

Redescription of *Psocus flavonimbatus* Rostock (Psocoptera: Psocidae) from Finland

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About 120 years since its original description from Estonia (region of lake Peipus) the enigmatic species *Psocus flavonimbatus* Rostock, 1879 has been rediscovered in semi-natural spruce-dominated forests in Kuhmo, Central Finland. The species, which had tentatively been synonymized with *Loensia variegata* (Latreille, 1799), is here reinstated. Coloration and general morphology of both sexes and terminalia of females are described and illustrated. Unfortunately the few males available are all damaged, lacking abdomen. Without information on male terminalia it is impossible to assign the species to one of the modern genera of Psocidae. Therefore, it is here retained in the genus *Psocus*, pending further studies.

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1. Introduction

The psocid fauna of Finland is considered well known: 62 species are listed by Lienhard (1998) and three additional species are reported by Kanervo (1996, 1997). This fauna, like the psocid fauna of Northern Europe in general, corresponds essentially to an impoverished fauna of Central Europe, lacking special boreal or arctic elements (Lienhard 1998).

The completely unexpected discovery, in semi-natural spruce-dominated forests in Kuhmo, Central Finland (habitat description: Várkonyi *et al.* in prep.), of a large and conspicuous Psocidae species, which cannot be identified with the recently published keys to the Western Palaearctic Psocoptera (Lienhard 1998), was more than a faunistic surprise. It enables us to resolve an old

enigma by redescribing the species *Psocus flavonimbatus*, described from Estonia (region of lake Peipus) more than 120 years ago by Rostock (1879). This species has never been found again and it was impossible to trace the type material (Lienhard 1990). The species was transferred to the genus *Amphigerontia* by Mühlen (1884), but this combination is only of historical interest; the species does not belong to the subfamily Amphigerontiinae, as it is presently defined (see Discussion). For a long time *Psocus flavonimbatus* was considered as a species inquirenda, and Smithers (1967) placed it in the genus *Psocidus*, because it was not possible to assign it with reasonable certainty to the genus *Psocus* in the restricted sense of Pearman (1932, 1934). Lienhard (1990) tentatively synonymized *Psocus flavonimbatus* with *Loensia variegata* (Latreille, 1799), based on the

similarity of the forewing pattern of a particular Greek form of *L. variegata*, with that described by Rostock (1879) for *P. flavonimbatus*. Therefore, the name *Psocus flavonimbatus* appears only as a synonym of *L. variegata* in his recent monograph on Western Palaearctic Psocoptera (Lienhard 1998).

A detailed comparison of the coloration characters of the enigmatic Kuhmo species with Rostock's description of *Psocus flavonimbatus* showed an extremely close correspondence not only in wing pattern but also in the presence of a yellow transverse frontal band contrasting with the dark brown vertex and postclypeus: "eine ziemlich breite gelbe Stirnbinde zwischen Scheitel und Stirn [=Postclypeus]" (Rostock 1879). This characteristic coloration of the head cannot be observed in *Loensia variegata* and the forewing pattern of the above-mentioned Greek form is clearly different, in spite of its superficial similarity. The most striking difference is the absence of brown spots in cell R3 and the presence of dark-brown apical spots on veins r2 + 3 to cu1 (cf. figure 13 in Lienhard 1990). There is no doubt that the Kuhmo specimens belong to *Psocus flavonimbatus*, and that the synonymization with *Loensia variegata* is not justified. This conclusion is also supported by the geographical distribution. The type locality of *Psocus flavonimbatus* (region of lake Peipus) is situated only about 600 km south of Kuhmo, thus much closer to this Finnish locality than to the Greek locality (Island of Paros) from where the above mentioned form of *Loensia variegata* is known.

In the following we give a redescription of *Psocus flavonimbatus* based on the Finnish material. All specimens available are trap-collected and most of them are more or less damaged; unfortunately the few known males are all heavily damaged, in particular lacking abdomen. In the absence of information on male terminalia it is not possible to assign the species to one of the modern genera of Psocidae (cf. Discussion).

