Arch. Biol. Sci., Belgrade, 63 (1), 275-286, 2011 DOI:10.2298/ABS1101275M

A REVISED DESCRIPTION OF *PSYLLOPSIS REPENS* LOGINOVA, 1963 (HEMIPTERA: PSYLLOIDEA: PSYLLIDAE), WITH FIRST RECORDS FROM EUROPE

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Abstract - Psyllopsis repens Loginova, 1963 (Hemiptera: Psylloidea: Psyllidae: Diaphorininae) is recorded for the first time from Europe from two localities within the city of Belgrade in Serbia. This jumping plant-louse species is narrowly oligophagous on several ash-tree species (*Fraxinus angustifolia*, *F. excelsior*, and *F. ornus*) and induces galls on leaves and buds. Previously, it was known only from the Caucasus and the Middle East. We provide detailed morphological descriptions and illustrations of adults and the fifth instar larva, and summarize available information on the biology, distribution, and economic importance of *P. repens*.

Key words: Diaphorininae, *Psyllopsis*, taxonomy, distribution, galls, *Fraxinus*, Serbia.

UDC 595.75:57.06(497.11)

INTRODUCTION

The jumping plant-lice or psyllids (Hemiptera: Sternorrhyncha: Psylloidea) are a group of phytophagous sap-sucking insects with usually narrowly restricted host plant ranges, mainly associated with dicotyledonous plants (Hodkinson, 1974; Ossiannilsson, 1992). Their life cycles are often synchronized with the phenologies of the host plants and well-adapted to local climatic conditions (Hodkinson, 2009). Many species induce galls of various types (Hodkinson, 1984; Burckhardt, 2005). While most of the approximately 3000 species described worldwide occur in the tropics and southern temperate regions, only 382 species have been recorded in Europe so far (Burckhardt, 2010).

Psyllopsis Löw, 1879 is a small West Palaearctic genus currently classified in the Psyllidae: Diaphorininae. It includes ten species exclusively associated with various ash species (*Fraxinus* spp., Oleaceae; another species, *Psyllopsis mexicana* Crawford, 1914, described from Mexico without a host plant record, is probably not related to the other *Psyllopsis* spp. but it has not been formally removed from the genus so far, see Crawford, 1914; Loginova, 1963; Hodkinson and White, 1981). Seven species, i.e. *P. discrepans* (Flor, 1861), *P. distinguenda* Edwards, 1913, *P. dobreanuae* Loginova, 1971, *P. fraxini* (Linnaeus, 1758), *P. fraxinicola* (Foerster, 1848), *P. machinosa* Loginova, 1963, and *P. meliphila* Löw, 1881 have been known from Europe (Burckhardt, 2010), while three species, namely *P. narzykulovi* Bajeva, 1964, *P. repens* Loginova, 1963 and *P. securicola* Loginova, 1963 are distributed in the Caucasus, Middle East, and Central Asia (Loginova, 1963; Baeva, 1985; Gegechkori and Loginova, 1990). Three species (*P. discrepans, P. fraxini* and *P. fraxinicola*) have been introduced into North America (Hodkinson, 1988), two (*P. fraxini* and *P. fraxinicola*) into Australia and New Zealand (Hollis, 2004) and one (*P. fraxinicola*) to temperate South America (Burckhardt, 1994a).

The *Psyllopsis* spp. share a similar adult and larval morphology. The adults are characterized by a usually broad posterior lobe of the male proctiger, complex parameres with numerous thick, usually sclerotized spines on the inner surface, a basal sleeve-shaped structure on the distal segment of the aedeagus; and the female subgenital plate is deeply incised at the apex and densely covered in long setae. The larvae can be distinguished from other psyllids by their tarsal arolium with a very long petiole and the presence of lanceolate and semiglobular-to-clavate setae on the body margin and dorsum, respectively. Most adult European *Psyllopsis* spp. can be identified using the specifications of Conci and Tamanini (1990), while the Asiatic species were treated by Loginova (1963) and Baeva (1985). White and Hodkinson (1982) provided an identification key to the fifth instar larvae, including four species occurring in Great Britain. Other illustrations and useful diagnostic information can be found also in Loginova (1954, 1964), Dobreanu and Manolache (1962), Lauterer and Eastop (1968), Klimaszewski (1969, 1975), Hodkinson and White (1979), Ossiannilsson (1992), and Rapisarda (1998).

