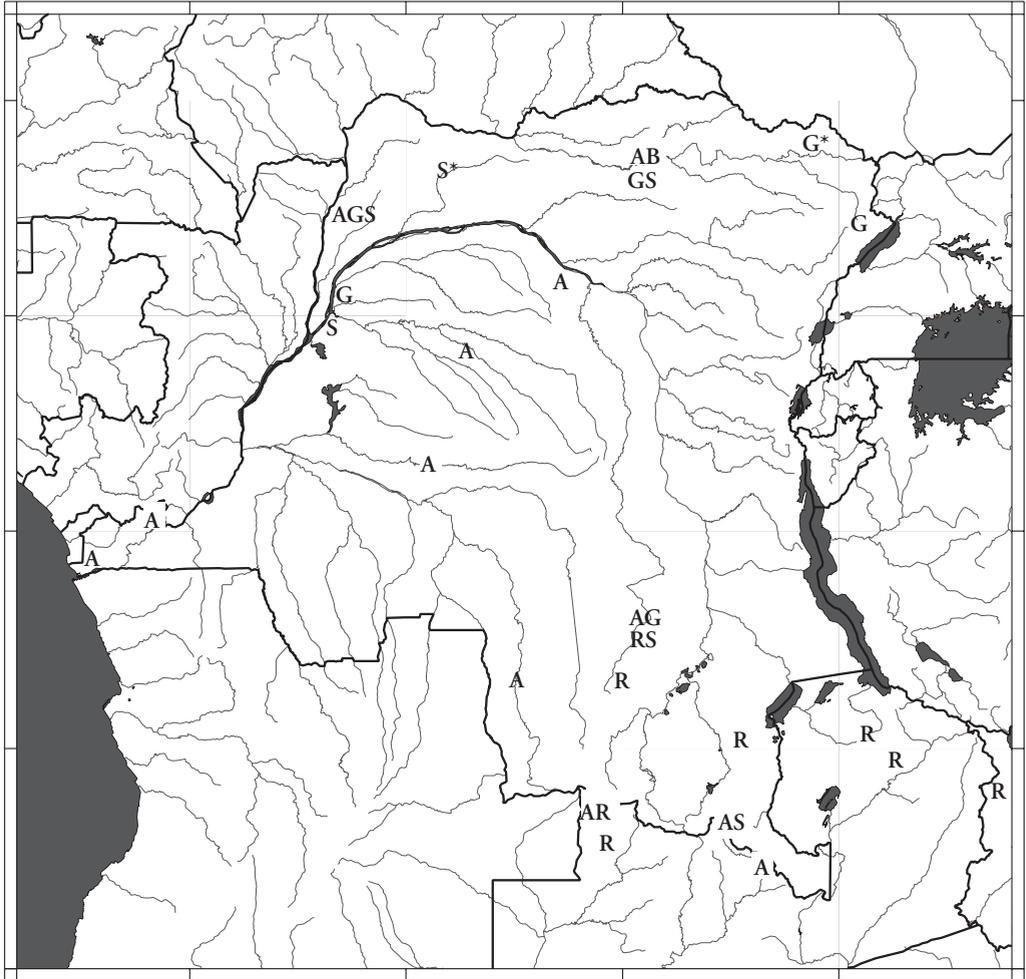


Figure 47. Distribution of *Porpax* species in Congo-Kinshasa, Zambia and Malawi. Legend. – A: *P. asperipes*; B: *P. bipunctus*; G: *P. garambensis*; R: *P. risi*; S: *P. sentipes*; *: type locality.

Porpax risi Pinhey

(figs. 2, 7, 13, 20, 30, 35, 38, 45)

Porpax asperipes nec Karsch, 1896 – Ris 1919: 1129.

Porpax asperipes risi Pinhey, 1958: 115. Holotype ♂: ZIMBABWE: 'Chibudzana R., Melsetter Dist. Dept. Agric. S. Rhodesia, 26/2.1948', J.A. Whellan, Collector', 'TYPE ♂ *Porpax asperipes* ssp. *risi* Pinhey 1956', BRIT.MUS. 1959-138' (BMNH) [examined].

