

The antlions of southern Africa (Neuroptera: Myrmeleontidae): genus *Palparellus* Navás, including extralimital species

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Palparellus Navás is reinstated as a valid genus and is revised. Twelve species comprise the genus, eight from southern Africa, two from central Africa and one each from Madagascar and India. A key to the species is provided and all are redescribed. One new species, *P. ulrike*, is described from southern Africa. The following species are synonymized: *Palparellus mistus* Navás and *P. excelsus* Navás with *P. nyassanus* (Navás); *P. roratus* Navás with *P. festivus* (Gerstaecker); *Palpares formosus bifasciatus* Stitz with *P. dubiosus* (Péringuey); *P. ruspolii* Navás with *P. rothschildi* (Van der Weele); *P. dubiosus* Navás with *P. astutus* (Walker). *Palpares virgineus* Stitz is a *nomen nudum*. A checklist of valid species and synonyms is provided. Larvae are unknown.

Key words: Palparini, Afrotropical, Oriental, Madagascar, systematic revision, distribution.

INTRODUCTION

Southern Africa harbours a high diversity of antlions (Neuroptera: Myrmeleontidae), with over 180 species in 50 genera, including many ecologically and economically important taxa. The larvae are all specialized predators that fulfil a role in regulating insect populations, especially in arid areas. They are consequently a significant element of the insect fauna of this subregion, where many endemic taxa occur. Some genera are also closely related to those of other continents, raising intriguing questions about their historical biogeography (Mansell 1990b). Despite this, it remains difficult to identify many of the genera and species because of their unresolved systematics and the existence of numerous undescribed taxa.

Palparellus Navás is an enigmatic genus of 12 attractive species in the tribe Palparini. It includes *P. voeltzkowi* (Kolbe) from Madagascar, one of the largest and most striking of all antlions. Southern Africa is the centre of diversity of *Palparellus*, with eight species inhabiting this subregion. Two species occur in central Africa, while Madagascar and India each harbour one.

Palparellus was described by Navás (1912a) with *Palpares spectrum* Rambur, 1842, as type species. Navás did not differentiate the genus clearly, and it was treated as a subgenus by Banks (1913), and later as a synonym of *Palpares* Rambur by Esben-Petersen (1916). Neither Banks nor Esben-Petersen substantiated their conclusions, and the resulting uncertainty saw species being placed in three

different genera, *Palpares*, *Palparellus* and *Tomatares* Hagen, by subsequent authors. *Palparellus* was still listed as a synonym of *Palpares* by Oswald & Penny (1991).

Although no autapomorphy has yet been detected to confirm the monophyly of *Palparellus*, the species constitute a homogeneous group that clearly differs from other palparine genera, and the genus is reinstated here as a valid taxon. Twenty four species of *Palparellus* have been documented in the 153 years since the description of *P. spectrum*. Twelve are synonyms and one is a *nomen nudum*, further complicating the systematics of *Palparellus* and necessitating this revision of the genus.

The revision is based on a study of all type material relevant to *Palparellus* and 472 other specimens in the following collections: The Natural History Museum, London (BMNH); Ernst-Moritz-Arndt-Universität, Greifswald (EMAU); H. Hölzel Collection, Brückl (HHCA); H. & R. Rausch Collection, Scheibbs (HRRC); H. & U. Aspöck Collection, Vienna (HUAC); Institut Royal des Sciences Naturelles de Belgique, Brussels (ISNB); Musée d'Histoire Naturelle, La Chaux-de-Fonds, Switzerland (MCFS); Museo Civico di Storia Naturale, Genova (MCSN); Museum of Comparative Zoology, Harvard University, Cambridge (MCZC); Muséum National d'Histoire Naturelle, Paris (MNHN); Naturhistorisches Museum, Vienna (NHMV); Natural History Museum of

Zimbabwe, Bulawayo (NMBZ); Hope Entomological Collections, Oxford (OXUM); P. Ohm collection, Kiel (POCG); South African Museum, Cape Town (SAMC); National Collection of Insects, Pretoria (SANC); State Museum of Namibia, Windhoek (SMWN); Transvaal Museum, Pretoria (TMSA); National Museum of Natural History, Washington (USNM); Zoological Institute, Lund University, Lund (ZILS); Museum für Naturkunde der Humboldt-Universität zu Berlin (ZMHB).

Abbreviations for morphological features are provided in the description of the genus. Computerized database numbers are cited for all specimens in SANC, under the accession code NEU. Label data on the type specimens are cited verbatim and a forward slash is used to separate data from consecutive labels. Additional data on all material examined are given in brackets.

This is the sixth contribution documenting the southern African antlions (Mansell 1985, 1987, 1988, 1990a, 1992a) and the third treating the Palparini. A checklist of valid species of *Palparellus* and their synonyms is provided in Appendix 1.

Genus *Palparellus* Navás

Palparellus Navás, 1912a: 225. Banks 1913: 186 (subgenus of *Palpares*); Esben-Petersen 1916: 11 (synonym of *Palpares*). Type species: *Palpares spectrum* Rambur, 1842, by original designation.

Parparellus (sic): Navás 1913b: 89.

Diagnosis

Medium-sized to large Palparini with small head, large globose eyes, narrow frons and long clavate antennae; thorax lacking a median longitudinal stripe; body not hirsute; wings pigmented with shades of brown or metallic-blue, usually on a yellow background.

Redescription

Size (mm). Body (including head) 31.0–80.0; forewing 32.0–80.0; hind wing 31.0–74.0; antenna 5.0–11.0.

Head. Dark-brown to black, wider than thorax, almost rectangular in dorsal view; vertex slightly raised, rounded, with distinct median sulcus and short sparse setae; face below toruli shiny-dark-brown to black, devoid of hair; torular membranes and clypeus yellow, clypeus with sparse long hairs. **Palps** short, shiny-dark-brown to black with yellow articulations; apical labial palpomere slender,

tapering to acute tip with round or oval opening on palpimacula. **Eyes** large, hemispherical, comprising most of head surface area and constricting the frons. **Antennae** long, much longer than width of head, about as long as foreleg; toruli close together, less than scape diameter apart, flagellum black, clavate with short black setae.

Thorax. Dark-brown to black, marked with yellow in some species but lacking median longitudinal stripe. **Prothorax** short, broad, with long erect setae and yellow intersegmental membranes. **Pterothorax** with sparse, long, soft, pale hair.

Wings. Long, usually narrow, marked with shades of brown or metallic-blue generally on a yellow background: some species with forewings almost entirely black (*P. spectrum*, *P. rothschildi* (Van der Weele)). **Forewings** slightly longer than hind wing with single costal series; origin of radial sector (Rs) close to, or opposite level of cubital (Cu) fork; presectoral area with several crossveins and irregular double cells; oblique crossvein (Mp2) originating six to eight cells beyond Cu fork; anterior cubitus (Cua) and first anal vein (1A) separate. **Hind wings** usually with large blotches and bands; origin of Rs proximal to Mp2 fork; presectoral area with 4–6 crossveins, irregular double cells rarely present; Cua arches forward very strongly at junction with posterior branch of Mp2, forming the recurrent vein characteristic of Palparini.

Legs. Long, slender, dark-brown to black; hind legs not extending beyond abdominal segment 3; tarsi usually equal or slightly longer than tibiae, tibial spurs brown, long, slender, slightly curved, extending beyond tarsomere 3 (Ta3); Ta1 to Ta4 short, Ta5 long, usually longer than combined length of Ta1 to Ta4, preapical claws brown, long, slender, slightly curved, almost as long as Ta5.

Abdomen. Long, longer than hind wing in males of some species, sparsely clothed with short black setae and long soft white pubescence proximally. **Male** with tergite 9 (T9) divided, sternite 9 (IX) with short rounded apex and long black setae. Ectoprocts curved, shortish, equal in length to tergite 8 (T8) or slightly shorter, with slender spines and hooks on inner apical surfaces and long slender curved setae on outer surfaces. Gonarcus and parameres sclerotized, fused into a rigid cone-shaped structure; parameres well developed, shiny-black with microscopic striations and a tuft of setae dorsomesally; gonarcus usually straight or slightly curved, gonarcus bulla prominent,

variously shaped. Hypandrium internum (Figs 52, 53) small, delicate, crescent-shaped in lateral view. *Female* (Figs 18, 19) with rounded ectoprocts bearing stout fossorial spines, lateral gonapophyses with stout fossorial spines, anterior gonapophyses with long slender setae; pregenitale sclerotized, triangular. Spermatheca (Fig. 20) slender, tube-like.

Larvae. Unknown.

Distribution. Sub-Saharan Africa, Madagascar, India.

Remarks. *Palparellus*, as constituted here, may be a paraphyletic assemblage, as no autapomorphy has yet been found to confirm the monophyly of the genus. The 12 species, however, form a clearly recognizable group with a unique combination of characters that preclude them from other palparine genera, and *Palpares* in particular. These differences, and their close similarity to one another, warrants a separate genus and the reinstatement of *Palparellus*.

The characters delimiting the genus include: the small, delicate head; large globose eyes; short fusiform labial palps; round or oval palpimaculae; lack of median longitudinal stripe on thorax; uniformly black legs; short, curved ectoprocts; prominent gonarcular bulla; shiny-black parameres; straight or slightly curved gonarcus; heavily pigmented wings (except *P. dubiosus* (Péringuey) and *P. damarensis* (McLachlan)). None of these features can, however, be regarded as autapomorphic. The first seven are found in many antlions, including other Palparini. The gonarcular bulla, paramere and gonarcular traits are unique to the Palparini, but may be plesiomorphic at the level of *Palparellus*. The heavily pigmented wings of most *Palparellus* species could be an autapomorphy, with a parallelism in *Palpares obscuripennis* Schmidt.

The adelphotaxon of *Palparellus* is the *Palpares speciosus* (Linnaeus) group (see Mansell 1992b), that includes *P. obscuripennis*. The *P. speciosus* group is characterized by autapomorphic ectoprocts with an internal lobe, distinguishing it from *Palparellus*. The two groups are otherwise very similar, and a preliminary phylogenetic analysis of the Palparini (Mansell, unpubl.) supports this conclusion as they appear as sister groups on the cladogram. *Palpares elegantulus* Péringuey and *P. graciosus* Navás resemble *Palparellus*, but differ in the apomorphic labial palps of these two species (Mansell 1992b; cf. Figs 6 and 10). The *Palpares sparsus* McLachlan group has a stripe on the thorax, yellow legs with black tarsi and a sensory bulla

between the parameres in some species, distinguishing them from *Palparellus*. Species of *Palparellus* have frequently been included in the genus *Tomatares* because of their pigmented wings, but the resemblance is superficial. The male genitalia of *Tomatares* are distinctly autapomorphic (Mansell 1992b: Fig. 19) and the antennae are short and clubbed, rendering the two genera distinct.

The ten Afrotropical species of *Palparellus* each has an obvious sister species, facilitating their arrangement into five species-pairs on the basis of male genitalia and similarity in wing patterns. They are: *P. nyassanus* (Navás) and *P. festivus* (Gerstaecker); *P. pulchellus* (McLachlan) and *P. ulrike* sp. n.; *P. flavofasciatus* (McLachlan) and *P. ovampoanus* (Péringuey); *P. damarensis* and *P. dubiosus*; and *P. rothschildi* and *P. spectrum*. No adelphotaxa are known for *P. voeltzkowi*, or *P. astutus* (Walker) from India.

The male ectoprocts and gonarcus/paramere complex are diagnostic for *Palparellus* species and are illustrated for all taxa. Female genitalia are more uniform and are only illustrated for *P. nyassanus*.

Palparellus does not occur in the Palaearctic Region, suggesting that the genus may be ancient clade, as the Palaearctic is inhabited by more advanced members of the tribe Palparini (Mansell 1992b).

Biology. Species of *Palparellus* are attracted to light but may also fly during the day. In southern Africa they frequent hillsides with interspersed rocks and grass or shrubs, while some species inhabit open grassland in sandy terrain. They are often numerous and are frequently flushed during the day. Nothing is known of their life histories or immature stages.

Conservation status. The southern African species are not yet endangered, although the three taxa in the Cape Provinces are at risk to pesticides used in anti-locust campaigns. The soil-inhabiting larvae are particularly vulnerable, while the adults are exposed when sprays are applied during their emergence period. At least two species, *P. nyassanus* and *P. festivus* are conserved in the Kruger National Park, and *P. nyassanus* in various Provincial reserves. *Palparellus festivus* also occurs in the Tembe Elephant Reserve in KwaZulu-Natal, while *P. dubiosus* inhabits the Kalahari Gemsbok Park. No extensive spraying is undertaken in Namibia to threaten the four local species. Nothing is known about the status of the four taxa from central Africa, Madagascar and India.

Key to the species of *Palparellus*

1. Large species, forewing longer than 65 mm; wings dark-metallic-blue (Fig. 11); abdomen blood-red; gonarcial bulla large, triangular (Fig. 82); Madagascar *P. voeltzkowi* (Kolbe)
 - Smaller species, forewing shorter than 55 mm; Africa, Oriental Region 2
2. Oriental species. Meso- and metatergites uniformly dark-brown; forewings with distinct yellow band in basal third (Fig. 12); gonarcial bulla flat (Fig. 89) *P. astutus* (Walker)
 - African species. 3
3. Forewings almost entirely black, with two distinct bands, one subapically, one in basal third (Fig. 10); gonarcial bulla small, distinctly rounded (Fig. 77); West Africa *P. spectrum* (Rambur)
 - Forewings less-uniformly marked, with various shades and patterns of yellow and brown on a hyaline membrane, some clearly maculate 4
4. Forewings with distinct, narrow, parallel-sided yellow band in basal third; gonarcial bulla rounded or flattish 5
 - Forewings lacking basal band, or basal band indistinct or irregularly shaped in some specimens of *P. dubiosus*, but this species has extensive yellow and black markings on the thorax, and a prominent, narrow gonarcial bulla, Fig. 59 9
5. Thorax with extensive pale-yellow area mid-dorsally; forewings with two distinct yellow bands, one subapical, one basal; gonarcial bulla large, rounded, projecting upwards (Fig. 17) *P. nyassanus* (Navás)
 - Thorax lacking extensive pale-yellow area .. 6
6. Forewings with distinct subapical yellow band; Namibia, Angola 7
 - Forewings without a distinct subapical yellow band; eastern Africa 8
7. Apical two thirds of hind wings dark-brown, enclosing several large yellow maculae; forewings heavily infuscated; gonarcial bulla large, rounded, projecting upwards (Fig. 51); Angola, northern Namibia *P. ovampoanus* (Péringuey)
 - Hind wings with three broad brown bands; forewings maculate; gonarcial bulla flattish (Fig. 45); Namibia, southern Angola. *P. flavofasciatus* (McLachlan)
8. Forewings dark-brown to black, with many hyaline spots; apical half of hind wings black, enclosing several large hyaline spots (Fig. 9); gonarcial bulla flattish with concave apex (Fig. 71); northeastern Africa *P. rothschildi* (Van der Weele)
 - Forewings without distinct hyaline spots; gonarcial bulla flattish, but with distinctly rounded apex (Fig. 24); southeastern Africa *P. festivus* (Gerstaecker)
9. Meso- and metatergites bright-yellow, each with a central black spot; gonarcial bulla very prominent, narrow (Figs 59, 65) 10
 - Meso- and metatergites uniformly brown, occasionally with tiny yellow spot on mesonotum and faint yellow marks on metanotum; gonarcial bulla rounded 11
10. Forewings heavily maculate (Fig. 8); male abdomen very long, distinctly longer than hind wing; gonarcial bulla with rounded apex (Fig. 65); South Africa, Botswana *P. dubiosus* (Péringuey)
 - Forewings sparsely marked (Fig. 7); male abdomen only slightly longer than hind wing; gonarcial bulla with acute apex (Fig. 59); Namibia .. *P. damarensis* (McLachlan)
11. Forewings heavily maculate with yellow and brown; gonarcial bulla small, flattish (Fig. 33); Northern Cape Province, South Africa *P. pulchellus* (Esben-Petersen)
 - Forewings not heavily maculate, large hyaline areas present; gonarcial bulla large, rounded, projecting slightly upwards (Fig. 39); Namibia, South Africa (Bushmanland) *P. ulrike* sp. n.

Palparellus nyassanus (Navás), Figs 1, 13–21, 91

Palpares nyassanus Navás, 1911: 237; Esben-Petersen 1916: 10 (incorrect synonym of *Palpares flavofasciatus* McLachlan).

Palparellus nyassanus (Navás): Navás 1912a: 225.

