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Source: Revue suisse de Zoologie, 131(1) : 251-255

Published By: Muséum d'histoire naturelle, Genève

URL: https://doi.org/10.35929/RSZ.0122

Revue suisse de Zoologie (March 2024) 131(1): 251-255 ISSN 0035-418

Two new African species of *Psyllipsocus* Selys-Longchamps, 1872 (Psocodea: 'Psocoptera': Psyllipsocidae)

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Abstract: Two new *Psyllipsocus* species are described and illustrated: *P. burckhardti* sp. nov. (from Cameroon) and *P. namibiensis* sp. nov. (from Namibia). A checklist of the eight species of *Psyllipsocus* known from the Ethiopian Region and North Africa is provided, comprising the cosmopolitan *P. ramburii* Selys-Longchamps, 1872, the pantropical *P. yucatan* Gurney, 1943, five species from African countries south of the Sahara and one from the southern Arabian Peninsula. The *ornatus* species group is proposed for three African species.

Keywords: Insecta - Trogiomorpha - Psyllipsocetae.

INTRODUCTION

Psyllipsocidae is the only known family of the infraorder Psyllipsocetae belonging to the suborder Trogiomorpha, the sister taxon of the remaining members of the Psocodea (de Moya *et al*., 2021). *Psyllipsocus* Selys-Longchamps, 1872 seems to be the "oldest extant" genus of the order Psocodea because several fossil species from Cretaceous Burmese amber have been assigend to it (Lienhard *et al*., 2022: 2; Lienhard, 2023: 75).

The genus *Psyllipsocus* is widely distributed, especially in the tropics, and has been rather well studied in the New World (Mockford, 2011; Lienhard & Ferreira, 2015). Recently a checklist for the Oriental Region has also been published, together with the description of 14 new species (Lienhard *et al*., 2022; Lienhard, 2023). However, only six species were previously known from the Ethiopian Region (see Appendix, below). Two new African species are here described and illustrated. In the Palaearctic (including Northern Africa) and in Australia the genus is only represented by the widespread cave species *Psyllipsocus ramburii* Selys-Longchamps, 1872, which is often also found in human dwellings (Lienhard, 1998, 2016).

MATERIAL AND METHODS

The type material of the new species is deposited in the Muséum d'histoire naturelle of Geneva, Switzerland (MHNG) and in the National Museum of Namibia, Windhoek (NMNW).

Wing pilosity is usually heavily damaged in the material studied. For the drawings it was reconstructed from the sockets of the hairs, which are always visible in slide-mounted wings, and the few hairs on each wing which were not lost. The length of these hairs was considered as representative for the pilosity of the entire wing margin or all the veins, based on the observation that in *Psyllipsocus* the length of marginal hairs, or of hairs on veins, is usually uniform over the whole wing.

Abbreviations: AP = areola postica (the marginal cell in forewing formed by veins CuA1 and CuA2); a.s.l. = above sea level; BL = body length (in alcohol); F = hind femur (length); FW = forewing (length); FWw = forewing (greatest width); HW = hindwing (length); IO/D = shortest distance between compound eyes divided by longitudinal diameter of compound eye in dorsal view of head; P2 = second article of maxillary palp; P4 = fourth (terminal) article of maxillary palp; T = hind tibia (length); t1, t2, t3 = tarsomeres of hind tarsus (length, measured from condyle to condyle). Abbreviations of wing veins are used according to Yoshizawa (2005).

Manuscript accepted 10.01.24
DOI: 10.35929/RSZ.0122

TAXONOMIC PART

Psyllipsocus burckhardti sp. nov.

Fig. 1A-F

Holotype: MHNG; male (several parts slide-mounted, but head and thorax partly in alcohol); Cameroon, Center Province, 20 km E of Yaounde, Soa, 630 m a.s.l., 3º59'N 11º35'E; 14.xi.2005; leg. D. Burckhardt #3.

Diagnosis: This species differs from all known species of the genus by its characteristic forewing pattern and by the presence of some thickened postero-lateral setae on male epiproct.

Etymology: This beautifully coloured species is dedicated to its collector, Dr Daniel Burckhardt, eminent specialist of psyllids, who kindly deposited the type specimen in the Psocoptera collection of the MHNG.