Porpax risi Pinhey, 1958 – Pinhey (1964a: 117, 1964b: 334, 1966: 52).

Other material. – CONGO-KINSHASA, 1♂, Lualaba, Kabongo, xi.1953, Ch. Seydel (MRAC); 2♂, Lualaba, Kamina, xi.1953, Ch. Seydel (MRAC); 1♂, Katshupa, 1.xi.1962, J.J. Symoens (MRAC); 1♂, 2♀, 15 km SW of Msipashi, 2.xi.1962, J.J. Symoens (MRAC); 17♂, 10♀, 20 km SW of Msipashi, 2.xi.1962, J.J. Symoens (MRAC).

–MALAWI: 2♂, 2♀, Northern Region, Rumphi District, Nyika National Park, Mwenyenyesi Valley below Chelinda Campsite (10°35.19'S 33°47.73'E), 2285 m, herbaceous marsh in montane grassland, 20.xii.2001, K.-D.B. Dijkstra (RMNH). – ZIMBABWE: 1♀ ('allotype'), Melsetter Dist., Chibudzana R., 14.xi.1948 (BMNH).

Diagnosis

This small, broad-bodied species is the most distinctive by markings, appearing pale and spotted rather than dark and banded, differing in both sexes by the largely pale labrum, pale veins and abdominal spotting (figs. 2, 30, 35). There are additional pale spots on the upper postgenae, sides of prothorax, fore coxae and anterior mesokatepisternum, which are not or

only indistinctly seen in all other species (figs. 7, 13). Pt is relatively long and pale; 2.5-3.5 mm and pale brown rather than 2-2.5 mm and dark brown. Morphologically it is similar to *P. asperipes*, but the lobe of the hamule is somewhat pointed and its hooks are especially long and slender (fig. 38).

Remarks

First described by Ris (1919, 1921) as an aberrant *P. asperipes* and later described as a subspecies by Pinhey (1958). Pinhey (1964a, b, 1966) raised *P. risi* to species level in three separate papers; Lieftinck (1969) provided a full comparison of the two.

Variation

The holotype has a continuous pale mesepimeral stripe (fig. 13) and half-black labrum. Specimens from NW Zambia and Katanga may have the mesepimeral stripe broken and the labrum largely pale (fig. 2). Both entire and broken mesepimeral stripes occur in the Malawian material (fig. 45).

Range and ecology

The species was known from NW and NE Zambia, the Kundelungu Plateau in S Katanga, and the mountains on the Mozambique-Zimbabwe border and in SW Angola (Lieftinck 1969, Pinhey 1975, 1984). *P. risi* was found for the first time in Malawi at 2285 m altitude on the Nyika Plateau (fig. 45). The habitat was open, herbaceous montane marsh. Syntopic species on the Kundelungu Plateau (*Africallagma sinuatum* (Ris, 1921) and *Pseudagrion inconspicuum* Ris, 1931; Pinhey 1967) suggest that the habitat there was similar. The species can be expected in SW Tanzania, e.g. in the Ufipa and Kipengere highlands. Pinhey (1966, 1984) stated 'open swamps' and 'swampy grasslands or reed-beds in or near forest or litus [= gallery streams]' as the habitat.

Porpax sentipes sp. n.

(figs. 3, 14, 21, 25, 31, 40)

Type material. – Holotype ♂: CONGO-KINSHASA: Ubangi, Businga, 2-4.iii.1932, H. J. Brédo (MRAC). – Paratypes: CONGO-KINSHASA: 7♂, 1♀, Eala, xii.1934-xi.1936, J. Ghesquière (MRAC); 1♂, 1♀, Ubangi, Busu Bombenga, 15-25.viii.1935, A. Bal (MRAC); 1♂, Elisabethville (= Lubumbashi), iii.1936, Ch. Seydel (MRAC); 68♂, 7♀, Uele, Bambesa, iii.1937-v.1939, J.M. Vrijdagh (MRAC); 15♂, 4♀, Uele, Bambesa, x.1938-v.1939, P. Henrard (MRAC); 1♂, Lubumbashi, 13.vii.1951, Ch. Seydel (MRAC); 1♂, Lualaba, Kabongo, x.1953, Ch. Seydel (MRAC).