2. Description

The following abbreviations are used for measurements: BL = body length; FW = forewing length; F = length of hind femur; T = length of

hind tibia; t1, t2 = lengths of hind tarsomeres (from condyle to condyle); IO/D = the shortest distance between compound eyes divided by antero-posterior diameter of compound eye, in dorsal view. For morphological terminology and corresponding abbreviations, see Lienhard (1998).

Psocus flavonimbatus Rostock

Psocus flavonimbatus Rostock, 1879: 129.

Amphigerontia flavonimbatus [sic!] (Rostock). Mühlen 1884: 331 (incorrect spelling).

Psocidus flavonimbatus (Rostock). Smithers 1967: 108.

Material examined (Natural History Museum of Geneva and Zoological Museum of the University of Turku). FINLAND: *Ok* province (Ostrobothnia kajanensis): Kuhmo, Särkijärvi (7111: 622) 1 female 30.VII.–11.VIII.1997 in an old-growth *Picea abies* forest by light trap (M. Kuussaari, H. Lappalainen and M. Romppanen leg.); Kuhmo, Jauhovaara (7106: 603) 29.VI.–27.VII.1998 1 ex., 27.VII.–24.VIII.1998 2 females (M. Kuussaari, H. Lappalainen and M. Romppanen leg.); Kuhmo, Teeri-Lososuo (7091: 608) 1.–29.VI.1998 1 female and 2 exx., 29.VI.–30.VII.1998 7 females, 3 males and 5 exx., 30.VII.–30.VIII.1998 3 females and 1 ex. (M. Kuussaari, H. Lappalainen and M. Romppanen leg.); Kuhmo, Teeri-Lososuo (7091: 608) 1.VI.–3.VII.2000 1 female and 1 ex., 3.VII.–1.VIII.2000 6 females, 1 male and 2 exx., 1.VIII.–1.IX.2000 1 ex. (G. Várkonyi, M. Salo and M. Romppanen leg.). Specimens from Jauhovaara and Teeri-Lososuo were caught by window traps placed directly onto trunks of old living aspen trees (*Populus tremula*).

Diagnosis. *Psocus flavonimbatus* differs from all known Western Palaearctic Psocidae species by its very characteristic forewing pattern (Fig. 1a–b) and the distinct yellow transverse band on frons (often subdivided by a median brown spot). In well-coloured specimens there is a strong contrast between these light-yellow parts of the frons and the adjacent dark brown vertex and postclypeus.

Coloration. Head dark brown, vertex medially somewhat paler, frons with a yellow transverse band which is often more or less interrupted medially by a brown spot (this spot sometimes only weakly developed), postclypeus dark brown,