Palpares nyassensis (sic): Banks 1913: 185; incorrect synonym of *P. flavofasciatus*.

Palparellus mistus Navás, 1912a: 226. **Syn. n.**

Palpares mistus (Navás): Banks 1913: 185 (incorrect synonym of *Palpares compositus* Navás).

Palparellus excelsus Navás, 1913b: 89; Esben-Petersen 1916: 10 (incorrect synonym of *P. flavofasciatus*). **Syn. n.**

Palparellus (sic) *excelsus*: Navás 1913b: 89.

Diagnosis

Characterized by broad, pale-yellow area on the pronotum, extending dorsomedially along meso- and metatergites. Forewings heavily marked with various shades of brown, and with two diagnostic yellow bands, one basal, the other subapical.

Redescription

Size (mm). Body length male 47.1 (40.0–52.0), female 39.2 (33.0–45.0); forewing length male 42.7 (39.0–46.0), female 45.2 (43.0–53.0); hind wing length male 40.3 (37.0–44.0), female 42.5 (40.0–50.0); antenna 8.6 (7.0–10.0) ($n = 62$).

Head. Dark-brown with several embossed black spots on vertex; labrum usually bright-yellow, occasionally brownish. Labial palps (Fig. 21) with small oval opening on palpimacula.

Thorax. *Prothorax* yellowish dorsomedially, brown laterally with narrow transverse brown band. *Mesothorax* brown, with broad yellowish area on mesoscutum, mesoscutellum almost completely yellow. *Metathorax*: metascutum with two pale-yellow velvety patches, metascutellum yellow, with variable brown area centrally.

Wings (Fig. 1). Fairly broad in females, narrower in males, smoothly rounded but with tiny apical tip. *Forewings* almost completely suffused with chocolate-brown and yellow, with distinctive yellow and brown bands. Costal area with alternating yellow and brown maculae; pterostigma yellow, enclosed in apical yellow band which extends from pterostigma, almost (or occasionally) reaching hind margin, band sometimes variable in width or interrupted; posterior margin infuscated from basal yellow band to apex. Base of wing yellow, with brown maculations between MP and Cua, coalescing with proximal brown band, and with a row of spots along posterior margin sometimes coalescing with each other; basal yellow band distinct, extending from R to posterior margin and flanked by two oblique brown bands; a large brown macule situated centrally, extending from R or Rs to Cua; wing apex infuscated, enclosing several irregular yellow maculae. *Hind wings* pale-yellow with three distinct brown areas sometimes coalescing along posterior margin. Costal area pale proximally, central area with

alternating yellow and brown maculae and a wide brown area proximal to yellow pterostigma. Basal third of wing yellow, occasionally with a macule on hind margin; basal brown band broad, extending from R to posterior margin, dilating posteriorly to enclose one to three yellow maculae; median band similar to proximal band but extending from C to posterior margin; wing apex brown, enclosing an irregular yellow macule.

Legs. Black, hind tarsus equal in length to tibia, fore- and midtarsi longer than tibiae.

Abdomen. Shorter than hind wing, uniformly pale-yellowish-brown. *Male* (Figs 13–17) with yellow ectoprocts; gonarcus straight with prominent rounded bulla. *Female* (Figs 18–20) as in genus.

Distribution (Fig. 91). Northern South Africa, eastern Botswana, Zimbabwe, Malawi.

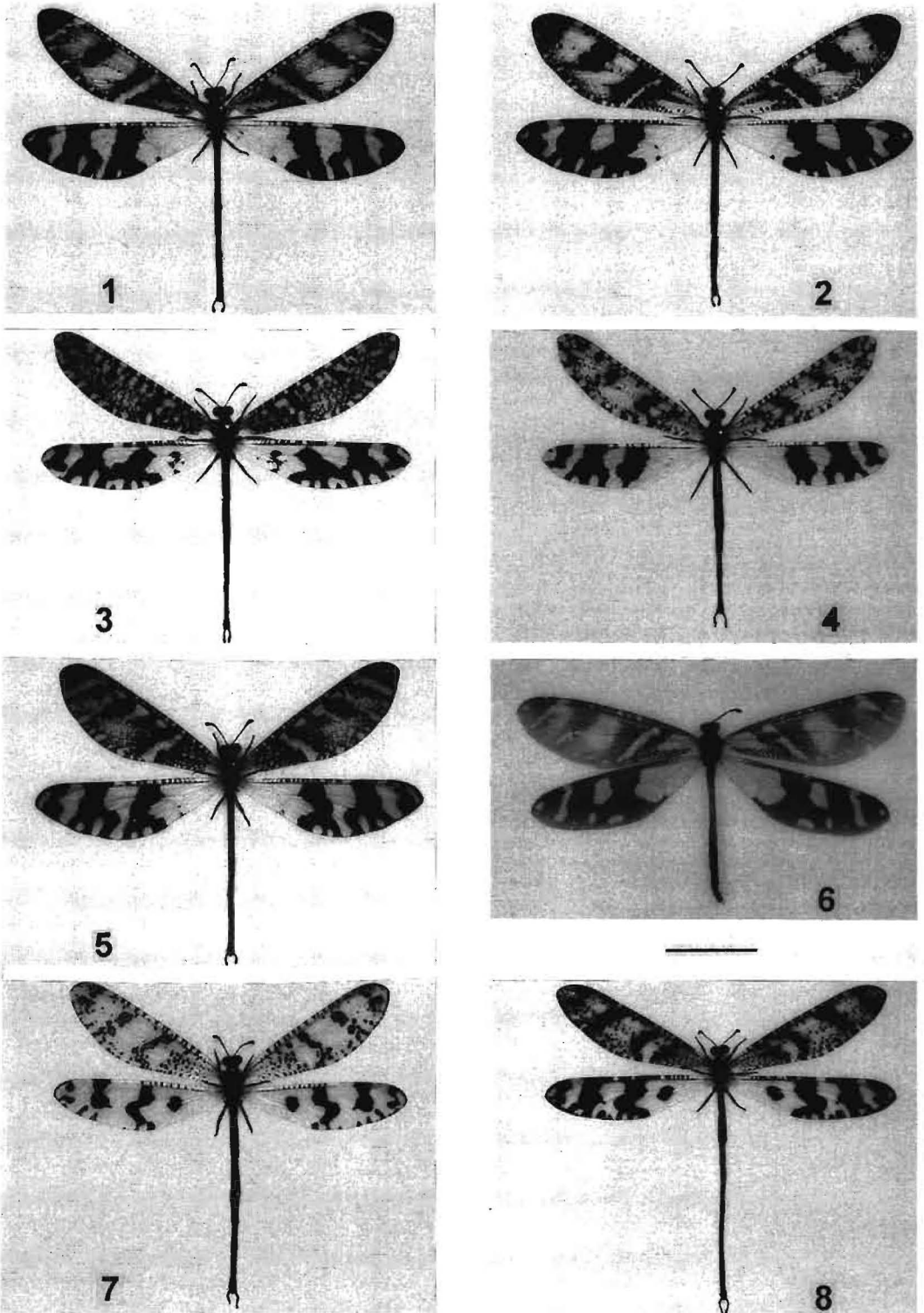
Biology. Adults have been recorded from 1 November to 25 January, but mainly November and December. They inhabit rocky hillsides, where they are encountered in grass and among shrubs in rocky areas. Specimens are also attracted to light.

Remarks. *Palparellus nyassanus* was incorrectly synonymized with *P. flavofasciatus* by Banks (1913) and Esben-Petersen (1916), while two species that are synonyms of *P. nyassanus* have been described. I have examined the holotypes of *P. flavofasciatus*, *Palpares nyassanus*, *Palparellus mistus* Navás and *Palparellus excelsus* Navás and confirm that *P. nyassanus* is a valid species while the latter two are its junior synonyms.

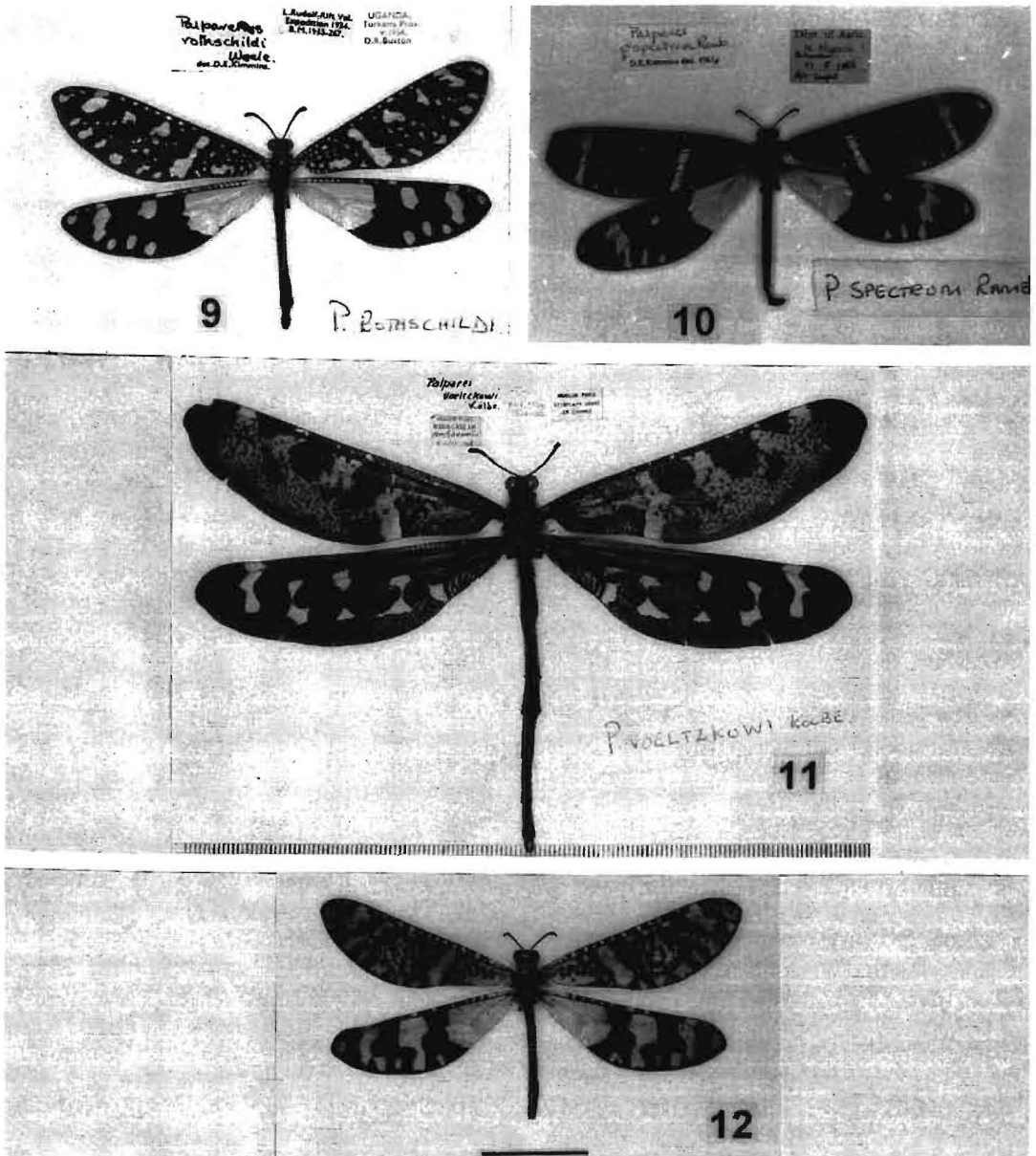
Palparellus nyassanus is the sister species of *P. festivus*, which it closely resembles. It is distinguished from *P. festivus* by the yellow area on the thorax, by the subapical yellow band in the forewing and by the more prominent gonarcus bulla in *P. nyassanus*.

While *P. nyassanus* inhabits the central regions of southern and central Africa, *P. festivus* occurs in the low-lying sandy areas of Mozambique and eastern South Africa. The two species are sympatric in the northern Kruger National Park, but they occupy different habitats, as described under the biology of the two species.

Type material examined. Holotype ♀, *Palpares nyassanus* Navás: 'Palparellus nyassanus Nav, Long Navás det / Lake Nyassa 77-35 / Typus / Type' (BMNH). Holotype ♀, *Palparellus mistus* Navás: 'Heyne 1877 / spectrum det Brauer / Palparellus mistus ♀ Nav / Typus / Coll Nat Mus Wien' (NHMV). Holotype ♀, *Palparellus excelsus* Navás: 'E Rhodesia about 3000 ft, Mpundzi River, Manica, Capt Nov 6-01 & pres 1904 by Guy Marshall MS by



Figs 1–8. *Palparellus* species: 1, *P. nyassanus*; 2, *P. festivus*; 3, *P. pulchellus*; 4, *P. ulrike* (♂ holotype); 5, *P. flavofasciatus*; 6, *P. ovampoanus* (♀ holotype); 7, *P. damarensis*, 8, *P. dubiosus*. Scale bar = 20 mm.

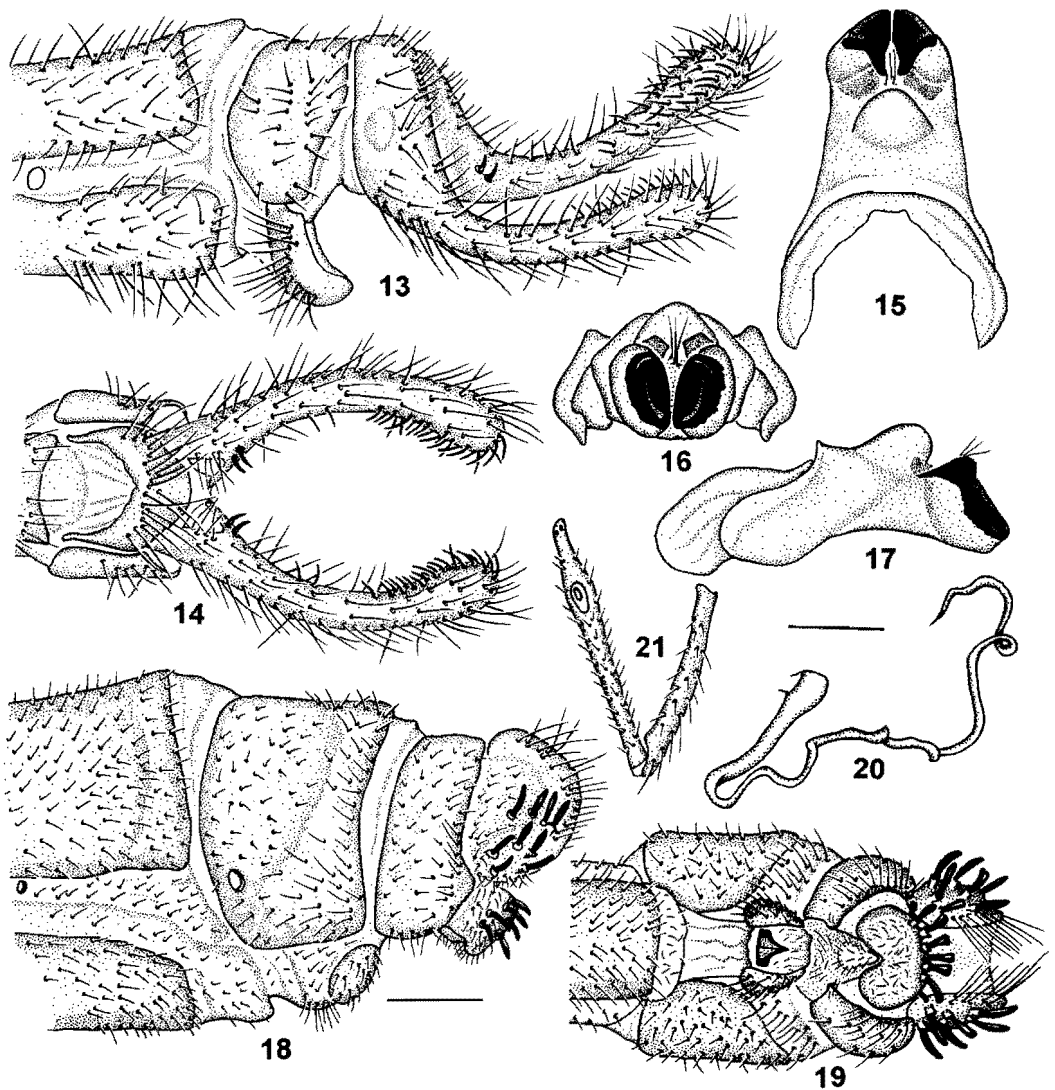


Figs 9–12. *Palparellus* species: 9, *P. rothschildi*; 10, *P. spectrum*; 11, *P. voeltzkowi*; 12, *P. astutus*. Scale bar = 20 mm.