Diagnosis

A fairly small, bare-legged species with uniquely duplicated row of spines on the hind femora (figs. 21, 25). Rather average in other features, the markings are quite like *P. asperipes*, the combination of the lateral prothoracic spot, (usually) dark spiracular dorsum and the S6 ring uninterrupted by black dorsally being diagnostic.

Description

Holotype male. – Measurements (mm): entire length: 31, abdomen length (without appendages): 19, Fw length: 24.5, Hw length: 23.5, Fw Pt: 1.7.

Prenotum black, labial palps yellow with inner three-fifths and squames black, this central black area widening anteriorly and extending thinly along anterior border. Mandibles greenish yellow, genae blackish. Labrum glossy black. Anteclypeus dark brown, postclypeus pale green, with anterior border narrowly black laterally and dark brown centrally (above anteclypeus). Frons broadly glossy black anteriorly, narrowly black bordering vertex and in median groove, enclosing two large pale green blotches on dorsum (fig. 3). Vertex black, dorsally with large pale green spot. Anterior half of occipital triangle black, posterior half and down occiput pale green. Postgenae black with isolated, contrasting, small, roundish yellow spot subdorsally and similar streak bordering eyes at ventral end (cf. fig. 5). Antennae and their bases black. Labrum, clypeus, frons, vertex, occiput and genae with long black hairs.

Prothorax black with pale green markings (fig. 14): anterior half forelobe and entire hindlobe, two vague and tiny spots on midlobe bordering hindlobe, prominent spots on pleura, occupying most of proepimeron. Hindlobe with fringe of long black hairs. Synthorax black with greenish yellow markings: Two small, closely apposed spots of unequal size on spiracular dorsum, just anterior of middorsal carina. Postdorsal stripes linear, closer to middorsal carina than humeral suture, parallel to carina, black area between the two postdorsal stripes just under twice as broad as one stripe. Antealar sinuses each with large oval spot, bordered anteriorly by smaller triangular spot on mesepisternum, these separated from postdorsal stripes by distance about equal to the width of the stripes. Mesepimeron and metepisternum both with pale stripe, former straight and unbroken, latter broken at metastigma and with dorsal section strongly sigmoid. Interpleural black area broader than two aforementioned stripes. Metepimeron largely pale, black on borders, this black extending from ventral side towards centre of metepimeron. Metapleural black area wider than pale stripe on metepisternum. Mesokatepisternum and metakatepisternum with pale spot on ventral corner. Synthoracic venter black with

large contrasting yellow blotches on metepimeron and sides of poststernum. Antealar sclerites black with greenish yellow central spots, interalar plates greenish yellow narrowly outlined with black.

Venation blackish. Wing membrane clear, very narrowly brown at base of Hw cubital space and along membranule. Membranule dark brown, paler at base. Pt brown. $10\frac{1}{2}$ Ax in both Fw, 8-9 in Hw. 9 Px in Fw, 9-10 in Hw. Arculus distal of Ax2 in all wings. 1 Cux in both Fw, 2 in Hw. Fw triangles just over 3x as long as wide, uncrossed, supratrangles without cross-veins, subtriangles of 2-3 cells. Discoidal field of 3 cells bordering triangle, then 2 rows for 4-6 cells, becoming 3 rows just proximal of nodus, Mspl scarcely defined. Hw triangle uncrossed. IR3 and Rspl enclosing single row of 5 cells in all wings. Anal field of 2 rows near rounded tornus, anal loop of 13 cells with blunt tip. Bridge spaces with 1 cross-vein.