Description

General characters: Macropterous (Fig. 1A-B), forewing relatively wide (FW/FWw = 2.7). Body medium brown to dark reddish brown, abdomen ventrally yellowish to light brown, terminalia brown, forewing (Fig. 1A) strikingly patterned, veins brown, hindwing (Fig. 1B) with weakly developed pattern, legs medium to dark brown with whitish trochanter. Compound eyes dark brown (observed after two years in alcohol), ocelli well developed, head capsule without particular sculpturation (its surface finely granulate), strongly flattened antero-posteriorly, thus vertex sharply rounded. Antennae and maxillary palps lost. Lacinial tip (Fig. 1D) strongly divergent apically, trifid, with relatively long outer tine. Pretarsal claws simple, symmetrical, with a small preapical denticle and a series of tiny plantar microtrichia (Fig. 1C). Hind leg with well-developed coxal organ, tibia relatively short (T only about 1.5x longer than F and 1.8x longer than t1). Forewing with short but conspicuous hairs on margin (except basal portion of hind margin) and slightly longer hairs on veins (except CuP). Hindwing bare, anal vein simple.

Male terminalia: Clunium simple. Epiproct (Fig. 1E) posteriorly on each side with four not very long but clearly thickened setae. Paraproct (Fig. 1E) with a sensorium of six trichobothria on vague basal florets, a stout anal seta on hind margin, a much thinner marginal seta ventrally to it and a tiny setal sensillum near to the latter. Hypandrium and phallosome as in Fig. 1F (pilosity of hypandrium dense and long, not shown in this figure), apex of hypandrium dorsally directed in lateral view, basal struts of phallosome strongly diverging anteriorly.

Female: Not known.

Measurements: *Male* (holotype): BL = 1.5 mm; FW = 2.0 mm; FWw = 0.73 mm; HW = 1.6 mm; F = 450 µm; T = 690 µm; t1 = 375 µm; t2 = 71 µm; t3 = 65 µm; IO/D = 1.8.

Distribution: Cameroon (only known from the type locality: Soa, 20 km E of Yaounde).

Remarks: This species is closely related to *Psyllipsocus ornatus* Badonnel, 1973, described from Angola. *P. ornatus* has a very similar lacinial tip and venation and pilosity of the forewing, and a patterned forewing, but it differs from the new species by details of male genitalia and forewing pattern (especially basal half of the wing colourless except for the uniformly brown anal cell) and by the absence of the thickened postero-lateral setae on epiproct (see Badonnel, 1973: figs 1-6). These two closely related species form a small group within the genus *Psyllipsocus*, here called the *ornatus* species group. *P. dorae* Badonnel, 1973, also known from Angola, is here also assigned to this group due to the presence of well-developed hairs on forewing margin and similar wing venation and male genitalia; but its lacinial tip is less divergent and the forewing membrane is almost uniformly tinged with brown, with a very indistinct darker pattern in apical half (see Badonnel, 1973: figs 8-14).

Psyllipsocus namibiensis sp. nov.

Fig. 1G-L

Holotype: NMNW; male (slide-mounted); Namibia, Brandberg, Hungorob Valley, Bushy Karoo-Namib shrubland, 1180 m a.s.l.; Malaise trap, 2-5.iv.1999; leg. S. van Noort & S. G. Compton (sample NA99-M04).

Paratypes: MHNG and NMNW; 1 male (sample NA99-M03); same data as for holotype. – 2 males (sample NA99-M12); Namibia, Brandberg, Messum Valley, Bushy Karoo-Namib shrubland, 700 m a.s.l.; Malaise trap, 5-17.iv.1999; leg. S. van Noort & S. G. Compton.

Other material: MHNG; 1 specimen lacking abdomen (sample NA99-M04); same data as for holotype.

Diagnosis: This species is characterized by the morphology of male genitalia, especially the distal part of the phallosome differentiated as two pairs of parallel sclerotized struts.

Etymology: The species epithet refers to Namibia, the country of the type locality.

Description

General characters: Macropterous (Fig. 1G-H), forewing relatively narrow (FW/FWw = 3.1). Body light to medium brown, abdomen whitish, terminalia light brown, legs light brown. Wings (Fig. 1G-H) hyaline, with almost colourless veins. Compound eyes reddish brown (observed after six years in alcohol), ocelli well developed, head capsule without particular sculpturation (its surface finely granulate), not strongly flattened antero-posteriorly, thus vertex normally rounded. Antennal