Guy M / *Palparellus excelsus* Nav Ann Soc Sci Bruxelles, 1912 Typus / Mpundsi R (circa 3000 ft) Manica 6-xi-1901 GAK Marshall / 1904 1591 / Type Neur: No 54 *Palparellus excelsus* Navás Hope Dept. Oxford' (OXUM).

Additional material examined. SOUTH AFRICA: Kruger National Park, 1♀, Bobomene, Pafuri, 22.26S 31.12E, 350m, 20.xi.1973, A.L. & H.H. Braack,

NEU01759; 1♀, same data but 27.xi.1973, NEU01760; 1♀, same locality but 23.xi.1973, M.English, NEU01761; 1♀, same locality but 25.i.1984, L.E.O. Braack, NEU00272; 1♂, Punda Maria, 22.43S 31.02E, 550m, 29.xi.1970, A.L. & H.H. Braack, NEU01762; 1♂, 1♀, Mukengalani Fountain, 22.31S 31.01E, 350m, 1.xii.1970, A.L. & H.H. Braack, NEU01763 (all SANC); 3♂, 3♀, Mogol



Figs 13–21. *Palparellus nyassanus*. 13, male terminalia, lateral; 14, same, ventral; 15, gonarcus and parameres, dorsal; 16, same, caudal; 17, same, lateral; 18, female terminalia, lateral; 19, same, ventral; 20, spermatheca; 21, left labial palp. Scale bars = 1 mm (Figs 13, 14, 18, 19); 0.5 mm (Figs 15–17, 20, 21).

Nat. Res., Ellisras Dist., 23.58S 27.45E, 19–23.xi.1979, M.W.Mansell, NEU01764; 3♂, 3♀, same data but 3–5.xii.1985, NEU00615; 1♂, 6♀, same data but 21.xii.1987, NEU00849; 1♀, D’Nyala Nat. Res., Ellisras Dist., 23.45S 27.49E, 850m, 8–11.xii.1989, H.& U.Aspöck, M.W.Mansell, NEU01313; 1♂, 5♀, same data (HUAC, NHMV); 7♀, same locality but 11.xii.1992, M.W.Mansell, H.Hölzel, P.Ohm, NEU01765; 1♀, Loskopdam Nat. Res., 25.25S 29.20E, 12–13.xii.1985, C.G.E.Moolman,

NEU01766; 1♀, Tshipise, 22.37S 30.10E, 28.xi.1988, S.Kamburov, NEU01767 (all SANC); 1♀, same locality but 25.xi.1992, H.Hölzel, P.Ohm, M.W.Mansell (HHCA); 1♀, Omega Farm, Groot Marico (25.41S 26.26E), 28.xi.1992, R.H.Watmough (Watmough Collection); 1♀, Rustenburg (25.40S 27.15E), xii.1908, T.Jenkins (TMSA); 1♂, Soutpan, Vivo Dist. (22.58S 29.20E), 6.xi.1985, R.Toms (TMSA); 2♀, Mosetse Camp, Lapalala, 23.53S 28.20E, 1100m, 9.xii.1995, M.W.& R.W.Mansell, NEU02205 (SANC);

1♀, Messina; (22.20S 30.02E), xii.1918, R.W.Tucker (SAMC). BOTSWANA: 1♀, Tuli Block (22.14S 29.00E), xi.1978, R.Toms (TMSA). MALAWI: 1♂, 1♀, Chipeta Village, Karonga, 09.41S 33.19E, 23.xi.1970, PMhlanga; 2♀, Senga Hills, 2000ft, Senga Bay (13.42S 34.40E), 4.xi.1979, J.G.M.Wilson (NMBZ). ZIMBABWE: 1♂, Victoria Falls (17.55S 25.51E), 7.xii.1914, Nat.Mus.S.Rhodesia (SAMC); 1♂, Kariba, 16.32S 28.50E, 18.xi.1970, B.G.Donnelly, NEU01771; 1♀, Buby River, Lion and Elephant Motel, 21.40S 30.31E, 22.xii.1975, M.W.Mansell, NEU01772 (both SANC); 2♀, Buby Bridge, Chikwarakwara Dip, Chipese TTL, SE Rhodesia (22.15S 31.02E), no date, Fde Moor; 1♂, 1♀, Devuli, S.Rhodesia (Devure Riv., ca. 19.56S 32.15E), 24/25.xi.1965, Nat.Mus.S.Rhodesia; 1♂, 3♀ same data but 12.xi.1965; 1♂, 1♀, Key Sandpit, 17mls N Bulawayo (20.00S 28.44E), S. Rhodesia, xi.1966, Nat. Mus.S.Rhodesia; 1♂, Sawmills (19.31S 28.02E), S.Rhodesia, 22.xi.1922, Rhodesia Museum; 2♀, Sanyati Valley (ca. 16.33S 28.45E), S.Rhodesia, ix/x.1925, R.H.Stevenson; 1♀, Matetsi, S.Rhodesia (18.15S 25.59E), 1925, Rhod. Museum; 1♀, Tschontanda (not located), S.Rhodesia, 24.xii.1942, Nat. Mus.S.Rhodesia; 1♂, 2♀, Katombora Rapids, Zambezi River (ca. 17.45S 25.30E), 3.xii.1982, Nat. Mus./Falc. Coll. Exp.; 1♀, Christon Bank, Salisbury (Harare), S.Rhodesia (17.43S 31.05E), 1.xi.1965, Nat. Mus.S.Rhodesia; 3♂, 1♀, Chete Game Res., 17.30S 27.30E, 3.xii.1980, Nat.Mus.S.Rhodesia, Phillip/Falc. Col. Exp.; 1♀, Chipinda Pools, Gona-re-zhou Game Res. (21.12S 31.56E), xii.1983, C.Sharp (all NMBZ); 1♂, Harare, Mazoe Citrus Ranch, 17.15S 31.02E, 5.xi.1987, A.J.Gardiner, NEU01786; 1♂, Christon Bank, 17.43S 31.05E, 1300m, 22.x.1992, N.J.Duke, NEU01783 (both SANC).

***Palparellus festivus* (Gerstaecker) comb. n.,**
Figs 2, 22–28, 91

Palpares festivus Gerstaecker, 1894: 115.

Palpares mosambicus Péringuey, 1910: 434; Banks 1913: 185.

Palpares latro Navás, 1911: 238; Banks 1913: 185.

Palparellus latro (Navás): Navás 1912a: 225.

Palparellus festivus (Gerstaecker) var. *latro*
Navás: Navás 1915b: 380.

Palparellus roratus Navás, 1913a: 496. **Syn. n.**

Palpares virgineus Stütz, 1912: 115. **Nomen nudum.**

Diagnosis

Resembling *P. nyassanus* but characterized by broad wings, uniformly brown thorax, lack of an

apical yellow band in the forewings and smaller, flatter gonarcular bulla.

Redescription

Size (mm). Body length male 49.5 (44.0–53.0), female 44.1 (33.0–50.0); forewing length male 46.4 (40.0–50.0), female 50.8 (40.0–56.0); hind wing length male 44.4 (40.0–49.0), female 48.6 (38.0–53.0); antenna 9.8 (8.0–11.0 mm) ($n = 34$).

Head. Uniformly brown; clypeus brown with yellowish margins; labial palps shiny-brown, palpimacula with small, round opening in males, oval in females (Figs 27, 28).

Thorax. Uniformly pale-yellowish-brown, with two yellowish velvet patches on metascutum.

Wings (Fig. 2). Similar to *P. nyassanus* but broader, duller, lacking the bright-yellow suffusion and subapical yellow band in forewings.

Legs. Brown, tarsi dark-brown.

Abdomen. Shorter than hind wing, uniformly yellowish-brown. **Male** (Figs 22–26) as in *P. nyassanus* but ectoprocts dark-brown, gonarcular bulla flattish, less prominent than in *P. nyassanus*. **Female** as in genus.

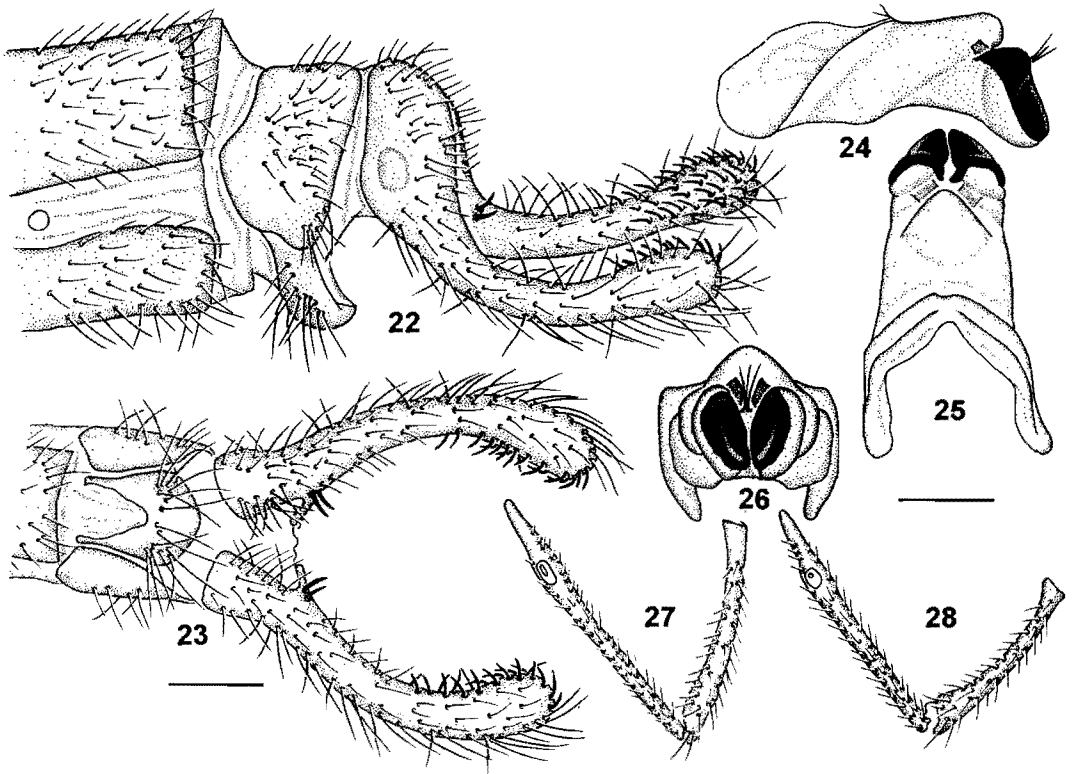
Distribution (Fig. 91). South Africa and Mozambique. Known from only from a few localities in the Kruger National Park, Mozambique and northern KwaZulu-Natal.

Biology. Adults have been recorded from 29 October to 18 February. They have been collected during the day in grassy areas on sandy substrates, particularly in the Tembe Elephant Reserve in northern KwaZulu-Natal and the Nyandu Sandveld in the northeastern Kruger National Park. Individuals are also attracted to light.

Remarks. The holotypes of all species listed in the synonymy have been examined and the established synonymies confirmed: *P. roratus* is added to the list of synonyms. A specimen in ZMHB labelled '*Palpares virgineus* Kolbe, ♂ type, Delagoa Bay', but never described, is mentioned by Stütz (1912). I have examined this specimen and confirm that it is *P. festivus*. It is listed above as a *nomen nudum* to clarify the taxonomic status of this name.

Palparellus festivus is the sister species of *P. nyassanus*, but is easily distinguished as outlined under that species, and by dark-brown ectoprocts in the male. Although *P. nyassanus* and *P. festivus* are sympatric in the northern Kruger National Park, *P. festivus* apparently has a more limited distribution. It is probably more widespread in Mozambique.

Type material examined. Holotype ♀, *Palpares*



Figs 22–28. *Palparellus festivus*. **22**, male terminalia, lateral; **23**, same, ventral; **24**, gonarcus and parameres, lateral; **25**, same, dorsal; **26**, same, caudal; **27**, left labial palp, male; **28**, same, female. Scale bars = 1 mm (Figs 22–23); 0.5 mm (Figs 24–28).

festivus Gerstaecker: 'festivus Gerst. *, Delagoa Bai, Heyne / Zool. Mus. Greifswald II 27420' (EMAU). Holotype ♂, *Palpares mosambicus* Péringuey: 'Lourenço Marques, Howard / Palpares mosambicus type, Py.' (SAMC). Holotype ♂, *Palpares latro* Navás: 'Del. B. / Palparellus latro Nav. Long. Navás det./Typus/Type' (BMNH). Holotype ♀, *Palparellus roratus* Navás: 'Mozambique, EMuir / Brit. Mus. 1950-556 / Palparellus roratus ♀ Navás. Type / Palparellus roratus ♀ Nav. Navás S.J. det / Typus' (BMNH); ♂ type, '*Palpares virgineus* Kolbe, Delagoa Bay' (ZMHB).

Additional material examined. SOUTH AFRICA: 1♀, Mkuze Game Reserve (27.37S 32.03E), 7.i.1964, A.C.van Bruggen, 'In rest camp at light' (ZILS); 20♂, 4♂, Sihangwana, Tembe Elephant Reserve, 27.03S 32.25E, 100m, 29.x.–2.xi.1995, M.W.Mansell, NEU02194; Kruger National Park, 1♂, Skukuza, 24.59S 31.35E, 26.xi.1970, A.L. & H.H.Braack, NEU01751; 1♂, same data but 23.xii.1970, NEU01752; 1♂, same data but 24.xi.1971,

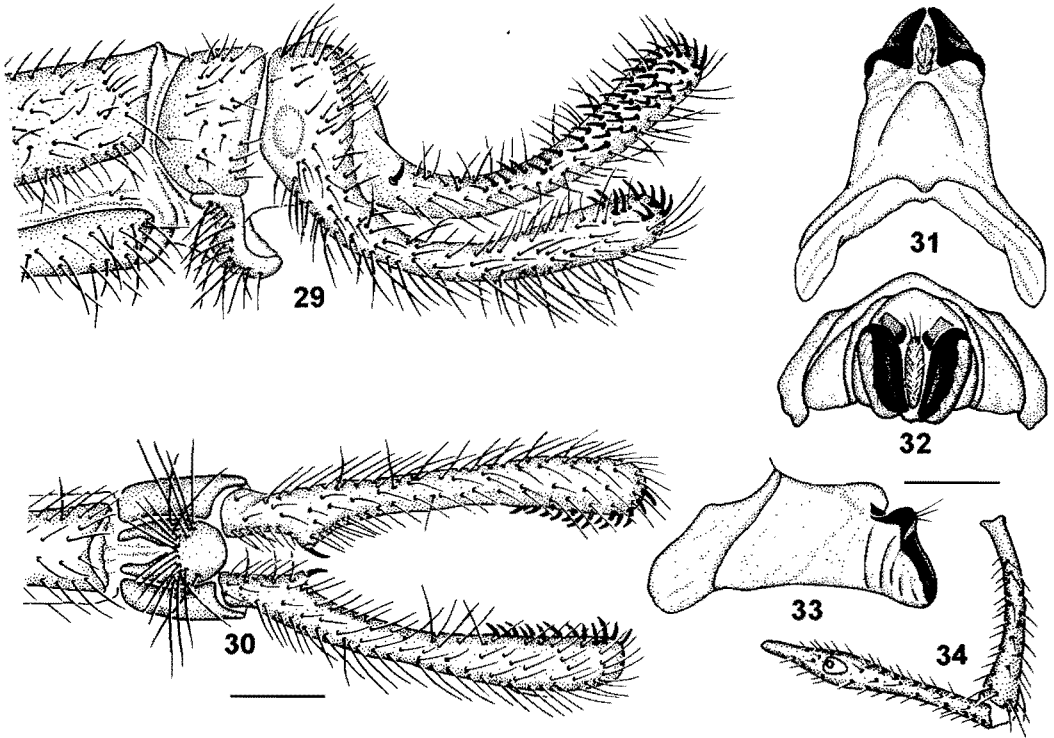
NEU01753; 1♂, same data but 18.ii.1974, NEU01754; 1♀, same locality but 12.xii.1985, L.E.O.Braack, NEU01755; 3♂, 7♀, Nyandu Sandveld, 22.39S 31.21E, 25.xi.1973, A.L. & H.H.Braack, NEU01756; 9♂, 7♀, same data but 30.xi.1973, NEU01757; 1♀, Shirombe Pan, 22.44S 31.24E, 18.xi.1983, L.E.O.Braack, NEU00234; 1♂, same locality but 24.i.1984, M.W.Mansell, NEU00278; 1♂, Bobomene, Pafuri, 22.26S 31.12E, 6.xii.1986, L.E.O.Braack, NEU01758 (all SANC). MOZAMBIQUE: 1♂, Masiene (25.03S 33.48E), xii.1923, R.F.Lawrence (SAMC).