Besides sharing hosts from the genus *Fraxinus*, the species of *Psyllopsis* also have a similar biology: all overwinter in the egg stage and have two (in some regions perhaps only one) generations per year (Lauterer, 1982, 1991; Conci and Tamanini, 1990; Hodkinson, 2009). The larvae of *P. fraxinicola* and *P. meliphila* mostly live freely on the underside of leaves while the other species produce leaf-roll galls, each inhabited by several larvae (Dobreanu and Manolache, 1962; Buhr, 1964; Nguyen, 1970; Conci and Tamanini, 1990; Rapisarda, 1998; Skrzypczyńska, 2002; Jerinić-Prodanović, 2007). The galls are often colonized by various arthropods including predators (mites, spiders, thrips, larvae of true bugs, hover flies, ladybirds and lacewings), ants, as well as *P. fraxinicola*, itself not inducing galls (Loginova, 1963; Nguyen, 1970; Hodkinson and Flint, 1971; Ossiannilsson, 1992). At some sites, several *Psyllopsis* spp. can be encountered on a same plant together (e.g. up to four species were reported by Loginova (1963) on one host in Armenia).

During recent extensive field work on the Psylloidea in Serbia, six species of *Psyllopsis* were collected (Jerinić-Prodanović, 2010). Among them, *P. repens* which had previously been known only from the Middle East and the Caucasus (Loginova, 1963; Halperin et al., 1982; Burckhardt and Lauterer, 1993) was found for the first time in Europe. As this species has been missing from the literature on European Psylloidea, including identification keys (the only illustrations were published in the original description in Russian by Loginova, 1963), and *P. repens* has been reported as a significant pest of *Fraxinus* in Iran (Rajabi Mazhar et al., 2004), we provide here detailed descriptions and illustrations of the adult morphology and also, for the first time, of the fifth instar larva, and we summarize known data on its biology, distribution and economic importance.

MATERIAL AND METHODS

The material of *P. repens* was collected by D. Jerinić-Prodanović in 2007–2009 in two localities in the city of Belgrade in the Republic of Serbia (Fig. 1):

Beograd, Hram Svetog Save [= St. Sava Temple], 44°47′53.7″N, 20°26′03.8″E (UTM grid 34TDQ5790160679), 120 m, on *Fraxinus ornus* L., 14.v.2007, 2 ♂♂, 3 ♀♀, and on *Fraxinus* sp., 5.ix.2007, several fourth and fifth instar larvae (L_4, L_5); Beograd, Autokomanda, 44°47′20.2″N, 20°26′20.2″E (UTM grid 34TDQ5825659642), 100 m, on *Fraxinus ornus* L., 30.vii.2008, L_4, 13.viii.2008, L_3 and L_4, 7.ix.2008, L_4 and L_5, 21.ix.2008, L_5, 4 ♂♂ and 3 ♀♀, 29.ix.2008, L_5; on *Fraxinus excelsior* L., 14.x.2008, eggs, L_5, 3 ♂♂, 3 ♀♀, 20.x.2008, eggs, L_5, 1 ♂, 1 ♀; on *Fraxinus* sp., 7.iv.2009, L_2.

The adults were collected from the host plants with an aspirator; the larvae of different instars were collected together with the plant organs on which they were found. Some fifth instar larvae were reared in laboratory conditions in Petri dishes until the emergence of adults. Both adults and fifth instar larvae were fixed in 70% ethanol or macerated in 10% KOH, and mounted on slides in Cana-

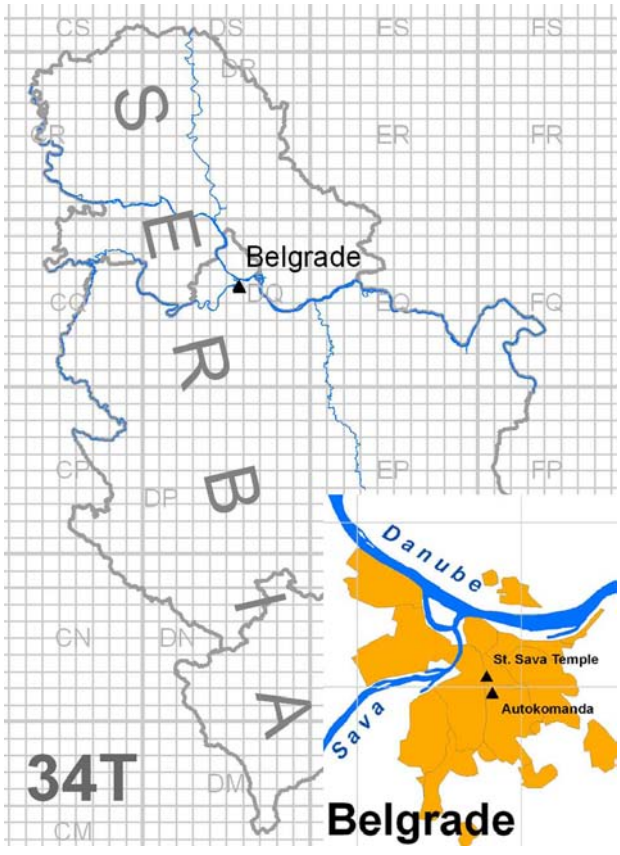


Fig. 1. Distribution of *Psyllopsis repens* Loginova in Serbia.

da balsam. The voucher material is deposited in the collections of the Faculty of Agriculture, University of Belgrade, Belgrade, Serbia, and the Department of Entomology, Moravian Museum, Brno, Czech Republic. Some additional material of *Psyllopsis* spp. originating from the Balkans, Central Europe and Central Asia was examined from the collection of the Moravian Museum, Brno and used for comparisons.