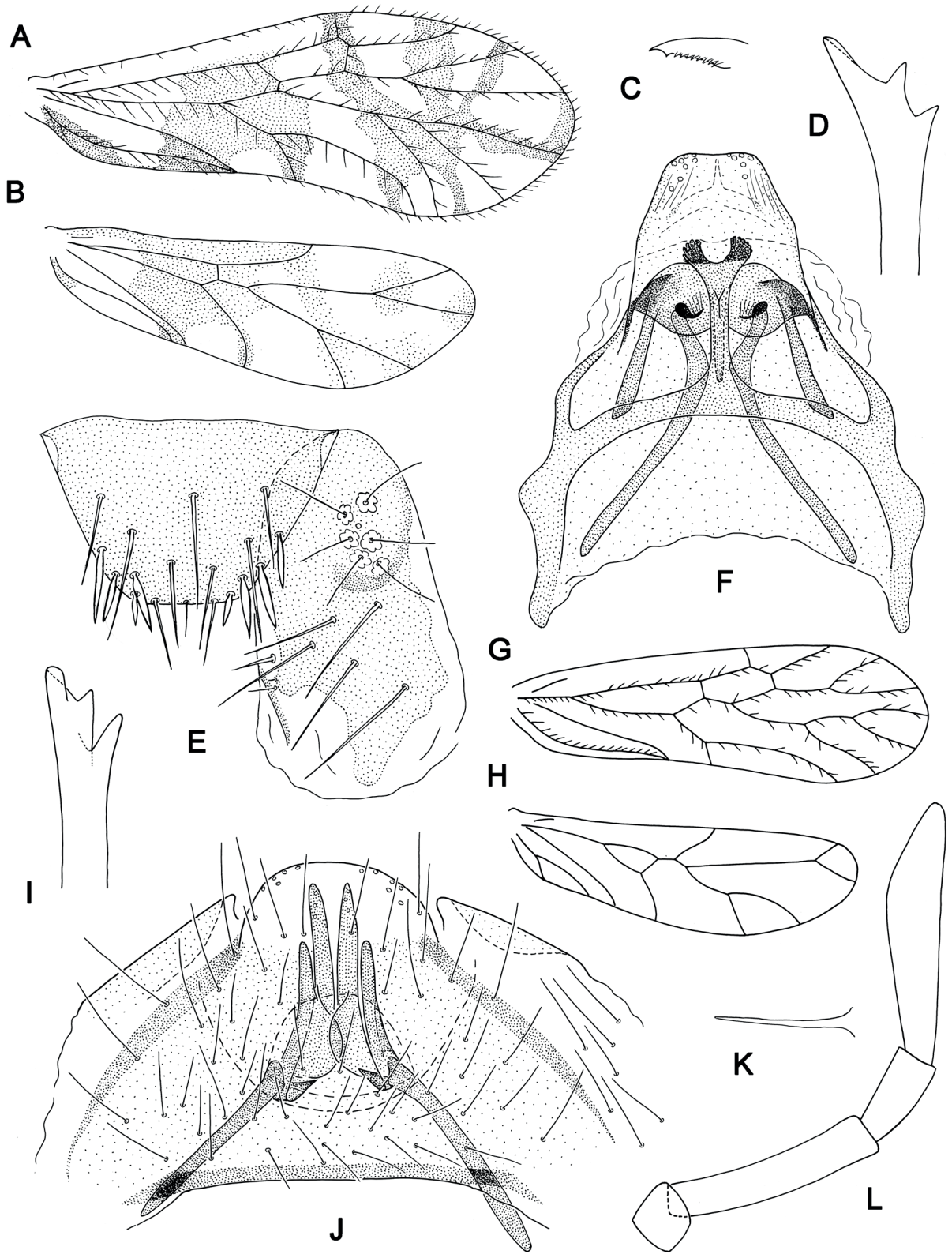

Fig. 1. *Psyllipsocus burckhardti* sp. nov., male holotype (A-F). (A) Forewing. (B) Hindwing (same magnification as A). (C) Pretarsal claw. (D) Lacinial tip. (E) Epiproct and right paraproct. (F) Hypandrium and phallosome (ventral view, pilosity not shown). *Psyllipsocus namibiensis* sp. nov., male holotype (G-L). (G) Forewing. (H) Hindwing (same magnification as G). (I) Lacinial tip. (J) Hypandrium and phallosome (ventral view). (K) Paraproctal anal spine. (L) Maxillary palp (pilosity not shown).

flagella damaged or lost, maxillary palp (Fig. 1L) whitish, P2 lacking conical sensillum, P4 slender and very slightly hatchet shaped. Lacinial tip (Fig. 1I) weakly diverging apically, trifid, outer tine not particularly long or curved. Pretarsal claws simple, symmetrical, with a small preapical denticle and a series of tiny plantar microtrichia. Hind leg with well-developed coxal organ, tibia relatively long (T about 1.8x longer than F and 2.5x longer than t1). Forewing lacking conspicuous marginal hairs but with short hairs on veins, except CuP (as usual in the genus *Psyllipsocus*), AP particularly long and narrow. Hindwing bare, anal vein bifurcate.
Male terminalia: Clunium and epiproct simple. Paraproct with a sensorium of six trichobothria on vague basal florets and a rigid anal spine on posterior margin (Fig. 1K), not articulated at its base. Hypandrium and phallosome as in Fig. 1J, basal struts of phallosome strongly diverging anteriorly, distal structures of phallosome differentiated as two pairs of parallel struts.
Female: Not known.