***Palparellus pulchellus* (Esben-Petersen) comb. n.**, Figs 3, 29–34, 92

Palpares pulchellus Esben-Petersen, 1922: 618.

Diagnosis

Characterized by narrow, yellow and black maculate forewings.



Figs 29–34. *Palparellus pulchellus*. 29, male terminalia, lateral; 30, same, ventral; 31, gonarcus and parameres, dorsal; 32, same, caudal; 33, same, lateral; 34, left labial palp. Scale bars = 1 mm (Figs 29, 30); 0.5 mm (Figs 31–34).

Redescription

Size (mm). Length of body male 54.8 (51.0–58.0), female 44.3 (38.0–47.0); forewing length male 45.8 (42.0–48.0), female 48.3 (41.0–53.0); hind wing length male 42.8 (40.0–45.0), female 45.3 (39.0–49.0); antenna 8.4 (7.0–9.0) ($n = 10$).

Head. Labrum brown; labial palps (Fig. 34) with small round opening on palpimacula.

Thorax. Pronotum black with anterior and posterior margins narrowly yellow. Metathorax: mesoscutum dark-brown with a small pale-yellow area anteromedially, metascutum with two large velvety-yellow spots.

Wings (Fig. 3). Long, narrow, with fairly acute apices. Forewings hyaline, heavily maculated with bright-yellow and dark-brown, some of the brown marks appearing iridescent-metallic-blue in fresh specimens. Origin of Rs on same level or slightly before Cu fork. Hind wings pale-yellow, with three discernible bands usually coalescing in middle of wing; base of wing pale-yellow with irregular

brown marking over MP fork and along CuA2 from recurrent vein to posterior margin of wing; proximal brown band extending from R, dilating posteriorly, median brown band extending from C, dilating posteriorly, apical band enclosing a large pale-yellow area at apex of wing.

Legs. Hind legs extending almost to posterior margin of abdominal segment 3.

Abdomen. Long, longer than hind wing in males; tergites pale-yellowish-brown, sternites darker-brown; tergite 8 in males dark-brown, posterior margins of T7 and T8 bright-yellow. Male (Figs 29–33): T9 brown, with yellow posterior margin; IX yellow; ectoprocts yellow. Gonarcus slightly curved, gonarcular bulla small, flattish, parameres prominent with distinct pelta medially, bearing short setae. Female as in genus.

Distribution (Fig. 92). Mainly the Great Karoo of South Africa.

Biology. Adults of *P. pulchellus* have been recorded from 11 December to 17 February. The species

inhabits rocky hillsides, usually in association with karoo bushes (*Pentzia* spp.), and the yellow and brown maculations of the forewings blend well with the leaf/shade texture of the karoo bushes, providing effective camouflage. In this regard *P. pulchellus* is another example of adaptations of antlions to certain plants in a particular habitat, and a striking wing pattern convergence with *Pamexis karoo* Mansell (Mansell 1992a). *Palparellus pulchellus* and *P. karoo* occupy the same habitat, are sympatric, and the forewing patterns of the two insects are remarkably similar. The adults occur at the same time during early summer (November, December), but whereas *P. pulchellus* appears to be nocturnal and attracted to light, *P. karoo* is diurnal and has never been taken at light-traps.

Remarks. *Palparellus pulchellus* is the sister species of *P. ulrike*, described below, and closely resembles that species. The former is distinguished by its more densely maculate forewings and the yellow mark on the mesoscutum. The gonarcular bulla of *P. pulchellus* is also smaller and flatter than that of *P. ulrike*. Existing records indicate that the two species are allopatric.

Type material examined. Holotype ♂, *Palparellus pulchellus* Esben-Petersen: 'Deelfontein, S.A. (30.59S 23.48E), Col. Sloggett, 1903-109 / TYPE / *Palparellus pulchellus* n.sp ♂, det. Esben-Petersen'. 1♀ paratype, same data but also 'taken on base of kopje / COTYPE' (BMNH).

Additional material examined. SOUTH AFRICA: 1♀, Perdefontein Farm, Williston Dist., 31.45S 20.44E, 1120m, 11.xii.1988, M.W.Mansell, NEU01138; 1♀, Westdene Farm, Richmond Dist., 31.24S 23.44E, 1320m, 14.xii.1989, H.& U.Aspöck, M.W.Mansell, NEU01252 (both SANC); 10♂, 2♀, Uurhoogte, 11km E Fraserburg, 31.52S 21.36E, 1280m, 14-16.xii.1989, H.& U.Aspöck, M.W.Mansell, NEU01253 (2♂, 2♀ HUAC, 3♂ NHMV, 5♂ SANC); 1♀, same locality but 16.ii.1996, M.W.Mansell, H.Hölzel, P. Ohm, NEU02248 (SANC); 3♂, 1♀, Komkommerleegte Farm, Fraserburg Dist., 31.46S 21.46E, 1300m, 16.xii.1989, H.& U.Aspöck, M.W.Mansell, NEU01254 (1♂ HUAC, 1♂ NHMV, 1♂, 1♀ SANC); 1♂, Sterkfontein Farm, 37km NE Middelpos, 31.49S 20.28E, 1178m, 17.xii.1989, H.& U.Aspöck, M.W.Mansell, NEU01255; 1♂, Roodekruis Farm, Fraserburg Dist., 31.47S 21.54E, 1270m, 1.i.1990, M.de Jager, NEU01256; 1♀, Fraserburg, 31.55S 21.31E, 1250m, 31.xii.1990, M.de Jager, NEU01257 (all SANC); 1♂, Gideonsfontein Farm, Williston Dist., 31.49S 20.59E, 1170m, 17.xii.1989, H.&

U.Aspöck, M.W.Mansell (NHMV); 2♀, Olifantshoek, 27.56S 22.45E, 1250m, 14.i.1996, J.D. Oswald (Oswald Collection).

Palparellus ulrike sp. n., Figs 4, 35-40, 92

Diagnosis

Characterized by long narrow wings: forewings hyaline, overlaid with large brown marks and smaller yellow maculae, and uniformly dark-brown thorax.

Description

Size (mm). Body length male 47.8 (46.0-50.0), female 40.0 (39.0-41.0); forewing length male 39.4 (37.0-42.0), female 44.3 (43.0-47.0); hind wing length male 37.0 (35.0-40.0), female 41.0 (40.0-43.0); antenna 8.1 (7.0-9.5) ($n = 8$).

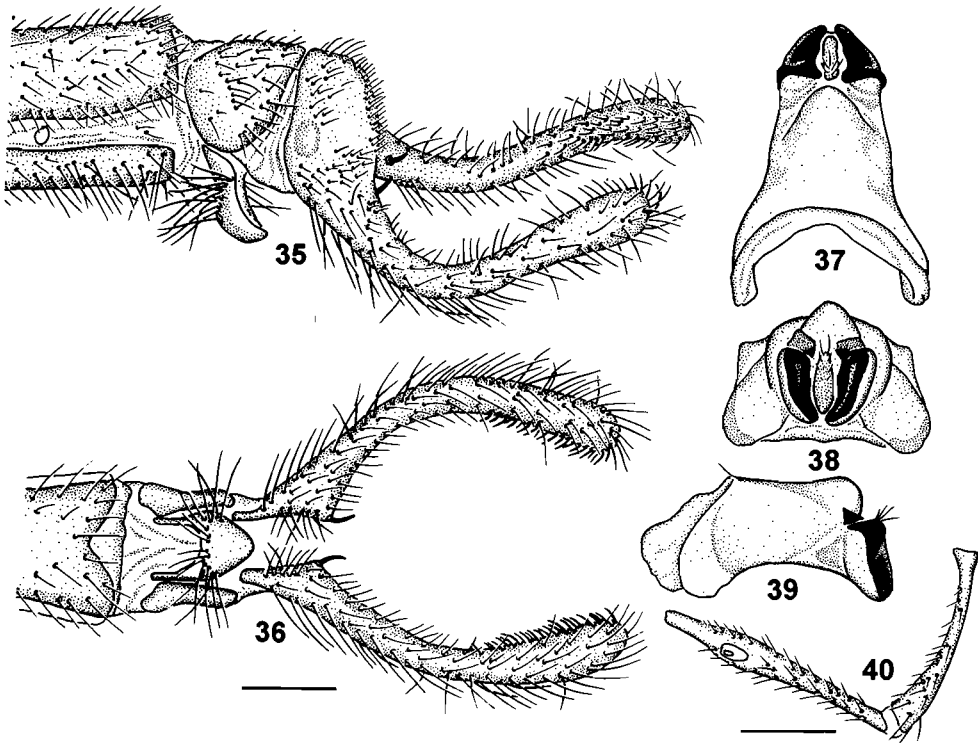
Head. Labrum black with yellow margins. Labial palps (Fig. 40) shiny-black, with small round opening on palpimacula.

Thorax. Pronotum dark-brown to black, anterior and posterior margins narrowly yellow. Mesothorax: mesoscutum dark-brown, occasionally tinged with yellow but no distinct yellow mark as in *P. pulchellus*. Metathorax: metascutum brown with dark-yellow velvety spots.

Wings (Fig. 4). Narrow with acute apices. Forewings distinctly hyaline with large irregular brown marks and smaller yellow maculae. One brown mark usually manifest as a curved band slightly distad of Cu fork, this band occasionally disrupted or not clearly discernible. The brown markings appear iridescent-metallic-blue in fresh specimens. Hind wings as in *P. pulchellus* but basal third of wing hyaline to very pale-yellow, usually immaculate but occasionally with some small irregular spots.

Legs. Long, slender, extending to or slightly beyond abdominal tergite 3.

Abdomen. Longer than hind wing in males; tergites pale-yellowish-brown, sternites darker. Male (Figs 35-39) with posterior margin of T7 bright-yellow, T8 dark-brown, T9 dark-brown, IX yellow; ectoprocts yellow, brown proximally, densely covered with long slender brown setae and dense, weakly-developed long spines on inner apical surfaces. Gonarcus short, slightly curved, gonarcular bulla small, smoothly rounded; parameres shiny-black, narrow in caudal view with distinct pelta medially, bearing a tuft of setae dorsally. Hypandrium internum as in genus.



Figs 35–40. *Palparellus ulrike*. 35, male terminalia, lateral; 36, same, ventral; 37, gonarcus and parameres, dorsal; 38, same, caudal; 39, same, lateral; 40, left labial palp. Scale bars = 1 mm (Figs 35, 36); 0.5 mm (Figs 37–40).

Female with T7, T8 and T9 yellow distally, brown proximally, otherwise as in genus.

Etymology. Named for my friend and colleague Dr Ulrike Aspöck, Vienna, Austria, in recognition of her significant contribution to Neuropterology, and in reminiscence of our field work in South Africa, together with Prof. H. Aspöck, during which this species was discovered.

Distribution (Fig. 92). Northwestern South Africa and southern Namibia

Biology. Recorded from 30 December to 24 February. Specimens have been taken during the day at Kenhardt on the granitic hillsides typical of the area. When flushed, they fly rapidly, before settling in the sparse vegetation between the granite rocks on the hills. Several specimens were also collected at light-traps.

Remarks. This species is distinguished from *P. pulchellus* by its less-heavily maculated forewings with large hyaline areas, its smaller size and by features listed under *P. pulchellus*.

Type material examined. Holotype ♂, SOUTH AFRICA: Kenhardt, Driekop Nature Reserve,

29.23S 21.06E, 30.xii.1989, M.W.Mansell, H.& U.Aspöck, NEU01426 (SANC). Paratypes: 4♂,3♀, same data as holotype (1♂,1♀ HUAC, 1♂,1♀ NHMV, 2♂,1♀ SANC); 1♂,1♀, same locality but 24.ii.1996, H.& U.Aspöck, H.Hölzel, M.W.Mansell, P.Ohm, NEU02253 (1♂ HUAC, 1♀ SANC); 13♀, Pofadder, 29.05S 19.24E, 1000m, 25.ii.1996, H.& U.Aspöck, H.Hölzel, M.W.Mansell, P.Ohm, NEU02250 (4♀ SANC, 3♀ HUAC, 2♀ NHMV, 2♀ HHCA, 2♀ POCG). NAMIBIA: 2♂,1♀, Keetmanshoop, 26.36S 18.08E, 24.ii.1988, M.W.Mansell, H.& U.Aspöck, NEU01091 (1♂ HUAC, 1♂,1♀ SANC); 2♂,3♀ Aar Farm, 25mls ESE Aus (26.45S 16.30E), 15–17.i.1972, Southern African Exp. B.M. 1971–72, NEU02254 (1♂,2♀ BMNH, 1♂,1♀ SANC); 1♀, Büllspoort, Naukluft Mountains (24.09S 16.21E), ii.1950, R.G.Strey (SAMC).

Palparellus flavofasciatus (McLachlan), Figs 5, 41–46, 92

Palparellus flavofasciatus McLachlan, 1867: 242.

Tomatares flavofasciatus (McLachlan): McLachlan 1873: 130.

Palparellus flavofasciatus (McLachlan): Navás 1912a: 225.

Palpares genialis Péringuey, 1910: 438; Banks 1913: 185.

Palparellus genialis (Péringuey): Navás 1912a: 225.

Tomatares guttatus Stitz, 1912: 115; Banks 1913: 185.

Palparellus guttatus (Stitz): Navás, 1912b: 73.

Diagnosis

Characterized by maculate forewings with two distinct yellow bands, one basal one subapical, and males with dark-brown ectoprocts.

Redescription.

Size (mm). Body length male 44.7 (40.0–52.0), female 41.8 (37.0–47.0); forewing length male 42.1 (38.0–46.0), female 45.5 (42.0–53.0); hind wing length male 40.4 (37.0–43.0), female 43.5 (40.0–50.0); antenna 7.8 (7.5–9.0) ($n = 26$).

Head. Black, fading to dark-brown in preserved specimens; labrum black; labial palps (Fig. 46) with oval opening on palpmacula.

Thorax. Pronotum dark-brown, with anterior and posterior margins narrowly yellow, occasionally with some diffuse pale-yellow marks medially. Mesothorax: mesonotum dark-brown. Metathorax: metanotum brown with two pale-yellow velvety patches on metascutum.

Wings (Fig. 5). Somewhat rounded but with tiny protruding tip. Forewings maculated with yellow and brown; costal area with alternating yellow and brown maculae; base of wing completely maculate; basal yellow band flanked by brown, extending from R to posterior margin; a large brown macule present in middle of wing, extending from R to M; apical yellow band extending from pterostigma to posterior margin; wing apex brown, enclosing several yellow maculae. Hind wings pale-yellow with three distinct brown bands which do not usually coalesce; base of wing generally immaculate, occasionally with some brown over recurrent vein; basal brown band extending from R to hind margin, dilating posteriorly, enclosing two yellow maculae; median band similar to basal band; apical band covering apex of wing and enclosing a large irregular yellow macule.

Legs. Shortish, not extending to extremity of T3.

Abdomen. Shorter than hind wing; tergites pale-yellowish-brown, sternites darker. Male (Figs 41–45): T8 dark-brown with yellow posterior margin

and yellow stripe anteromedially, T9 dark-brown to black, IX dark-brown with rounded yellow membranous area posteriorly; gonarcular bulla flattish. Female as in genus.