The morphological terminology mostly follows Ossiannilsson (1992). Measurements, drawings and photographs of the head and fore wing were made from slide-mounted material using an Olympus BX-41 compound microscope with an attached digital camera and the image analysis software QuickPhoto Pro (Promicra, Czech Republic), or the software package IM 1000 (Leica, Wetzlar, Germany). The nomenclature of the host plants was unified according to Greuter et al. (1989).

RESULTS

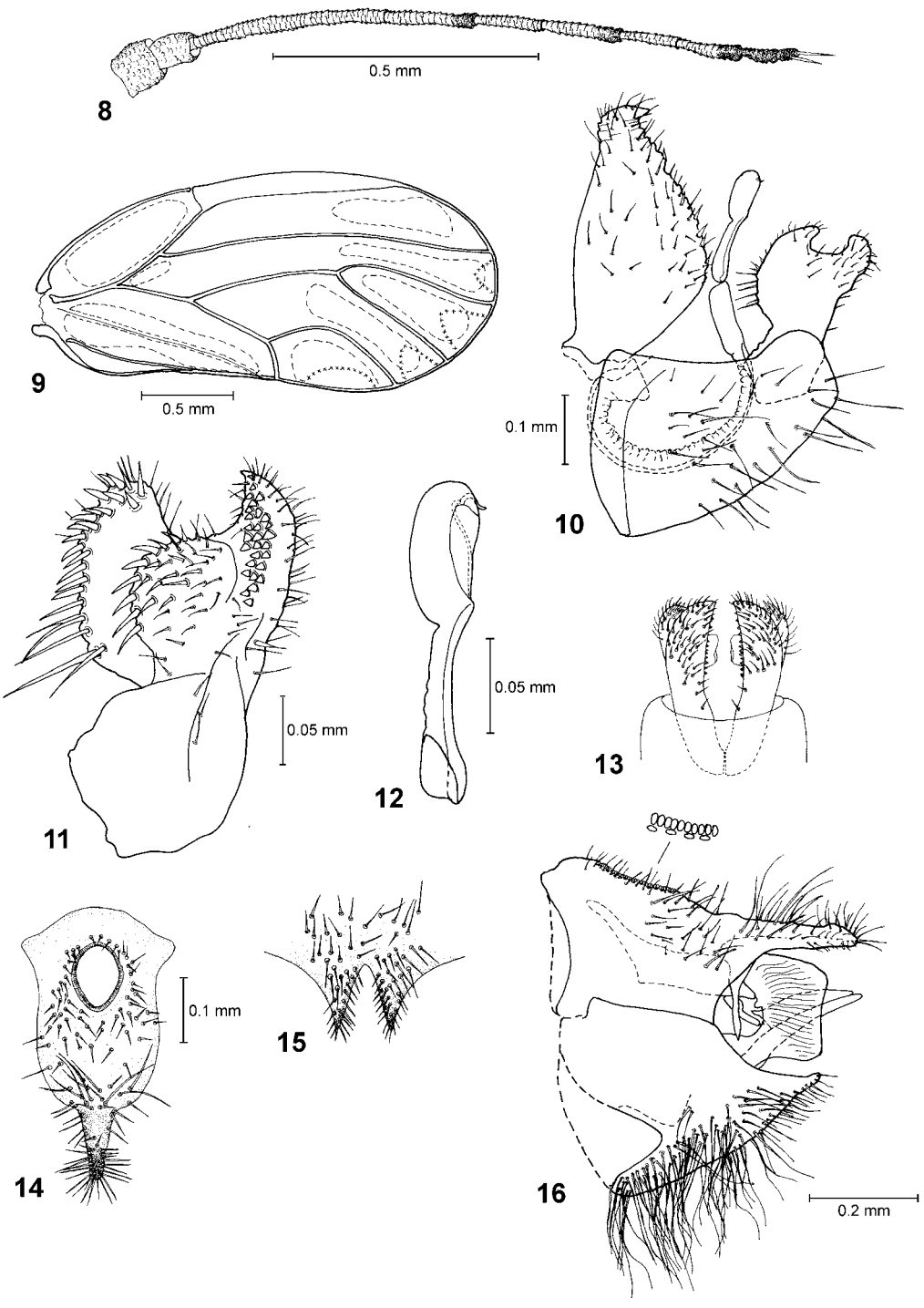
Psyllopsis repens Loginova, 1963

Psyllopsis repens Loginova, 1963: 185, Figs. 1–11.