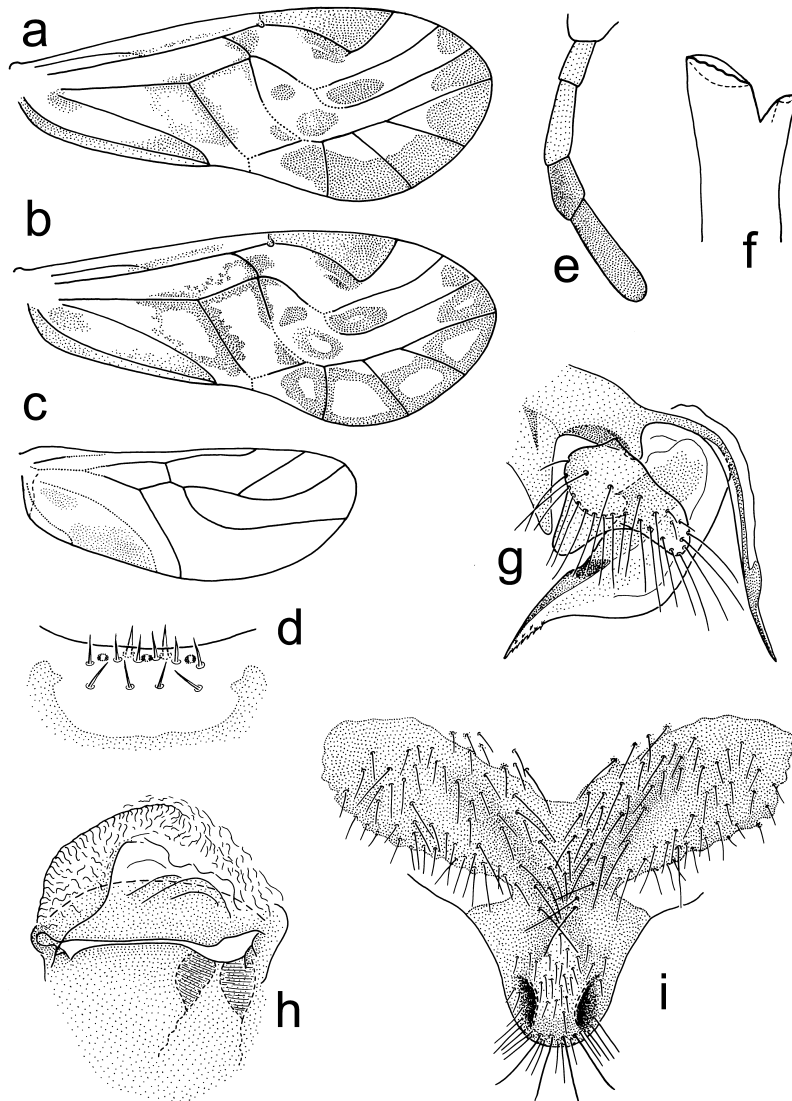


Fig. 1. *Psocus flavonimbatus* Rostock, female. — a. Forewing (specimen no. 7495, Geneva Natural History Museum). — b. Forewing (specimen no. 7594, Geneva Natural History Museum). — c. Hindwing. — d. Distal labral sensilla. — e. Maxillary palpus (pilosity not illustrated). — f. Lacinial tip. — g. Gonapophyses. — h. 9th sternite with spermapore (distal part of spermatheca visible by transparency, represented by small broken lines). — i. Subgenital plate.

with longitudinal stripes, anteclypeus yellowish, labrum brown. Eyes black, antennae medium brown, basal segments of maxillary palpus (P1, P2) yellowish, apical segments (P3, P4) brown (Fig. 1e). Thorax dark brown, sclerites with yellow margins, legs brown. Colour pattern of forewing characterized by the presence of a broad brown marginal zone reaching from cell R3 to AP, by two nearly round spots in basal part of cell R5 and one elongated spot basally in cell R3 (Fig. 1a). The brown zones of the marginal cells (especially of M1 to M3) and the more distal spot in cell R5 are often paler in the middle, some-

times with an almost hyaline central zone (Fig. 1b). All intermediate states between the patterns represented in Fig. 1a–b can be observed. Hindwing hyaline, at most with two light-brown patches in cell Pcu (Fig. 1c). Abdomen yellowish, with some red-brown hypodermal pigment, terminalia dark brown.

Morphology. Apical segment of maxillary palpus (P4) slightly more than 4 times longer than wide near base (Fig. 1e). Lacinial tip as in Fig. 1f. Distal labral sensilla as in Fig. 1d. Ocelli well developed, compound eyes distinctly larger in males than in females (see “Measurements”). In

forewing (Fig. 1a–b) vein *m* forming distal closure of discoidal cell distinctly concave, *rs* and *m* fused in a point or joined by a very short crossvein, first section of *cul* more than twice as long than second section, which is fused to *m*, pterostigma sometimes with a very short spurvein at hind angle (Fig. 1a), usually no spurvein (Fig. 1b). Venation of hindwing as in Fig. 1c. Terminalia of female: Epiproct and paraproct without particular characters. Subgenital plate (Fig. 1i) in basal part broadly V-shaped, with a pair of crescent-like sclerifications on the inner (dorsal) side of the apical lobe. Gonapophyses as in Fig. 1g. Region of spermapore on 9th sternite (Fig. 1h) with weakly sclerified asymmetrical structures, spermathecal duct very short, its opening situated laterally, in a membranous transversal fold of the spermapore plate. Terminalia of male not known (cf. Introduction). The asymmetrical structure of the spermapore plate in the female speaks in favour of an asymmetrical structure of the phallosome and probably also of the hypandrium (cf. Lienhard 1983).