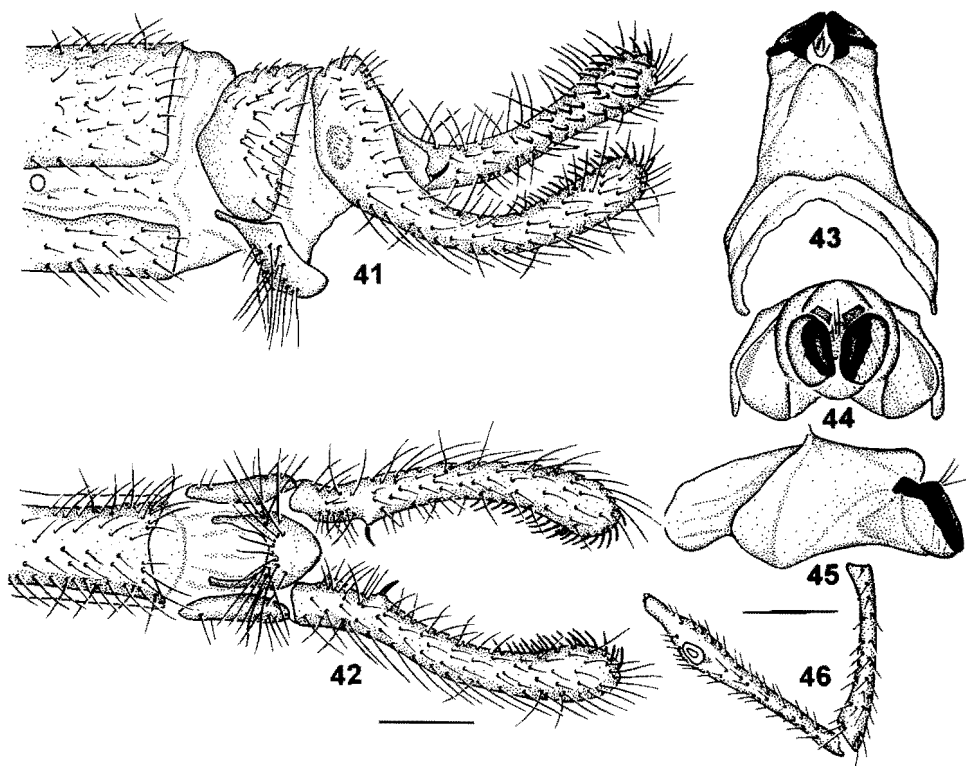
Distribution (Fig 92). Namibia and southern Angola.

Biology. Adults have been recorded from 20 December to 18 April. They occur in open grassland, often in large numbers, and are occasionally attracted to light.

Remarks. Banks (1913) synonymized *Palpares genialis*, *Tomatares guttatus* and *Palpares nyassensis* (sic) with *P. flavofasciatus*. I have examined the type material of these four species, and confirm the synonymy of the former two, while *P. nyassanus* was incorrectly synonymized. Esben-Petersen (1916) also synonymized these three species with *P. flavofasciatus*, adding *Palparellus excelsus* Navás, but then listed only *P. genialis* and *T. guttatus* as synonyms of *P. flavofasciatus* in a later paper (Esben-Petersen 1928). *Palparellus excelsus* is a synonym of *P. nyassanus*.

Type material examined. Holotype ♂, *Palpares flavofasciatus* McLachlan: 'Tomateres (sic) flavofasciatus McL. (Type) / McLachlan Coll. B.M. 1938-674 / Type / Damara Land Anderson' (BMNH). Holotype ♀, *Palpares genialis* Péringuey: 'Palpares genialis type ♂ (sic) Pér / Limpopo River Eriksson' (SAMC). Syntypes, 5♂, 3♀, *Tomatares guttatus* Stitz: 'D.S.W. Afrika, Okahandja, Dinter I.G. (blue handwritten label) / Type / Tomatares guttatus Stitz' (ZMHB).

Additional material examined. ANGOLA: 2♂, 1♀, Caracul, Moçamedes Dist. (15.03S 12.39E), 26–27.iii.1971, NEU01787; 1♀, 24 mi. NE Iona, Iona Nat. Park (16.50S 13.20E), 9.iv.1971, NEU01788; 1♀, Lucira (13.51S 12.31E), Moçamedes Dist., 18.iv.1971, NEU01789; 1♂, 13 mi. W Virei, Moçamedes Dist. (15.30S 13.00E), 18.iv.1971, NEU01790, all H.D. Brown (SANC). NAMIBIA: 1♀, Okahandja (21.58S 16.56E), 28.ii.1967, F. Gaerdes (SMWN); 1♂, 2♀, Valencia Ranch, 60 km SE Windhoek (23.11S 16.30E), ii.1970, A.C. Kemp, NEU01792; 2♂, 2♀, Tsumeb (19.14S 17.42E), 2.i.1972, L.R. Minter, NEU01793 (SANC); 1♂, Otjikoko Süd Farm (W36), Karibib Dist. (21.18S 16.24E), 10–13.ii.1972; 1♂, Otjimbingi Farm, 27 mls ESE Kamanjab (19.48S 15.11E), 13–15.ii.1972, all Southern African Exp. BM 1972-1 (BMNH); 1♀, Wasservallei, Windhoek (22.55S 16.22E), 20–23.xii.1974, no collector (SMWN); 2♀, Ganab, Namib/Naukluft Park, 23.06S 15.33E, 16.iii.1983, R. Oberprieler, NEU00085; 1♂, Outjo,



Figs 41–46. *Palparellus flavofasciatus*. 41, male terminalia, lateral; 42, same, ventral; 43, gonarcus and parameres, dorsal; 44, same, caudal; 45, same, lateral; 46, left labial palp. Scale bars = 1 mm (Figs 41, 42); 0.5 mm (Figs 43–46).

52km W on Road 65, 20.14S 15.40E, 24.iii.1984, B.R.Stuckenberg, J.G.H.Londt, NEU01797; 1♂, Khorixas, 28km E on Road 65, 20.16S 15.12E, 24.iii.1984, B.R.Stuckenberg, J.G.H.Londt, NEU01798; 1♂, Keetmanshoop, 26.36S 18.08E, 1050m, 24.ii.1988, M.W.Mansell, NEU01092; 2♂, 1♀, Naukluft Campsite, Namib-Naukluft Park, 24.16S 16.15E, 6.iii.1987, R.Oberprieler, NEU01799; 2♂, Usakos, 22.00S 15.35E, 950m, 21.ii.1988, M.W.Mansell, NEU01036 (all SANC); 2♂, same data but H. & U.Aspöck (HUAC, NHMV); 1♂, 1♀, same data but H.Rausch (HRRC); 2♂, 1♀, Ameib Ranch, 21.48S 15.39E, 1000m, 22.ii.1988, H.& U.Aspöck (1♂HUAC, 1♂, 1♀ NHMV); 1♀, same data but H.Rausch (HRRC); 1♂, same locality but 4.ii.1994, H.& U.Aspöck (NHMV); 11♂, 5♀, same but 22.ii.1994 (6♂, 2♀ HUAC, 5♂, 3♀ NHMV); 1♀, Windhoek (22.34S 17.06E), 25.ii.1992, R.Oberprieler NEU01800 (SANC); 14♂, 25♀, Outjo Camp, Outjo, 20.08S 16.10E, 1300m, 7–8.ii.1994, H.& U.Aspöck (7♂, 12♀ HUAC, 7♂, 13♀ NHMV); 12♂, 9♀, same data but H.& R.Rausch (HRRC); 1♂, 6♀, 53km WSW Outjo, 20.12S

15.41E, 1300m, 19.ii.1994, H.& U.Aspöck (1♂, 3♀ HUAC, 3♀ NHMV); 2♂, 1♀, same data but H.& R.Rausch (HRRC); 1♀, Khorixas Camp, Khorixas, 20.21S 14.56E, 1000m, 6.ii.1994, H.& U.Aspöck (HUAC); 2♀, same data but H.& R.Rausch (HRRC); 1♀, Halali Camp, Etosha National Park, 19.02S 16.28E, 1100m, 23.xii.1994, I.Coetzer, NEU02251 (SANC).

***Palparellus ovampoanus* (Péringuey), Figs 6, 47–54, 92**

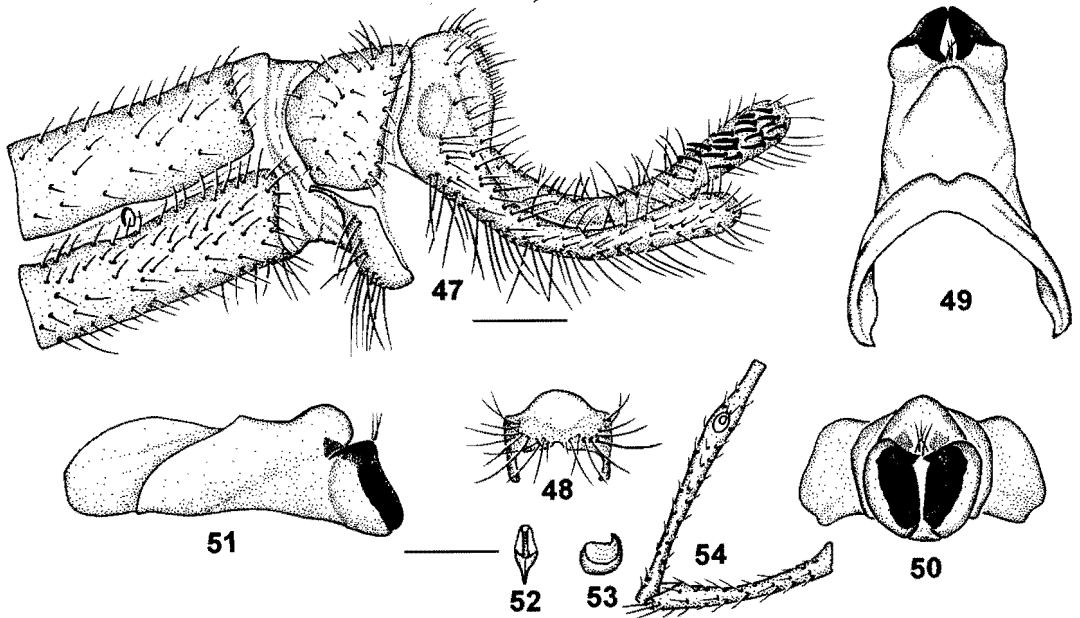
Palparellus ovampoanus Péringuey, 1910: 439.

Palparellus ovampoanus (Péringuey): Navás 1912a: 225.

Palparellus (*Palparellus*) *ovampoanus* Péringuey: Banks 1913: 186.

Diagnosis

Characterized by its distinctive wing pattern in which the apical two thirds of the hind wings are dark-brown.



Figs 47–54. *Palparellus ovampoanus*. 47, male terminalia, lateral; 48, sternite 9, ventral; 49, gonarcus and parameres, dorsal; 50, same, caudal; 51, same, lateral; 52, hypandrium internum, dorsal; 53, same, lateral; 54, left labial palp. Scale bars = 1 mm (Figs 47, 48); 0.5 mm (Figs 49–54).

Redescription

Size (mm). Body length male 43.0, holotype female 40.0; forewing length male 42.0, holotype female 44.0; hind wing length male 38.0, holotype female 43.0; antenna 7.5 (7.0–8.0) ($n = 2$).

Head. Dark-brown, labrum brown with yellow margin; labial palps (Fig. 54) with small round opening on palpimacula.

Thorax. Uniformly dark-brown with two pale-yellow velvety patches on metascutum.

Wings (Fig. 6). Apex smoothly rounded except for tiny protruding tip. *Forewings* almost completely overlain with yellow and brown pigment. Costal area brown with a row of small yellow maculae; pterostigma yellow, enclosed by oblong yellow macule; wing apex brown, enclosing a single yellow macule; posterior margin broadly infuscated, enclosing several variable yellow maculae. Base of wing yellow with brown costal and anal margins; discal area hyaline and yellow, traversed by three oblique brown bands; basal and middle brown bands narrow, enclosing a distinct narrow oblique yellow area, beyond this in the centre of the wing a broad hyaline area overlain with yellow between Cua and R; the distal brown band broad, interrupted by a narrow yellow streak running along

Cua where Cua and a branch of Rs link to form a distinct loop; distal hyaline area small with oblique yellow streak extending from pterostigma almost to posterior margin. *Hind wings* pale-yellow with apical two thirds brown, enclosing several large yellow maculae. Costal area brown with a few variable yellow maculae, pterostigma yellow enclosed by oblong yellow macule; apical region brown, enclosing a yellow macule; posterior margin excepting anal area brown. Base of wing pale-yellow, a large yellow patch in middle of wing extends from R to Mp1, with three or four smaller maculae posterior to it along posterior margin; a distinct oblique yellow area extends from pterostigma almost to posterior margin.

Legs. Dark-brown to black.

Abdomen. Shorter than hind wing in both sexes, tergites pale-brown, sternites darker-brown. *Male* (Figs 47–53) with straight gonarcus and prominent, rounded gonarcular bulla. Sternite IX very short with slightly recurved tip. *Female* as in genus.

Distribution (Fig. 92). Recorded from north-eastern Namibia and southeastern Angola.

Remarks. Two females are present in SAMC but only one bears a type label in Péringuey's handwriting, although both have identical data and

were certainly available to him. The labelled specimen is regarded as the holotype of *Palpares ovampoanus*, as Péringuey's description does not indicate that it was based on more than one specimen. This species is known only from these two specimens and a male from Angola, also recorded by Esben-Petersen (1931).

The colours in the specimens have probably faded from black to dark-brown on the body and legs, and the brown and yellow pigment on the wings is probably much brighter in living specimens. The rediscovery of this insect will be important in establishing the distribution and conservation status of the species. *Palparellus ovampoanus* closely resembles *P. flavofasciatus*, its adelphotaxon, but is clearly separated by its more evenly pigmented forewings and infuscated hind wings. The two species may be sympatric in northern Namibia.

Type material examined. NAMIBIA: holotype ♀, *Palpares ovampoanus* Péringuey: 'Omaramba (ca. 17.57S 20.25E), Jan 1888, Eriksson / *Palpares ovampoanus* type ♀ Periy.'; 1♀ paratype, same data but lacking a type label (SAMC).

Additional material examined. ANGOLA: 1♂, Chimporo (17.20S 17.17E), ix. Miss. sc. Suisse 1928-29 (MCFS).

***Palparellus damarensis* (McLachlan) comb. n.,**
Figs 7, 55–60, 91

Palpares damarensis McLachlan, 1867: 241.

Palpares formosus bifasciatus Stitz, 1912: 107; Banks 1913: 185 (incorrect synonymy)

Palpares damariensis (sic) McLachlan: Esben-Petersen 1928: 208.

Diagnosis

A small species with sparsely marked forewings and distinctive yellow pattern on thorax.

Redescription

Size (mm). Body length male 46.1 (40.0–54.0), female 34.6 (31.0–38.0); forewing length male 36.1 (32.0–40.0), female 37.1 (35.0–40.0); hind wing length male 34.9 (31.0–38.0), female 35.6 (33.0–39.0); antenna 6.5 (5.0–7.5) ($n = 33$).

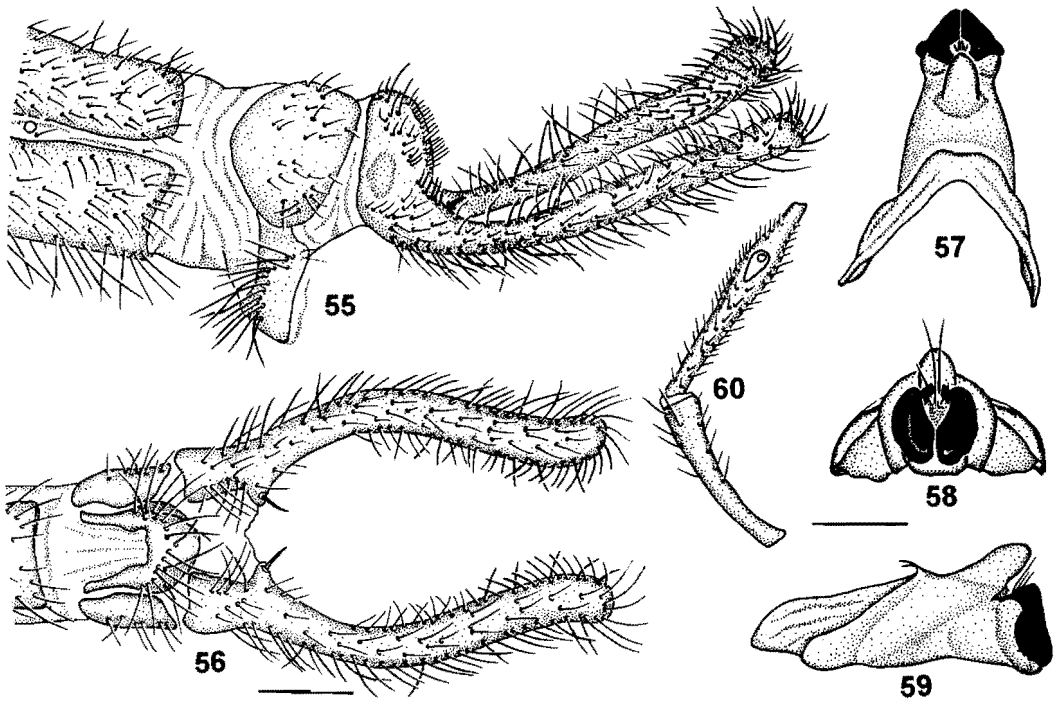
Head. With short white setae flattened against vertex and frons; a yellow spot on genae over mandibular articulations; clypeus and labrum uniformly yellow. Labial palps (Fig. 60) short, shiny-blackish-brown with small round opening on palpimacula.