Description. **Adult.** Color. Body pale dirty yellow (freshly emerged or alcohol preserved specimens) to orange brown or ochreous (Fig. 2). Head with compound eyes red, ocelli intensively orange, genal cones pale yellow. Antenna pale yellow; apices of segments 4 and 6, apical half of segment 8 and entire segments 9 and 10 dark brown; apex of segment 7 slightly infuscated (Fig. 8). Mesopraescutum with two small dark markings in anterior half; mesoscutum with four stripes ranging from light to dark brown. Fore wing membrane transparent, clear; veins pale yellow in basal half, darker brown in apical half of fore wing (Fig. 7). Hind wing clear. Legs uniformly pale yellow, sclerotized spurs on apex of metatibia black. Abdominal tergites mostly dark yellow to ochreous, light to dark brown basally; sternites mostly uniformly pale yellow; male and female genitalia mostly dirty yellow, base of male proctiger and apex of paramere darker brown.

Morphology. Head with genal cones relatively long and slender, about two thirds of length of vertex, narrowly triangular in shape, subacute at apex, covered with numerous setae (Fig. 6); coronal suture developed throughout; vertex dorsally with a well-distinct fovea on each side of midline. Antenna 10-segmented, relatively long and slender, segments 3–10 subcylindrical, hardly widening to apex; single oval rhinarium present subapically on each of segments 4, 6, 8 and 9; terminal setae subequal, the longer terminal seta about 1.5 times longer than segment 10 (Fig. 8). Fore wing widest in apical third, apex broadly rounded; pterostigma about 0.5 times as broad and 0.6 times as long as cell r_1; cell m_1 relatively long and narrow (Figs. 7, 9). Fore wing membrane with fields of fine surface spinules present in all cells, leaving spinule-free bands along veins; sur-

Figs. 2–7. *Psyllopsis repens* Loginova, from Serbia: 2 – adult female; 3 – fifth instar larva; 4 – galls on terminal buds of *Fraxinus* sp.; 5 – detail of buds with waxy secretions of larvae; 6 – head; 7 – forewing.



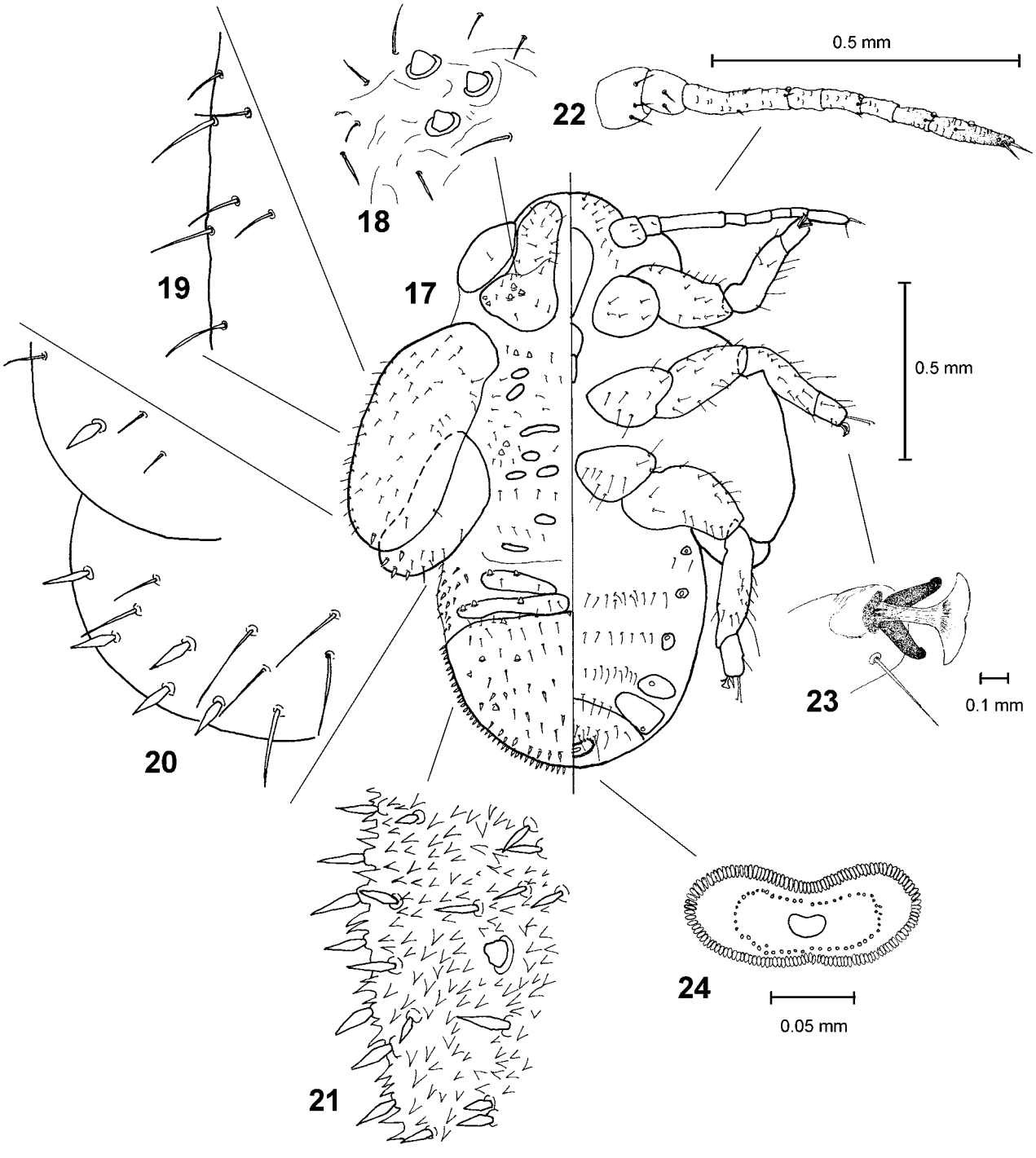
Figs. 8–16. *Psyllopsis repens* Loginova, from Serbia, adults: 8 – antenna; 9 – forewing (dashed lines – area covered with surface spinules, crossed lines – area covered with radular spinules); 10 – male terminalia in lateral view; 11 – inner surface of paramere in lateral view; 12 – distal segment of aedeagus in lateral view; 13 – parameres in posterior view; 14 – female proctiger in dorsal view; 15 – apex of the female subgenital plate in ventral view; 16 – female terminalia in lateral view.