Measurements (for F, T, t1, t2, IO/D only 1 specimen measured). Female: BL = 3.5 to 3.9 mm; FW = 4.4 to 4.9 mm; F = 0.90 mm; T = 1.78 mm; t1 = 600 µm; t2 = 175 µm; IO/D = 1.6. Male (abdomen and hindlegs damaged): FW = 4.7 to 4.9 mm; IO/D = 1.3.

3. Discussion

Due to the presence of a concave vein *m* forming distal closure of discoidal cell in the forewing, the present species has to be placed in the subfamily Psocinae (*sensu* Mockford 1993). Definite tribal placement would only be possible based on information about male terminalia. The relatively slender apical segment of maxillary palpus and the pointed apex of the second valvula of female gonapophyses exclude a placement in the tribes Cerastipsocini and Metylophorini. Therefore the species belongs either to the tribe Psocini or Ptyctini (*sensu* Mockford 1993). The genus *Psocidus*, to which it has provisionally been assigned by Smithers (1967) (cf. Introduction) belongs to the Ptyctini (Lienhard & Smithers 2002), the genus *Psocus* to the Psocini. As we are not able to assign the species to one of the modern

genera of Psocidae, we prefer to retain it in its original genus, pending further studies, even if it seems not very probable that it really belongs to the genus *Psocus* as it is presently defined (cf. Lienhard 1998).

The phenology of the material examined indicates that *Psocus flavonimbatus* hibernates in nymphal stage. The earliest Finnish captures were made in June 1998; in Kuhmo, all species hibernating in the egg stage have been collected later in the year 1998. The Estonian type material (one specimen of unknown sex) has also been collected in June (Rostock 1879).

Psocus flavonimbatus is presently only known from Central Finland and from Estonia. Rostock (1879) calls it a Russian species (“eine besondere nordrussische Art”) and indicates that it has been taken near lake Peipus, without mentioning an exact locality. Lake Peipus is situated on the boundary of Russia and Estonia. According to Mühlen (1884), the collector of Rostock’s material, and Danks (1959, 1968) the species is only known from the type locality in Estonia. The present records may suggest a more eastern distribution in the Palaearctic. In this context, we would like to mention here *Ptycta chubsugulensis*, an interesting species described from Mongolia by Günther (1982). Only one male of *P. chubsugulensis* is known; unfortunately the colour characters of this specimen are poorly preserved (cf. Günther 1982), so that the possibilities for a comparison with *Psocus flavonimbatus* are limited. Forewing length and venation are identical in both species and Günther’s figure of the forewing shows two weakly developed spots in cell R5, a basal spot in R3 and a slightly darker marginal zone from cell R3 to AP. This wing pattern corresponds to weakly coloured specimens of *Psocus flavonimbatus*. Therefore it cannot be excluded that the holotype of *Ptycta chubsugulensis* is nothing else than a male of *Psocus flavonimbatus*. From a biogeographical point of view this would not be surprising, since about 85% of the psocid species known from Mongolia are widely distributed and belong also to the European fauna (cf. Lienhard 1998). The phenology of *Ptycta chubsugulensis* apparently also corresponds to that of a species hibernating in nymphal stage: the only known specimen has been collected together with several adults of *Tricha-*

denotecnum germanicum Roesler (Günther 1982), a widely distributed species also occurring in Europe, where it is known to hibernate in a late nymphal stage (cf. Lienhard 1998).

All these problems could be resolved when the morphology of male terminalia of *Psocus flavonimbatus* will be known. The present observations on trap-collected material indicate that the species is not rare in the Kuhmo region, so the first capture of an intact male is probably only a matter of time. That's why the last sentence of Rostock's (1879) original description is still as true as it was at the time of its publication: "Nordische Entomologen mögen daher diesem Thiere ihre besondere Aufmerksamkeit schenken".

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