Thorax. Pronotal markings variable; raised anterior portion completely yellow except for small anteromesal brown stripe, middle and posterior portions brown, usually with two yellow spots or extensively yellow with three brown markings. Mesoprescutum brown, with lateral margins yellow converging into a V-shape; mesoscutum brown, with large triangular yellow mark on either side of midline and a smaller curved yellow mark posterolateral to this; mesoscutellum yellow, with large brown area anteromesally. Metaprescutum yellow, enclosing a brown area centrally; metascutum brown with yellow areas enclosing the velvet spots; metascutellum yellow, with large brown area anteromesally.

Wings (Fig. 7). Narrow, slightly broader in females. *Forewings* slightly longer than hind wings; Rs arises on same level as Cu fork; membrane hyaline with faint yellowish tinge and three distinct brown bands: basal brown band extending from R and enclosing a pale spot at posterior margin; median band broader but sometimes disrupted; apical band extends from below pterostigma, sometimes much disrupted and enclosing pale apex; costal area with a row of brown maculae, pterostigma yellow; basal one third of wing maculated with brown; apical margin narrowly infuscated; posterior margin of wing with row of irregular maculae. *Hind wings* hyaline, faintly tinged with yellow and overlaid with distinct brown markings; costal area with a few tiny brown maculae proximally; basal one third of wing immaculate except for a large brown spot over Mp fork; basal brown band curved, extending from R to posterior margin; median band extending from C to posterior margin; apical band variable, enclosing pale apex; apical margin narrowly infuscated, posterior margin with irregular maculae.

Legs. Slender, shortish; foreleg with enlarged coxa covered with long, soft white pubescence; femur with short white setae on inner surface and long white and black bristles ventrally; tibia shorter than tarsus with short white setae, long black bristles and a dense pad of short golden-brown setae ventrally; tarsi long. Middle leg similar to prothoracic leg but tibia same length as tarsus and lacking pad of hairs. Hind leg similar but with tibia longer than tarsus.

Abdomen. Long, longer than hind wing in males, pale-yellowish-brown dorsally, darker ventrally. *Male* (Figs 55–59): tergite 8 brown with dorsomesal



Figs 55–60. *Palparellus damarensis*. 55, male terminalia, lateral; 56, same, ventral; 57, gonarcus and parameres, dorsal; 58, same, caudal; 59, same, lateral; 60, left labial palp. Scale bars = 1 mm (Figs 55, 56); 0.5 mm (Figs 57–60).

yellow stripe, T9 brown proximally, yellow distally; IX brown with rounded, yellow membranous posterior margin. Ectoprocts longer than T8, brown with yellow proximally and at apices. Gonarcus and parameres straight; gonarcular bulla prominent, angular in lateral view. *Female* as in genus.

Distribution (Fig. 91). Angola and Namibia.

Flight period. Recorded from 22 February to 2 May.

Remarks. Banks (1913) incorrectly regarded *Palpares formosus bifasciatus* Stitz as a synonym of *P. damarensis*. The synonymy of *P. formosus bifasciatus* is discussed below under *P. dubiosus*. Navás (1912a) designated a specimen without locality (in NHMV), but labelled *Palpares damarensis* McLachlan by Brauer, as the holotype of *Palpares compositus* Navás, 1912a. This specimen is neither *P. damarensis* nor a *Palparellus*, but a synonym of another southern African species, *Palpares elegantulus* Péringuey.

Type material examined. NAMIBIA: 2♀ syntypes, *Palpares damarensis* McLachlan: 'Tomateres (sic) damarensis McL. (Type) / Damara-land, Anderson / McLachlan Coll. B.M. 1938-674 / Type' (BMNH).

Additional material examined. ANGOLA: 1♂, Espinheira, 2mi. W Iona Nat.Park (ca. 16.50S 12.30E) 4.iv.1971, NEU01703; 1♂, 1♀, Virei, 13mi. W, Moçamedes Dist. (15.30S 13.00E), 16.iv.1971, NEU01704; 7♂, 7♀, Rio Mutiambo, Moçamedes Dist. (not located), 17.iv.1971, NEU01705; 1♀, Rio Mutiambo, 40 mi. N Moçamedes (not located), 18.iv.1971, NEU01706, all H.D.Brown (SANC). NAMIBIA: 3♂, 1♀, Valencia Ranch (23.08S 16.30E), ii.1970, A.C.Kemp, NEU01707 (SANC); 1♀, Springbokwasser, Damaraland, 20.20S 13.32E, iii.1985, NEU01708; 1♀, Mudorib Turnoff to Hunkab Fountain, Damaraland, (19.19S 13.13E), 3.iii.1986, NEU01709, both S.Braine (SANC); 5♂, 2♀, Ameib Ranch, Usakos Dist. 21.48S 15.38E, 22.ii.1988, M.W.Mansell, NEU01059 (SANC); 1♀, same data but (HRRC); 1♀, Ugab River nr. Onverwag, SE2014Dd (20.52S 14.57E), 19.iv.1991, NEU01711; 1♂, Warmquelle, 26km ESE Sesfontein, SE1913Bb (19.10S 13.48E), 20.iv.1991, NEU01712, both E.Holm, S.Gussmann (SANC); 1♂, 1♀, Bethanien (26.30S 17.09E), 22.iii.1959; 1♀, Zesfontein (Sesfontein, 19.08S 13.36E), 2.v.1961; 1♂, Klein Spitskoppe (21.52S 15.03E), 24.iv.1966; 2♂, 3♀, Twyfelfontein

(20.33S 14.22E), 9–16.iv.1963, F.Gaerdes (ZILS); 1♀, Büllspoort (24.09S 16.21E) (1400m), iii.1949, R.G.Strey (TMSA); 1♀, Hardap Dam, Mariental Dist. (24.30S 17.51E) (1200m), 10–14.iv.1972, Strydom & Jones (TMSA); 1♂, Rehoboth (23.19S 17.05E), xi.1937–i.1938, Bell-Marley; 1♂, Kaross (19.23S 14.31E), ii.1923, SA Mus.Exp.; 1♂, Kowares (19.03S 14.20E), iii.1926, SA Mus. Exp. (all SAMC).

***Palparellus dubiosus* (Péringuey) comb. n.**, Figs 8, 61–66, 91

Palpares dubiosus Péringuey, 1910: 440.

Palpares formosus Banks, 1911: 4; Navás 1923: 432.

Palpares formosus bifasciatus Stütz, 1912: 107. **Syn. n.**

Diagnosis

Characterized by narrow, densely maculate forewings, extensive yellow markings on thorax, and very long male abdomen.

Redescription

Size (mm). Body length male 58.4 (50.0–65.0), female 43.4 (38.0–48.0); forewing length male 41.6 (35.0–48.0), female 45.0 (40.0–48.0); hind wing length male 39.9 (34.0–47.0), female 42.7 (39.0–46.0); antenna 7.5 (6.0–9.0) ($n = 58$).

Head. Small, pitch-black with sparse white reclinate setae on vertex and frons; face below antennae glabrous, shiny-black; clypeus and labrum bright-yellow. Labial palps (Fig. 66) shiny-black, with small, round opening on palpimacula.

Thorax. *Pronotum* black, anterior margin yellow laterally, with a row of setae and longish black setae laterally. Mesothoracic spiracle yellow. Mesoprescutum black with faint yellow stripes on anterolateral margins; mesoscutum black with two large, yellow, triangular patches dorsomesally, posterolateral margins with sparse long white hairs; mesoscutellum brown, broadly yellow posterolaterally with long white setae along posterior margin. Metaprescutum brown; metascutellum brown with two large yellow patches dorsomesally, enclosing the dark-yellow velvety patches; metascutellum brown with yellow posterior margin bearing sparse long white setae.

Wings (Fig. 8). *Forewings* narrow, pale-yellow, heavily maculate, with three discernible brown bands; proximal band curved, extending from R to posterior margin; median band extending from R, usually disrupted and not reaching posterior

margin; distal band usually disrupted medially. Radial sector arises on same level or slightly distad of Mp fork; venation yellow, brown in maculae. Costal area with a row of brown maculae from base to yellow pterostigma; basal area of wing heavily maculate; apex of wing hyaline, densely maculate; posterior margin of wing with a row of irregular maculae, sometimes completely infuscated. *Hind wings* yellowish, with three brown bands: basal band curved, extending from R to posterior margin; median band extending from C to posterior margin; wing apex infuscated, enclosing several irregular hyaline areas. Costal area with a row of small maculae extending from base to proximal band; base of wing immaculate except for a large prominent macula over Mp2 fork; posterior margin with row of large maculae or entirely infuscated.

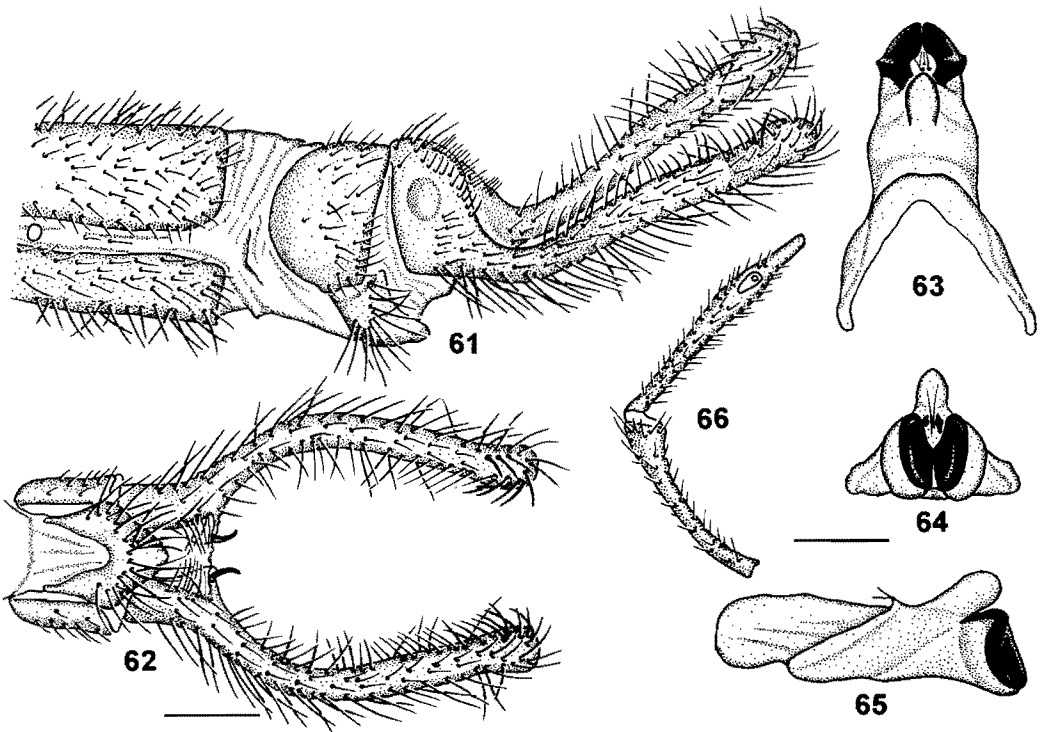
Legs. Pitch-black. Forecoxa with dense white hair; femur with short reclinate white setae on inner surface and sparse black setae on outer surface; tibia shorter than tarsus, with a patch of short dense golden-brown setae on inner surface and sparse white and black setae on outer surface; Ta5 long, longer than Ta1 to Ta4. Middle leg similar to prothoracic leg but tibia shorter than tarsi and no tibial pad and white femoral hairs; hind leg similar but tarsus longer than tibia and no white setae.

Abdomen. Long, usually about 10 mm longer than hind wing in males, densely covered with short black setae. Abdominal segment 1 black; segment 2 black laterally, yellow dorsally; segments 3–5 uniformly yellowish-brown; T6 pale anteriorly, darker posteriorly; sternites 6–9 black; T7 black with broad dorsomesal stripe; T8 and T9 black with narrow dorsomesal stripe. *Male* (Figs 61–65) with slender ectoprocts longer than T8, brown with yellow apices; IX short with rounded membranous posterior margin. Gonarcus straight, gonarcus bulla prominent with rounded apex extending over parameres. *Female* as in genus.

Distribution. Botswana. South Africa: Northern, Western and Eastern Cape Provinces, Free State.

Flight period. Recorded from 19 January to 25 April.

Remarks. In his description of *Palpares dubiosus*, Péringuey (1910) stated that he had seen six specimens, including two males. He mentioned that they were from four localities, Touw's River, Clanwilliam, 'Bushmanland' and Kimberley, but did not designate a holotype. Six specimens from these localities, collected before 1910, must



Figs 61–66. *Palparellus dubiosus*. 61, male terminalia, lateral; 62, same, ventral; 63, gonarcus and parameres, dorsal; 64, same, caudal; 65, same, lateral; 66, left labial palp. Scale bars = 1 mm (Figs 61, 62); 0.5 mm (Figs 63–66).

therefore be considered syntypes. Only two female specimens, one from Touw's River, the other from Bushmanland, remain in SAMC. The two males are apparently lost. The female from Touw's River is in the best condition and is designated here as lectotype of *Palpares dubiosus* Péringuey.

Banks (1913) synonymized *Palpares formosus bifasciatus* Stitz with *Palpares damarensis* McLachlan, and Esben-Petersen (1928) concurred with this synonymy. I have examined Stitz's five syntypes in ZMHB and conclude that they are not *P. damarensis* but *P. dubiosus*. *Palpares formosus bifasciatus* Stitz is accordingly synonymized here. I have also examined the holotype of *Palpares formosus* Banks (MCZC) and confirm the synonymy of Navás (1923).

Type material examined. SOUTH AFRICA: lectotype ♀, *Palpares dubiosus* Péringuey, designated here: 'Touws River (33.20S 20.02E), D.P.Lefebvre, Mar. 1892' (SAMC). Paralectotype ♀, designated here: 'Namaqualand, Bushman Ld., G.Alston, May 1894' (SAMC). Holotype ♀, *Palpares formosus* Banks: 'Willowmore, Cape Colony (33.18S 23.30E),

20.2.1908 / Type 10550 / *Palpares formosus* Bnks, type' (MCZC). BOTSWANA: 1♂, 4♀ syntypes, *Palpares formosus bifasciatus* Stitz: 'Betschuanaland Prot. Kalahari, Kanya (24.59S 25.22E), x.04, L.Schultze / *P. formosus* Banks var. *bifasciatus* Stitz 1912' (ZMHB).