face spinules mostly absent from basal halves of cells r_1, r_2 and m_2; cells r_2, m_1, m_2 and cu_1 also with broadly triangular areas at wing margin covered in radular spinules (Fig. 9). Metacoxa with relatively long, peg-like meracanthus, subacute at apex; metatibia basally smooth, apically with an open crown of 7–8 sclerotized spurs, metabasitarsus with two sclerotized spurs at apex. Male terminalia as in Figs. 10–13. Male subgenital plate, in lateral view, relatively long and narrow, covered with long setae ventrally and apically (Fig. 10). Male proctiger, in lateral view, broadest in basal third, with posterior margin broadly rounded and gradually narrowing to apex; proctiger covered with short fine setae and a few short stout setae on posterior margin (Fig. 10). Paramere, in lateral view, with a deep U-shaped incision on dorsal margin dividing it into a broadly rounded anterior lobe and a hook-like posterior lobe, ending with a tooth at the apex; inner surface of paramere with a broadly rounded interior lobe medially; dorsal and posterior surfaces of paramere with numerous fine setae, inner surface with ca. 25 short and stout, weakly sclerotized conical peg-like setae on the posterior lobe and numerous long stout setae on the interior lobe and near paramere anterior margin (Figs. 11, 13). Distal segment of aedeagus with elongated, parallel-sided apical dilatation, broadly rounded at apex; ductus ejaculatorius short; basal sleeve-like structure inconspicuous (Fig. 12). Female terminalia as in Figs. 14–16. Female proctiger, in lateral view, with slightly concave, slightly sinuous dorsal margin; apical extension relatively long and narrow, nearly parallel-sided; circumanal pore ring composed of two rings of pores (Fig. 16). Female subgenital plate, in ventral view, deeply incised at apex (Fig. 15), in lateral view, subacute apically, densely covered with long setae in basal two-thirds ventrally and shorter setae apically (Fig. 16). Dorsal and ventral valvulae smooth, lacking distinct teeth.

Measurements (in mm). **Male** (9 ex.). Head width (HW): 0.68–0.72; antenna length (AL): 1.14–1.22; fore wing length (WL): 2.18–2.48; fore wing width (WW): 0.91–1.06; metatibia length (TL): 0.70–0.75; male proctiger length: 0.37–0.45; paramere length (PL): 0.29–0.32; distal segment of aedeagus length (DL): 0.17–0.19. Ratios: AL/HW: 1.63–1.81; WL/HW: 3.03–3.49; WL/WW: 2.09–2.51; PL/HW: 0.42–0.48; DL/HW: 0.26–0.28. **Female** (6 ex.). HW: 0.69–0.76; AL: 1.02–1.08; WL: 2.50–2.71; WW: 1.15–1.20; TL: 0.72–0.75; female proctiger length (FP): 0.56–0.63; female subgenital plate length (SL): 0.46–0.49. Ratios: AL/HW: 1.38–1.57; WL/HW: 3.54–3.74; WL/WW: 2.14–2.34; FP/HW: 0.77–0.88; SL/HW: 0.43–0.46.