Legs black save some yellow on outer ridge fore coxae, yellow posterior spots on mid and hind coxae and yellowish interior side of fore femora and trochanter. Hind femora and trochanters with only scattered long hairs. About 28 small spines, densely arranged in outer anterior row of hind femur: 16 spines in two files on basal third of femur, and irregular single file of about 12 spines in apical two-thirds (cf. figs. 21, 25). Most apical spine longest, about as long as half-width of femur, remaining spines much shorter, most apical spine about twice as long as most basal, but still only about a seventh of femoral width long. Right hind leg missing.

Abdomen slender, S3 about 2x as long as wide with posteriorly converging sides, S4 about 3x as long as wide and parallel-sided. Abdomen black, marked with greenish yellow (fig. 31): S1 with long lateral mark along apical border and roundly triangular apical spot on dorsum. S2 with round spot above genital fossa and dorsal band narrowing laterally anterior of subbasal transverse ridge. S3 broadly pale laterally and basally, forming a basal ring, which is almost complete (very thinly dark on dorsal carina), occupying half of distance between basal border and subbasal ridge. Pale lateral area S3 also extends slightly dorsally on posterior side of ridge. S4 with large triangular latero-basal spots, which extend along two-thirds of lateral carina and are only narrowly separated by black on dorsum. S5 with small latero-basal dots and streak on lateral carina. S6 with complete, rectangular subbasal band occupying less than half of segment (cf. fig. 34). S7-10 all black. Cerci and epiproct pale yellowish, contrasting with S10, cerci with 8-9 black denticles in a neat slightly sigmoid row (ventral view) on ventral side, and black denticle on apex, epiproct darkened at extreme tip. Venter of abdomen (sternites and ventral portions tergites) black, only narrowly yellowish below lateral carinae where there are

pale lateral markings. Secondary genitalia similar to *P. asperipes*, with round lobe and long curved hook of hamule (fig. 39).

Female paratype Busu Bombenga. – Measurements (mm): entire length: 30, abdomen length (without appendages): 17.5, Fw length: 26.5, Hw length: 25.5, Fw Pt: 2.3.

Larger, more robust and stouter than holotype, S3 as long as wide, S4 about 1.5x as long as wide, both almost parallel-sided. Markings as in holotype but pale areas less green and more extensive, especially on abdomen and dark areas of thorax and abdomen browner. Greater extent of pale markings and fainter contrast especially obvious on S3, which on dorsum has complete basal and subapical pale brown rings, and narrower subbasal and apical dark brown rings. Wings similar to those of holotype, differing as follows: Hw base has slightly more brown. $10\frac{1}{2}$ Ax in both Fw, 8 in Hw. 8-9 Px in Fw, 8-9 in Hw. One Fw triangle crossed, both subtriangles of 3 cells. Discoidal field of 2 cells bordering triangle in left wing. Anal loop of 14-15 cells. Hind femora and trochanters with only scattered long hairs. 10-11 rather long spines in outer anterior row of hind femur widely spaced and in single file. Most apical spine about two-thirds as long as width of femur, most basal spine about a fifth as long as apical one. Vulvar scale appressed, extending just beyond tergite S8, with two round lateral swellings densely set with short hairs, the swellings separated by a shallow round concavity that is about as wide as one swelling (cf. fig. 41). Cerci and epiproct pale yellowish, contrasting with S10, cerci with black denticle on apex.

Variation

The labrum and spiracular dorsum are typically all black, but both can have two small pale dots in their centre (fig. 3), which can be fused into one larger marking on the spiracular dorsum.

Etymology

The name (noun in apposition) is an analogy to *asperipes* (rough legs) and is derived from the Latin *sentus* (briary, thorny), referring to the diagnostic patch of thorns on the hind femora.

Range and ecology

Appears to range throughout the Congo Basin (fig. 47). Nothing is known about the ecology.

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