Additional material examined. SOUTH AFRICA: 2♀, Vryburg (26.57S 24.44E), i–ii. 1930, C.G.Stone (SAMC); 1♂, Fraserburg (31.54S 21.31E), 26.ii.1974; 1♀, Williston, 8km S, Bushmanland (31.23S 20.54E), both A.B.Gurney (USNM); 2♂, 1♀, Uurhoogte, 11km E Fraserburg, 31.52S 21.36E, 1280m, 16.ii.1996, M.W.Mansell, H.Hölzel, P.Ohm, NEU02247 (SANC); 1♂, Fraserburg, 25km NW (31.43S 21.24E), (1250m), 27.iii.1974, H.D.Brown, NEU01722; 1♂, Stormfontein Farm, Colesburg Dist., 30.45S 25.26E, 1350m, 28.iii.1971, P.J.Ashton, NEU01723; 6♂, Nosob Camp, Kalahari Gemsbok Nat. Park, 25.25S 20.36E, 900m, 10–13.ii.1972, NEU01725; 1♀, same data but 25.iv.1973, NEU01726, all M.W.Mansell; 1♂, same locality but 22.ii.1990, J.J.Herholdt, NEU01727; 1♀, same locality but 27.iii.1990, J.Klimaszewski, NEU01728; 1♂, Twee Rivieren,

Kalahari Gemsbok Nat. Park, 2620Bc (26.28S 20.37E), 20.iii.1982, J.G.H.Londt, L.Schoeman, NEU01729; 1♂, same locality but 28.iii.1990, J.Klimaszewski, NEU01730; 1♂, 1♀, Groblershoop, 28.53S 21.59E, 1–7.iv.1980, NEU01731; 1♂, same data but 13–17.iv.1981, NEU01732; 2♂, 1♀, same data but 8.iv.1982, NEU01733, all C.G.Moolman; 1♀, Bloemendal Farm, Malmesbury Dist., 33.27S 18.38E, 9.ii.1987, M.D.Picker, NEU01734; 3♂, 3♀, Melton Wold, Victoria West Dist., 31.27S 22.45E, 1300m, 10.iii.1989, S.Louw, NEU01735; 2♂, 5♀, same locality but 16.ii.1991, M.W.Mansell, NEU01736; 4♂, Copperton, 29.58S 22.24E, 1100m, 18.ii.1991, hand-netted, NEU01737; 1♂, 3♀, Prieska Poort, 29.47S 22.42E, 1050m, 18.ii.1991, NEU01738; 1♂, Driekop Nat. Res. Kenhardt, 29.23S 21.06E, 850m, 19.ii.1991, NEU01739, all M.W.Mansell; 1♀, Middelburg, Grootfontein Agric. Coll. 31.29S 25.02E, 26.i.1980, NEU01740; 1♂, same data but ii.1984, NEU01741, both M.W.Pretorius; 1♂, same locality but 1.ii.1988, NEU01742; 4♀, same data but 4.ii.1990, NEU01743; 6♀, same data but ii.1991, NEU01744, all M.de Jager; 2♂, 3♀, Douglas, 64km S, 29.23S 23.20E, 1070m, A.Whittington, J.G.H.Londt, NEU01747; 1♀, Nieuwoudtville, 31.23S 19.06E, 750m, 19.i.1995, P. Bayliss, NEU02240; 1♀, Sandveld Nat. Res., Hoopstad, 27.41S 25.41E, 31.i.1986, R.A.Adam, NEU01745; 1♂, Tussen die Riviere, 30.30S 26.15E, 20–24.i.1994, VM.Uys, NEU01746; 1♀, Wellwood Farm, Graaff Reinet, 32.01S 24.39E, 2.ii.1995, J.H.Hoffmann, NEU02030; 1♀, Middelpoort, 31.54S 20.14E, 1200m, 23.ii.1996, H.Aspöck, NEU02246 (all SANC). BOTSWANA: 1♀, 42mls W. Kalkfontein, 11–12.iv.1972, Southern African Exp. B.M. 1972-1 (BMNH); 2♀, Middelpoort (26.40S 21.53E), 25.ii.1991, P.Forchhammer, NEU02252 (SANC).

***Palparellus rothschildi* (Van der Weele), Figs 9, 67–72**

Tomatares rothschildi Van der Weele, 1907b: 257.

Palparellus rothschildi (Van der Weele): Navás 1912b: 72.

Palpares rothschildi (Van der Weele): Banks 1913: 186.

Palparellus ruspolii Navás, 1915a: 21. **Syn. n.**

Diagnosis

Forewings dark-chocolate-brown with yellow maculae and a yellow band in basal third of wing; hind wings dark-chocolate-brown with yellow maculae, basal third pale-yellow. Pronotum with a broad yellowish-orange area.

Redescription

Size (mm). Body length male 37.0, female 35.0; forewing length male 36.5 (35.0–38.0), female 43.0; hind wing length male 33.3 (32.0–35.0), female 40.0; antenna 8.6 (8.0–10.0) ($n = 3$).

Head. Clypeus yellow distally, labrum black with sparse long hair. Labial palps (Fig. 72) with large oval opening on palpmacula.

Thorax. *Prothorax* dark-brown with yellow area anteromedially. *Mesothorax* brown laterally, tergites yellow. *Metathorax* brown with two yellowish-brown velvety patches, scutellum brown with narrowly pale margins and delicate pale setae.

Wings (Fig. 9). Fairly broad in female, narrower in male. *Forewings* dark-chocolate-brown with yellow maculae: subcostal area with a row of small spots, a large yellow mark over pterostigmal area and a row of usually seven large spots along posterior margin; two large spots and several smaller yellow maculae in central area and a conspicuous yellow band extending from R in region of origin of Rs to posterior margin; basal third with several small spots and a large spot near posterior margin. *Hind wings* dark-chocolate-brown in apical two thirds with two large maculae and about five smaller spots along posterior margin, sometimes coalescing with larger spots; basal third of wing pale-yellow with brown markings in costal area. Dark wing colour faded in older preserved specimens.

Legs. Dark-brown, tarsi black; femora and tibiae with long sparse black setae, and short white procumbent setae especially on dorsal surface of forefemora; tarsi with short black setae.

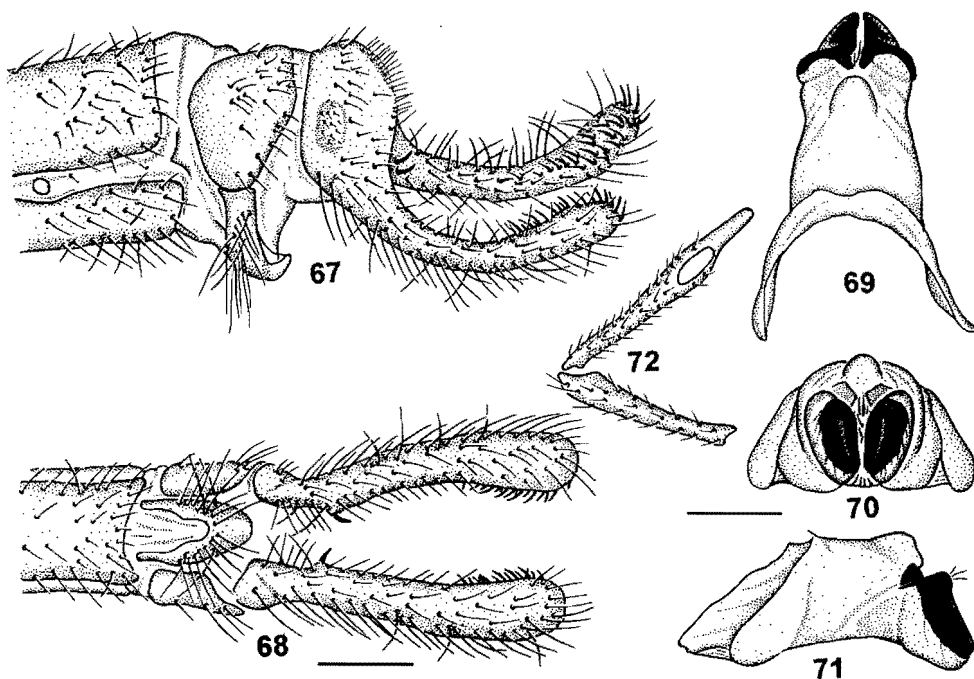
Abdomen. Shorter than hind wing, pale-brown. **Male** (Figs 67–71) with yellow ectoprocts. Gonarcus slightly rounded, gonarcular bulla prominent, slightly concave in profile. **Female** as in genus.

Distribution. Eastern Africa: Ethiopia, Somalia, Kenya, Uganda, Tanzania, Malawi.

Flight period. Recorded from 6 August to 18 May.

Remarks. *Palparellus rothschildi* resembles *P. astutus* from India, but the latter lacks the yellow mesothoracic tergites and the forewings are more heavily maculate than in *P. rothschildi*.

Among the African species, *P. rothschildi* closely resembles its adelphotaxon, *P. spectrum*, but can immediately be separated by its more heavily maculate wings and yellow mesotergites. The forewings of *P. spectrum* are almost entirely fuscous with two pale bands, and the thorax is uniformly dark-brown.



Figs 67–72. *Palparellus rothschildi*. 67, male terminalia, lateral; 68, same, ventral; 69, gonarcus and parameres, dorsal; 70, same, caudal; 71, same, lateral; 72, left labial palp. Scale bars = 1 mm (Figs 67, 68); 0.5 mm (Figs 69–72).

Type material examined. 1♂, 1♀ syntypes: 'Museum Paris, Afrique Orien. Angl. Lesammise, Rendile, Maurice de Rothschild, 1905 / Tomatares rothschildi, type v.d. Weele / TYPE / Avril / Palparellus rothschildi v.d. Weele Long. Navás det.' (MNHN). Holotype ♂, *Palparellus ruspolii* Navás: 'Palparellus ruspolii ♂ Nav., Navás, S.J. det./typus / Lugh (Lugh Ganana, Somaliland 02.52N 42.34E), IV. 1892-93, E. Ruspoli' (MCSN).

Additional material examined. ETHIOPIA: 1♀, S Galla, Djaro (probably Jarso in Galla, 05.17N 37.31E), 19.iv.1901, B.v.Erlanger; 1♀, Woute, (probably Wota, now Shea Ghimarra, 07.04N 35.51E), 18.v.1901, B.v.Erlanger (ZMHB). MALAWI: 1♀, Nyasaland, Lingadzi, near Domira Bay (13.38S 34.26E), 1700ft. 10.xii.1914, Dr W.A.Lamborn, P. rothschildi, det. N.Banks (BMNH). TANZANIA: 1♂, East Africa, Tendaguru (09.49S 39.20E), 6.viii.1924, W.E.Cutler, B.M. 1930-489; 2♀, same locality but D.O.Afrika, Janensch leg. (BMNH); 1♂, Ost-Afrika, Kilwa (ca. 09.00S 39.30E), Reimer (ZMHB). UGANDA: 1♀, Turkana Prov., v.1934, D.R.Buxton, L. Rudolf Rift Val. Expedition 1934, B.M. 1935-267 (BMNH).

***Palparellus spectrum* (Rambur), Figs 10, 73–78**

Palpares spectrum Rambur, 1842: 376.

Myrmeleon spectrum (Rambur): Walker 1853: 313.

Tomateres (sic) *spectrum* (Rambur): McLachlan 1873: 130.

Palparellus spectrum (Rambur): Navás 1912a: 225

Palparellus spectrum tristis Navás, 1912c: 37; Prost 1995: 95.

Diagnosis

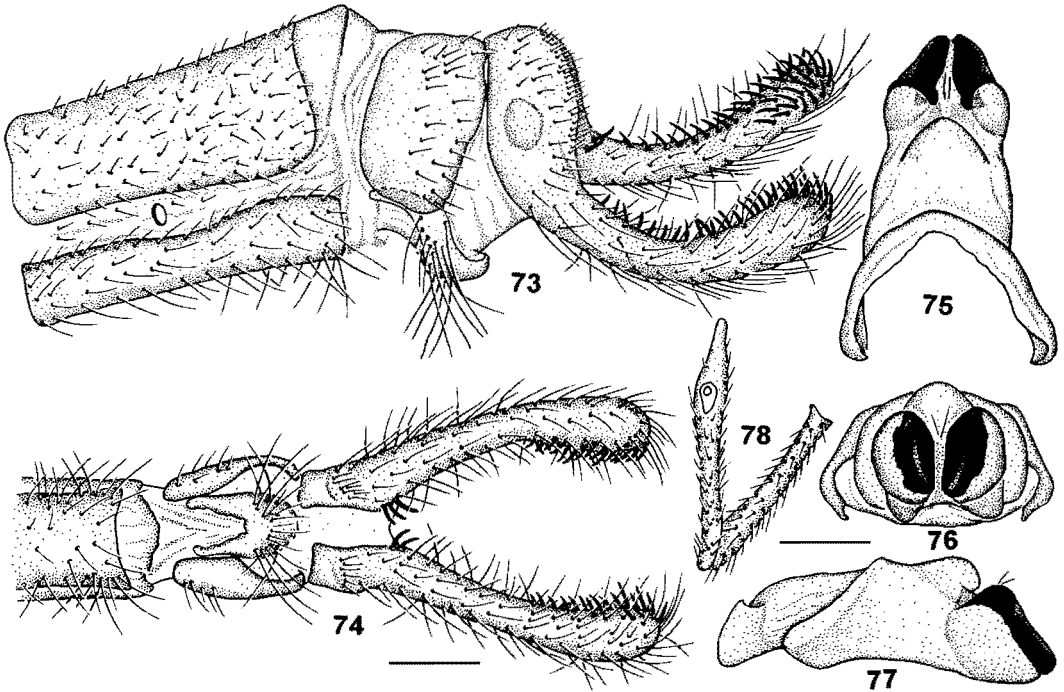
Forewings almost entirely shiny-black with two conspicuous yellow bands; thorax uniformly dark-brown.

Redescription

Size (mm). Body length male 40.0, female 38.0; forewing length male 40.0, female 45.0; hind wing length male 36.0, female 43.0; antenna male 9.0, female 8.0 ($n = 2$).

Head. Dark-brown; clypeus pale-yellow distally. Labial palps (Fig. 78) with small round opening on palpimacula.

Thorax. Uniformly dark-brown.



Figs 73–78. *Palparellus spectrum*. 73, male terminalia, lateral; 74, same, ventral; 75, gonarcus and parameres, dorsal; 76, same, caudal; 77, same, lateral; 78, left labial palp. Scale bars = 1 mm (Figs 73, 74); 0.5 mm (Figs 75–78).

Wings (Fig. 10). Broad in female, narrower in male, with rounded apices. *Forewings* almost completely fuscous, iridescent, with two characteristic transverse yellow bands, one extending from R to posterior margin just beyond origin of Rs, the other from anterior to posterior margin in pterostigmal region; a row of small pale spots present in subcostal area, one spot in wing apex and a few scattered on median area and basal third. *Hind wings* fuscous, iridescent, with pale-yellow band in pterostigmal region and other variable pale-yellow maculae in apical two thirds of wing; basal third pale-yellow but subcostal area brown. Dark wing pigment fades to pale-brown in older preserved specimens.

Legs. As in *P. rothschildi*.

Abdomen. Shorter than hind wing, uniformly pale-brown. **Male** (Figs 73–77) with brown ectoprocts; gonarcular bulla prominent.

Distribution. West Africa: Senegal, Mali, Benin, Ivory Coast, Burkina Faso, Chad, Congo (Prost 1995), Nigeria and Togo.

Flight period. Recorded from 5 May to 26 June (Prost 1995).

Remarks. This species can be distinguished from *P. rothschildi* as indicated under that species. *Palparellus spectrum* could be confused with *P. obscuripennis* which it superficially resembles, but the two may be distinguished by the male ectoprocts that have an internal lobe (cf. Mansell 1992b: Fig. 2) in *P. obscuripennis*, and which lacks the two bands in the forewing. *Palparellus spectrum* is much smaller than *P. obscuripennis*. Prost (1995) has provided a detailed taxonomic discussion of *P. spectrum*.

Type material examined. Type ♂, *Palparellus spectrum* Rambur, Senegal (ISNB). Designated as lectotype of *Palparellus spectrum* Rambur by Prost (1995).

Additional material examined. NIGERIA: 1♀, N Nigeria, Samaru (11.10N 07.38E), 11.v.1958, Dept. of Agric (BMNH).