Fifth instar larva. Color. Body dirty white to pale yellow, sclerites on dorsum including wing pads and caudal plate dark brown, eyes dark pink to red; body surface covered with whitish waxy filaments (Fig. 3). Antenna dirty white except for most of segment 8 which is darker brown.

Morphology. Body form as in Fig. 17. Antenna 8-segmented (Fig. 22); single rhinarium present on segments 3, 5 and 7 subapically, and on segment 8 medially. Eyes with a fine ocular seta medially. Cephaloprothorax covered with numerous short fine simple setae, two groups each of 2–3 larger, broadly conical setae present near eyes in posterior part (Fig. 17, 18). Thoracal dorsum with several isolated small sclerites and 2+2 broadly conical setae similar to those on cephaloprothorax near inner margins of fore wing and hind wing pads on each side of body. Forewing pad covered with fine simple setae (Fig. 19), a single lanceolate seta present near outer margin apically (Fig. 20); hind wing pad with 5–7 slender lanceolate setae and several simple setae (Fig. 20). Mid and hind tibiae with a fairly long fine seta on outer margin subapically (Fig. 17). Tarsal arolium broadly fan-shaped on long petiole (Fig. 23). Abdominal dorsum with two larger free sclerites and a large fused caudal plate; numerous lanceolate setae present near body margin, densely arranged especially along lateral and posterior margins of caudal plate; free sclerites each with 2–3 broadly conical setae near anterior margin, caudal plate with 4–5 such conical setae on dorsum and near anterior and lateral margins on each side of body; all dorsal abdominal sclerites with strong micro sculpture consisting of densely arranged small sharp cuticular teeth (Fig. 21). Anus ventral; outer circumanal pore ring consisting of single row of pores throughout (Fig. 24).



Figs. 17–24. *Psyllopsis repens* Loginova, from Serbia, fifth instar larva: 17 – body (left dorsal surface, right ventral surface); 18 – detail of sensilli on the cephalothorax; 19 – detail of setae on forewing pad margin; 20 – detail of setae on hind wing pad and apex of forewing pad; 21 – detail of setae and micro sculpture on the caudal plate margin; 22 – antenna; 23 – apex of tibiotarsus; 24 – circumanal pore ring.

Measurements (in mm; 6 ex.). Body length (BL): 1.48–1.97; body width (BW): 1.14–1.38; antenna length (AL): 0.62–0.69; fore wing pad length (FL): 0.68–0.80; metatibiotarsus length: 0.42–0.46; caudal plate length (CL): 0.44–0.56; caudal plate width (CW): 0.69–1.03; circumanal ring width (RW): 0.13–0.18. Ratios. BL/BW: 1.16–1.67; AL/FL: 1.65–2.11;CL/CW: 0.54–0.64; RW/CW: 0.16–0.20.

Distribution. Afghanistan (unpublished data from the Moravian Museum, Brno), Armenia, Azerbaijan, Iran, Israel (Loginova, 1963; Halperin et al., 1982; Gegechkori and Loginova, 1990; Burckhardt and Lauterer, 1993), and Serbia.

Host plants. So far found on four western Palaearctic species and subspecies of *Fraxinus* (Oleaceae): *F. angustifolia* subsp. *oxycarpa* (M.Bieb. ex Willd.) Franco & Rocha Afonso (= *F. oxycarpa* M. Bieb. ex Willd. = *F. rotundifolia* Mill.; Gegechkori and Loginova, 1990; Rajabi Mazhar et al., 2004), *F. angustifolia* subsp. *syriaca* (Boiss.) F. Yaltirik (Halperin et al., 1982), *F. excelsior* L. (Loginova, 1963; our data), and *F. ornus* L. (our data).

Biology. The biology of *P. repens* was studied in detail by Rajabi Mazhar et al. (2004) on *Fraxinus angustifolia* subsp. *oxycarpa* in Iran. It has two generations per year and overwinters in the egg stage. The first larvae of the first generation appear at the beginning of April, adults emerge in the middle of May, mate a week after and oviposit on the leaves (including galls induced by the first generation larvae) and petioles (ca. 16 eggs per female in average). The embryonal development takes 7–10 days, the larvae of the second generation appearing in early June. The adults of the second generation emerge in late August to early September, mate around buds and deposit eggs in the sutures and crevices of twigs (ca. 11 eggs per female in average), probably preferring lower branches (Rajabi Mazhar et al., 2004). Our field data from Serbia suggest also two generations per year with eggs overwintering, adults of the first generation emerging in mid-May and adults of the second generation as late as the third decade of September.