Measurements: *Male* (holotype): BL = 1.7 mm; FW = 1.7 mm; FWw = 0.55 mm; HW = 1.4 mm; F = 386 µm; T = 705 µm; t1 = 287 µm; t2 = 56 µm; t3 = 60 µm; IO/D = 1.4.

Distribution: Namibia (only known from Brandberg, the type locality).

Remarks: Based on the very characteristic differentiation of the distal structures of the phallosome this species seems to occupy a rather isolated position within the genus *Psyllipsocus*. The following African species of this genus have also hyaline wing membranes: *P. ramburii* Selys-Longchamps, 1872 and *P. yucatan* Gurney, 1943, both widely distributed, and *P. spinosus* Badonnel, 1955, only known from Angola. The macropterous form of *P. ramburii* is characerized by the absence of an R1-Rs crossvein which is present in the other two species and in *P. namibiensis* sp. nov. *P. spinosus* is characterized by the very short tines of the lacinial tip. In *P. ramburii*, *P. spinosus* and *P. namibiensis* sp. nov. a non-articulated anal spine is differentiated on the paraproctal hind margin, while this structure is replaced by a normally inserted stout seta in *P. yucatan* (for figures see Badonnel, 1955: figs 27-31; Lienhard, 1998: 37-38; Lienhard & Ferreira, 2015: figs 2-6).

DISCUSSION

Only few species of *Psyllipsocus* are known from the Ethiopian Region (see Appendix, below), probably because these tiny and fragile psocids are under-represented in the material, usually collected by non-specialists, hitherto available for study. Two species are widely distributed, the cosmopolitan and often domestic *P. ramburii*, and the pantropical *P. yucatan*. Three closely related African species form the small *ornatus* species group: *P. ornatus, P. dorae* and *P. burckhardti* sp. nov. Two species each seem to have a rather isolated position within the genus: *P. namibiensis* sp. nov., characterized by a phallosome with two pairs of parallel apical struts, and *P. spinosus*, characterized by the very short tines of the trifid lacinial tip (the male of this species is not yet known). The species *P. disparunguis* Lienhard, 2009, only known from southern Arabian Peninsula is an Oriental element forming together with three species from Southeast Asia the very characteristic *disparunguis* species group (Lienhard, 2023). It is evident that more collecting is necessary to complete our knowledge of this genus in the Ethiopian Region.

ACKNOWLEDGEMENTS

I am very grateful to Daniel Burckhardt (Basle) and to Eugene Marais (Windhoek) for having put at my disposal material from their collections. Many thanks go also to John Hollier and Kazunori Yoshizawa for critical reading of the manuscript and useful comments, and to Christina Lehmann-Graber for technical assistance.

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Appendix. Checklist of *Psyllipsocus* species known from the Ethiopian Region and North Africa

Psyllipsocus burckhardti Lienhard, **sp. nov.**, Cameroon (see description in the present study).

Pyllipsocus disparunguis Lienhard, 2009: 49. United Arab Emirates (Lienhard, 2009).

Psyllipsocus dorae Badonnel, 1973: 65. Angola (Badonnel, 1973).

Psyllipsocus namibiensis Lienhard, **sp. nov.**, Namibia (see description in the present study).

Psyllipsocus ornatus Badonnel, 1973: 63. Angola (Badonnel, 1973).

Psyllipsocus ramburii Selys-Longchamps, 1872: 146. Algeria, Morocco, Tunisia (Lienhard & Smithers, 2002; Lienhard, 2016), Angola (Badonnel, 1955), Zimbabwe (Smithers, 1966, 1974).

Psyllipsocus spinosus Badonnel, 1955: 35. Angola (Badonnel, 1955, 1969).

Psyllipsocus yucatan Gurney, 1943: 212. Congo (Badonnel, 1946, 1948, under the junior synonym *P. collarti* Badonnel, 1946), Kenya and Senegal (Lienhard & Ferreira, 2015). Widely distributed in American tropics (Lienhard & Ferreira, 2015) and also known from Thailand (Lienhard *et al*., 2022).