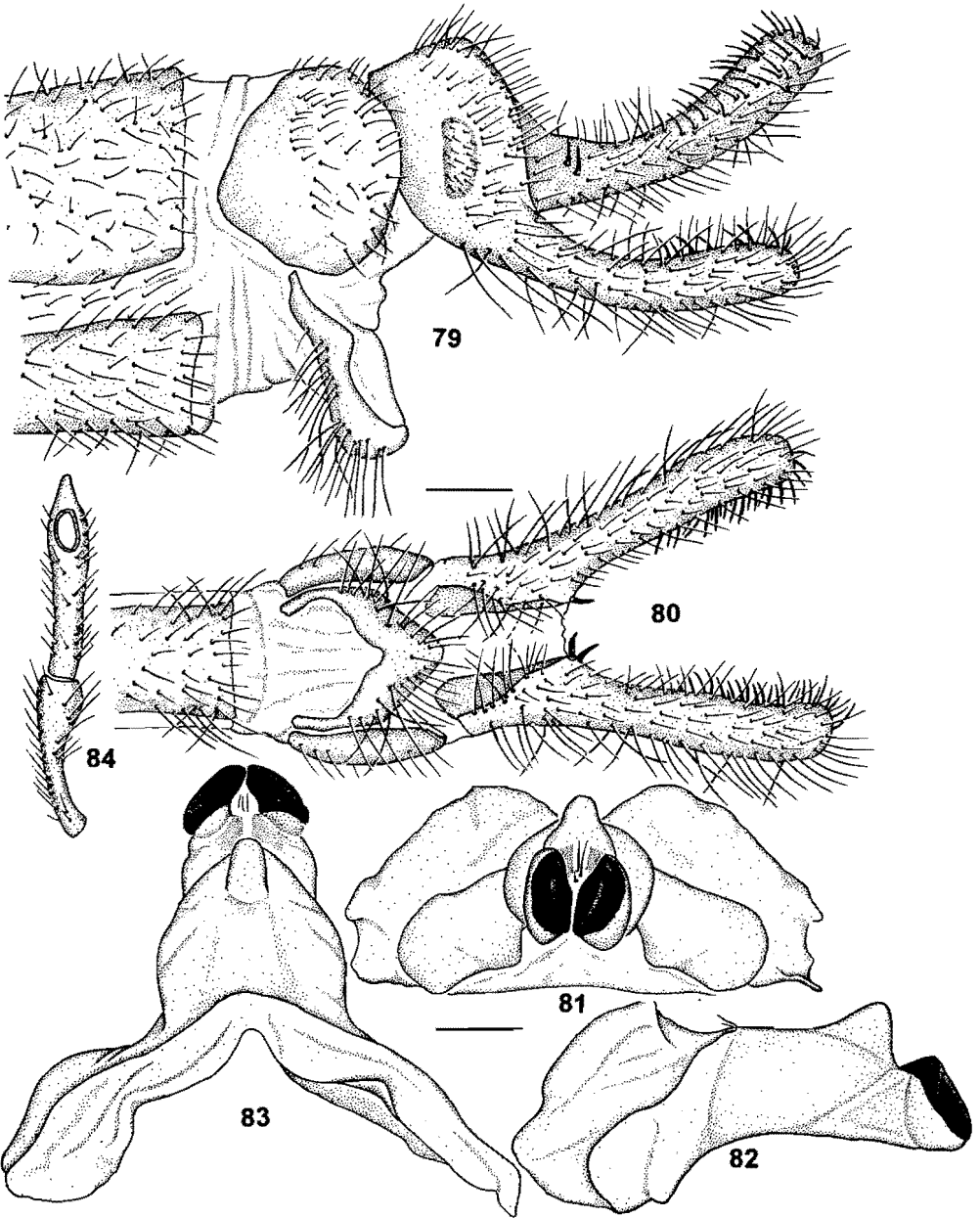
Other records. Localities recorded by Prost (1995).

***Palparellus voeltzkowi* (Kolbe) comb. n., Figs 11, 79–84**

Palparellus voeltzkowi Kolbe, 1906: 139.

Negretus voeltzkowi (Kolbe): Navás 1912d: 57.

Palparellus *Voeltzkowi* (sic): Navás 1925: 181.



Figs 79–84. *Palparellus voeltzkowi*. **79**, male terminalia, lateral; **80**, same, ventral; **81**, gonarcus and parameres, caudal; **82**, same, lateral; **83**, same, dorsal; **84**, left labial palp. Scale bars = 1 mm (Figs 79, 80); 0.5 mm (Figs 81–84).

Diagnosis

Distinct species, one of the largest and most magnificent of all antlions, characterized by long, dark-metallic-blue wings and thorax, and blood-red abdomen.

Redescription

Size (mm). Male: body length 73.3 (69.0–78.0); forewing length 69.0 (67.0–70.0); hind wing 64.0 (62.0–66.0); antenna 11.3 (10.0–12.0) (*n* = 3); *female* (after Kolbe 1906): forewing length 75.0–80.0; hind

wing 70.0–74.0; body 58.0–62.0; antenna not measured ($n = 4$).

Head. Uniformly dark-brown, virtually denudate; vertex with two slightly raised carinae. Antennae long, uniformly reddish-brown. Labial palps (Fig. 84) short, uniformly brown, with large oval, sensory opening on palpimacula.

Thorax. Dark-metallic-blue with long sparse setae.

Wings (Fig. 11). Long, narrow with rounded apices; heavily pigmented with dark-metallic-blue. *Forewings:* Rs originates beyond Cu fork. Subcostal area dark with a few pale spots, pterostigmal area pale; apex and hind margin uniformly dark, with three or four blotches and numerous tiny brown spots on the wing membrane in apical two thirds; a distinct but variable pale band extends from R to posterior margin in basal third, sometimes ending in middle of wing; basal third of wing dark. *Hind wings* slightly shorter than forewings; dark-metallic-blue, with approximately seven pale maculae arranged into two rows, and with a pale band extending from pterostigma but not reaching posterior margin. *Legs* uniformly reddish-brown, with long black setae.

Abdomen. Long, blood-red in fresh specimens, fading to reddish-brown in older, preserved material. *Male* (Figs 79–83): ectoprocts very short, less than one third length of T8; IX with acute apex; gonarcus curved, wide in dorsal view; gonarcular bulla prominent, triangular; hypandrium internum small, sclerotized, C-shaped. *Female* not dissected.

Distribution. Madagascar and Europa Island.

Flight period. Recorded from 15 November to February.

Type material examined. MADAGASCAR: 2♀ syntypes, NW Madagascar, Majunga (15.40S 46.20E) 15.xi.1890, Voeltzkow (ZMHB);

Additional material examined. MADAGASCAR. 1♂, Ambovombe (25.10S 46.06E), 1926, R.Desary; 1♂, Soalala (16.05S 45.21E), i.09, R.P., Fraser Bequest Brit. Mus. 1963-234 (BMNH); 1♂, Cote Ouest, etre Morondava et Mahabo (20.22S 44.39E), Grandidier, 2855-90 (MNHN) (also recorded by Van der Weele (1907a)).

Other records: MADAGASCAR: Tuléar (23.20S 43.41E), 1922, G.Petit (Navás 1925); 1♂, 1♀, Europa Island (22.20S 40.20E), ii.1950, P.C.; 2♂, Soalara (not located), i.1949, R.Paulian; 2♀, Betsioky (22.26S 43.43E), 10–23.xii.1948, Clement (Fraser 1951).

***Palparellus astutus* (Walker)**, Figs 12, 85–90

Myrmeleon astutus Walker, 1853: 398.

Palpares astutus (Walker): Hagen 1860: 362.

Tomatares astutus (Walker): Hagen 1866: 461.

Palparellus astutus (Walker): Navás 1912a: 225.

Palpares (*Palparellus*) *astutus* (Walker): Banks 1913: 189.

Palparellus dubiosus Navás, 1925: 183 (*nec*. Périn-guey, 1910). **Syn. n.**

Diagnosis

A small species with maculate forewings, and hind wings with distinct banding. Pterothorax uniformly dark-brown.

Redescription

Head. Uniformly dark-brown; clypeus and labrum yellowish. Labial palps (Fig. 90) with small round opening on palpimacula.

Thorax. Pronotum brown with anterior margin yellow laterally; long brown setae present, especially on anterior and posterior margins. *Mesonotum* uniformly brown, covered with delicate white setae, especially on mesoscutellum. *Metanotum* brown with two yellowish-brown velvet patches and delicate white setae, especially on metascutellum.

Wings (Fig. 12). *Forewings* yellow, heavily maculate with dark-brown; a large pale area overlies the pterostigmal region and a distinct yellow band present in basal third, extending from posterior margin to R; basal area of wing pale-yellow with small brown spots. *Hind wings* yellow, with three distinct brown bands in apical two thirds, usually coalescing near posterior margin; basal third pale-yellow, with some brown spots in subcostal area.

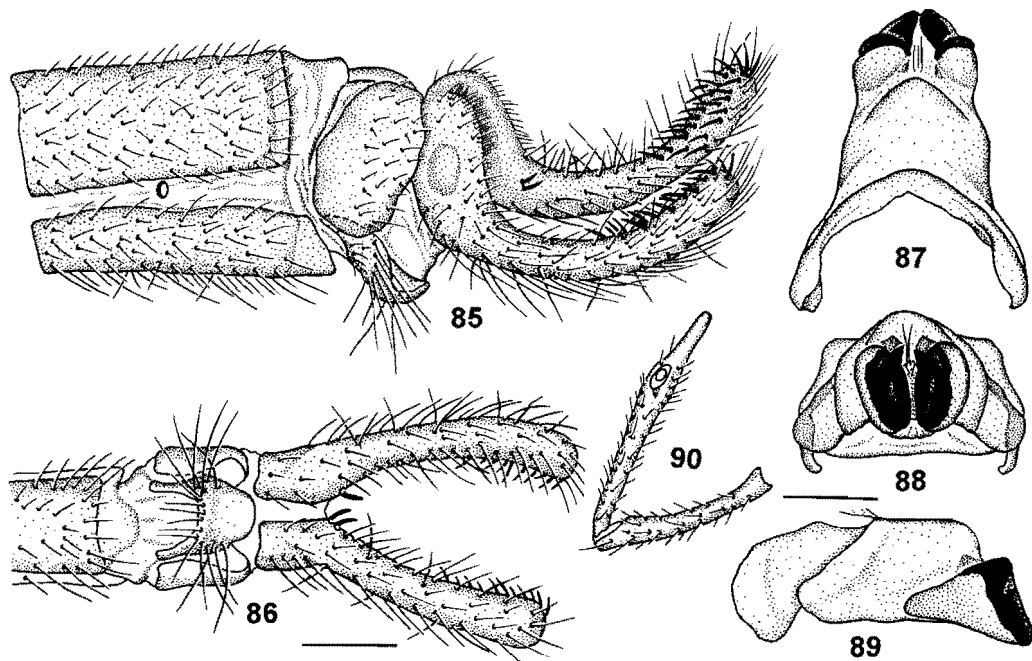
Legs. Uniformly black, sparsely covered with long black setae and denser decumbent short white setae.

Abdomen. Yellowish-brown, slightly longer than hind wing. *Male* (Figs 85–89) with short yellow ectoprocts, but longer than T8. Gonarcus slightly curved, with flat gonarcular bulla. *Female* not dissected.

Distribution. Known only by a few specimens from India.

Remarks. *Palparellus astutus* most resembles *P. rothschildi* but lacks the yellow mesonotum manifest in that species. It is currently the only *Palparellus* species recorded from the Oriental Region, and no adelphotaxon is known.

There is very little information on *P. astutus*, and



Figs 85–90. *Palparellus astutus*. **85**, male terminalia, lateral; **86**, same, ventral; **87**, gonarcus and parameres, dorsal; **88**, same, caudal; **89**, same, lateral; **90**, left labial palp. Scale bars = 1 mm (Figs 85, 86); 0.5 mm (Figs 87–90).

few locality records exist: BMNH is apparently the only museum that holds material of this species. *Palparellus astutus* is not mentioned by Ghosh (1984) in his monograph of the Indian Myrmeleontidae, and the taxon is in urgent need of study.

Palparellus dubiosus Navás, 1925, was described from a unique specimen in MNHN that was labelled only 'Tomatares astutus, Walk?'. Navás (1925) indicated that the specimen was from 'Africa', but did not elaborate. This is not an African species, and comparison with the syntypes of *Myrmeleon astutus* in BMNH indicate that it is this species. *Palparellus dubiosus* Navás, nec. *P. dubiosus* (Péringuey), is accordingly synonymized with *P. astutus*.

Type material examined. INDIA: 2♀ syntypes *Myrmeleon astutus* Walker (BMNH). Holotype ♀, *Palparellus dubiosus* Navás: 'Tomatares astutus Walk. ? / *Palparellus dubiosus* Nav. P. Navás S.J. det. / TYPE' (MNHN).

Additional material examined. INDIA: 2♂, 8♀, Localities not recorded (BMNH).

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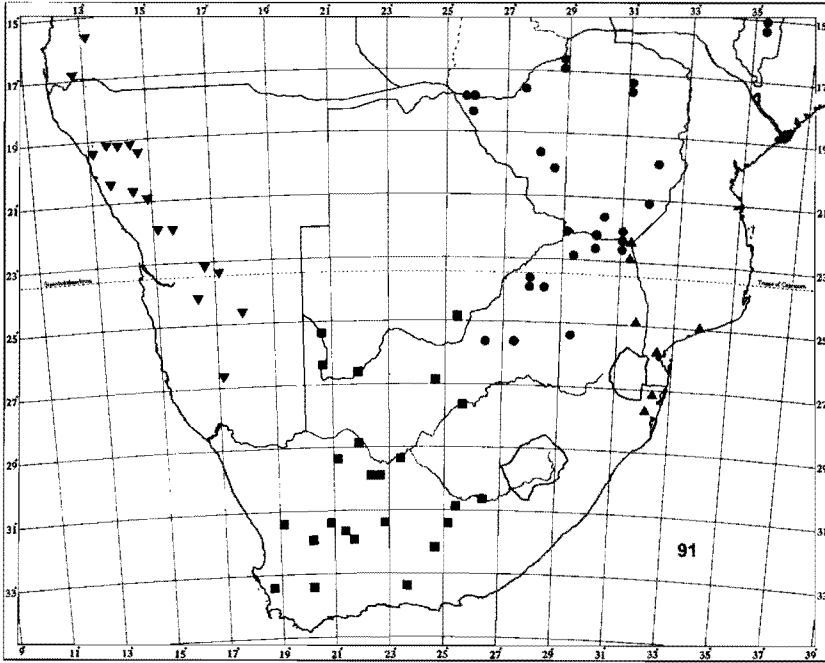


Fig. 91. Recorded distributions of: *Palparellus nyassanus* ● (28 localities); *P. festivus* ▲ (7); *P. damarensis* ▼ (17); *P. dubiosus* ■ (24).

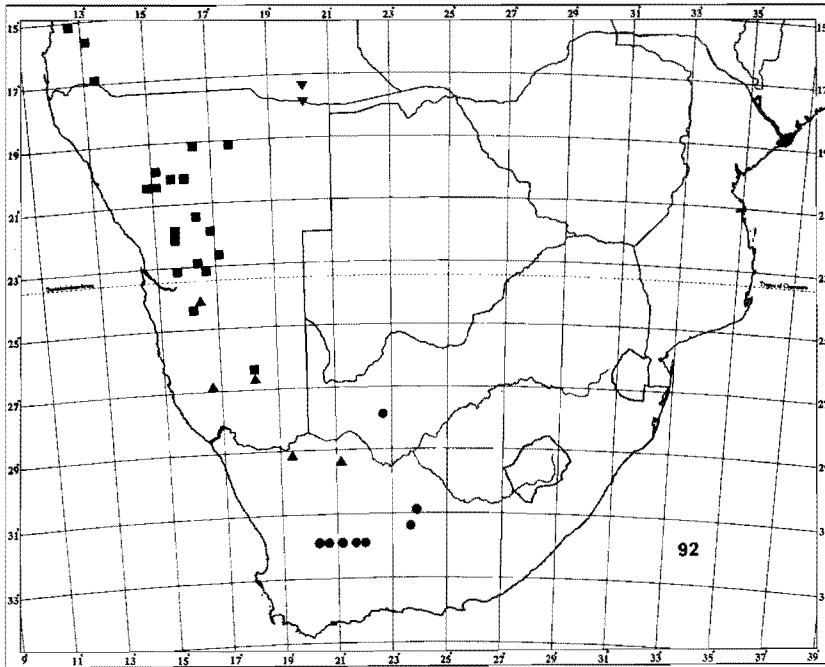


Fig. 92. Recorded distributions of: *Palparellus pulchellus* ● (8 localities); *P. ulrike* ▲ (5); *P. flavofasciatus* ■ (20); *P. ovampoanus* ▼ (2).

Appendix 1. Checklist of the species of *Palparellus* Navás

- Palparellus nyassanus** (Navás, 1912).
 = *Palparellus mistus* Navás, 1912.
 = *Palparellus excelsus* Navás, 1913.
- Palparellus festivus** (Gerstaecker, 1894).
 = *Palpares mosambicus* Péringuey, 1910.
 = *Palpares latro* Navás, 1911.
 = *Palparellus roratus* Navás, 1913.
 = *Palpares virgineus* Stitz, 1912.
- Palparellus pulchellus** (Esben-Petersen, 1922).
- Palparellus ulrike** sp. n.
- Palparellus flavofasciatus** (McLachlan, 1867).
 = *Palpares genialis* Péringuey, 1910.
 = *Tomatares guttatus* Stitz, 1912.
- Palparellus ovampoanus** (Péringuey, 1910).
- Palparellus damarensis** (McLachlan, 1867).
- Palparellus dubiosus** (Péringuey, 1910).
 = *Palpares formosus* Banks, 1911.
 = *Palpares formosus bifasciatus* Stitz, 1912.
- Palparellus rothschildi** (Van der Weele, 1907).
 = *Palparellus ruspolii* Navás, 1915.
- Palparellus spectrum** (Rambur, 1842).
 = *Palparellus spectrum tristis* Navás, 1912c: 37.
- Palparellus voeltzkowi** (Kolbe, 1906).
- Palparellus astutus** (Walker, 1853).
 = *Palparellus dubiosus* Navás, 1925.

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