P. repens is known to induce galls on leaves (Loginova, 1963; Rajabi Mazhar et al., 2004). The galls induced by the first generation presumably take a similar form of leaf rolls as those induced by other *Psyllopsis* spp. (cf. Dobreanu and Manolache, 1962; Buhr, 1964; Nguyen, 1970). On the *Fraxinus* trees in Belgrade infested with *P. repens*, two other gall-inducing species (*P. discrepans* and *P. machinosa*) also occurred and we were unable to differentiate specifically the effects of the first generation larvae of *P. repens*. The larvae of the second generation of *P. repens* (the identity of which was confirmed by rearing in laboratory) concentrated in terminal buds in the late summer and caused their conspicuous deformation into cone-like structures hampering a further bud development (Fig. 4). Two or three larvae were usually observed per one bud, each being covered with thick wax fibers and hidden under a deformed bud scale (Fig. 5).

Natural enemies. In Iran, the natural enemies of *P. repens* include true bugs (Heteroptera: Anthocoridae: *Anthocoris* sp. and *Orius* sp.), thrips (Thysanoptera: Aeolothripidae: *Aeolothrips* sp.) and two species of parasitoid wasps, *Psyllaephagus claripes* Trjapitzin, 1967 (Hymenoptera: Chalcidoidea: Encyrtidae) and *Marietta picta* (André, 1878) (= *Marietta zebrata* (Mercet, 1916); Hymenoptera: Chalcidoidea: Aphelinidae) which attack the fifth instar larvae (Rajabi Mazhar et al., 2004; Sadeghi et al., 2007; Fallahzadeh and Japoshvili, 2010). Especially *P. claripes* seems to be an effective parasitoid of *P. repens*, having been found in up to 80% of the examined fifth instar larvae (Sadeghi et al., 2007). In Serbia, *P. repens* was predated by the true bug species *Anthocoris nemoralis* (Fabricius, 1794) and *Orius* (*Heterorius*) *minutus* (Linnaeus, 1758) (determined by L. Protić) and the mite *Anystis baccarum* (Linnaeus, 1758) (Acari: Prostigmata: Anystidae, determined by B. Stojnić).

DISCUSSION

Compared with other *Psyllopsis* species, the adults of *P. repens* are especially similar to the *P. meliphila*, known from southern parts of Central Europe, Italy, the Balkans, Republic of Moldova, and Morocco

(Conci and Tamanini, 1990; Burckhardt, 2010). Both species share prevailingly light yellow or orange brown body coloration usually with only a few dark markings, the forewing with clear membrane and apically darkened veins, and the relatively long and narrowly pointed genal cones. Both species can be reliably distinguished using the shape of the male terminalia, particularly the paramere. The paramere of *P. meliphila* in lateral view, is weakly sinuate at the dorsal margin with a small triangular posterior lobe (lacking a deep U-shaped incision and a strong hook-shaped posterior lobe present in *P. repens*). It has a different chaetotaxy on the inner side: the short and stout sclerotized conical peg-like setae are situated near the dorsal paramere margin medially, not along the upper part of the posterior paramere margin as in *P. repens*. The males of *P. meliphila* also have a slightly narrower (posteriorly less produced) male proctiger and a basally broader apical dilation of the distal segment of the aedeagus than *P. repens*. The females of *P. meliphila* can be distinguished by the relatively shorter and broader apical extension of the female proctiger (relatively long, narrow and parallel-sided in *P. repens*); the differences are, however, more subtle than in males. The male and female terminalia of *P. meliphila* were figured in detail by Conci and Tamanini (1990). Besides *P. meliphila*, *P. repens* also resembles *P. dobreanuae* (so far known only from Romania and the Republic of Moldova, with an unpublished record from Macedonia in the collections of the Moravian Museum, Brno, P. Lauterer leg.), *P. fraxinicola* (widely distributed in the western Palaearctic region), *P. machinosa* (recorded from Bulgaria, Republic of Moldova, Serbia, Armenia, Kazakhstan and Central Asia; Gegechkori and Loginova, 1990; Burckhardt, 2010; Jerinić-Prodanović, 2010), and *P. securicola* (distributed in the Caucasus, Israel, Iran and Central Asia; Gegechkori and Loginova, 1990) which all also lack extensive dark brown markings on the body and the fore wing membrane. All these species can be differentiated from *P. repens* by the shape of the paramere in the male, and the proctiger in the female (figured in Loginova, 1963 and Conci and Tamanini, 1990). *P. dobreanuae*, *P. machinosa* and *P. fraxinicola* also differ in the broader and apically blunt genal cones (figured in Dobreanu and Manolache, 1962 and Loginova, 1963; in Dobreanu and Manolache, 1962, *P. dobreanuae* is erroneously given under the name of *P. meliphila*), and the general body coloration of live specimens of *P. fraxinicola* and *P. machinosa* is light green.

The fifth instar larva of *P. repens* closely resembles in size and structure *P. meliphila*, as described by Rapisarda (1998) (larval material of *P. meliphila* was not directly available for this study). According to Rapisarda (1998), the larva of *P. meliphila* should differ from *P. repens* in the uniformly greenish-yellow color and the number and shape of the large short and broad setae on the dorsum which should be relatively numerous (ca. 13 on each side of the dorsum of the caudal plate) and semispherical in *P. meliphila,* while there are only 4–5 broadly conical setae on each side of the caudal plate in the material of *P. repens* from Serbia. The larva of *P. repens* resembles in its dark brown coloration the larvae of *P. discrepans*, *P. distinguenda* and *P. fraxini*. These three latter species, however, can be differentiated by the structure of their outer circumanal ring which consists, at least partly, of 2–3 rows of pores (White and Hodkinson, 1982; Ossiannilsson, 1992) while it is composed of a single row of pores throughout in *P. repens*. A single row of pores in the circumanal pore ring is present, besides *P. repens* and *P. meliphila,* also in *P. fraxinicola*. The larva of *P. fraxinicola* is, however, light green (pale in alcohol-preserved or slide-mounted material), and is further characterized by the presence of small lanceolate setae along the outer margin of the forewing pad and even more numerous (ca. 70) semispherical setae on the dorsum of the caudal plate than in *P. meliphila* (White and Hodkinson, 1982; Conci and Tamanini, 1990; Rapisarda, 1998). The larvae of *P. dobreanuae, P. machinosa, P. narzykulovi* and *P. securicola* are unknown.

The trees of *Fraxinus* on which the *P. repens* was collected in Belgrade in Serbia are ca. 30–40 years old, growing as five or six isolated trees in a street near the centre of the city. We have been unable to find information on their origin. *P. repens* may be an

autochthonous species in the fauna of south-eastern Europe which has so far been overlooked. The possibility that it was introduced into Serbia from the Caucasus, Middle East or central Asia cannot, however, be excluded. Introductions of *Psyllopsis* spp. are probably relatively easy together with the host plant material, facilitated by the life history traits of the genus, particularly the overwintering in the egg stage in the crevices of the bark of the *Fraxinus* twigs and the larval life in galls. Introductions of *P. fraxini, P. fraxinicola* and *P. discrepans* outside the West Palaearctic region are well-documented and one or more of these species became established in the United States and Canada (Hodkinson, 1988; Maw et al., 2000; Wheeler and Hoebeke, 2004), Australia and New Zealand (Hollis, 2004), and Chile (Burckhardt, 1994a). In general, the introduction of psyllids is not unusual, e.g. altogether 14 species from different taxonomic groups of Psylloidea have so far been introduced into Europe from other parts of the world (Mifsud et al., 2010).

P. repens was reported as a serious pest of *Fraxinus angustifolia* subsp. *oxycarpa* in Iran, causing sap loss, reduction of the chlorophilic area of the leaves and their severe deformation by gall formation, and a decrease in, or halt of seedling growth because of the damage of the second generation larvae to the terminal buds (Rajabi Mazhar et al., 2004). Strong infestations of *Fraxinus* trees by *P. repens* were also reported by Loginova (1963, 1968) from the parks of the city of Yerevan in Armenia. The other *Psyllopsis* spp. widely distributed in Europe (particularly *P. fraxini* and *P. fraxinicola*) are known as occasional pests of ash trees with mostly low importance but sometimes causing outbreaks in forest and urban habitats (Conci and Tamanini, 1990; Burckhardt, 1994b; Rapisarda and Belcari, 1997) or damaging young trees (Schindler and Ehrhardt, 1964). The economic importance of *P. repens* for European forestry and ornamental gardening has yet to be assessed.

Acknowledgments – We thank Dragica Smiljanić for drawing figures 8, 13–15, and 22–23. We are obliged to Ljiljana Protić (Natural History Museum, Belgrade) and Bojan Stojnić (Faculty of Agriculture, University of Belgrade) for the identification of the Heteroptera and mite material, respectively. Our work was partly supported by the project MK00009486201 from the Ministry of Culture of the Czech Republic to the Moravian Museum, Brno.

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