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Rediscovery of *Livilla radiata* (Foerster, 1848) after 130 years in Hungary, with notes to the Fabaceae-associated jumping plant lice in Hungary (Insecta: Psylloidea)

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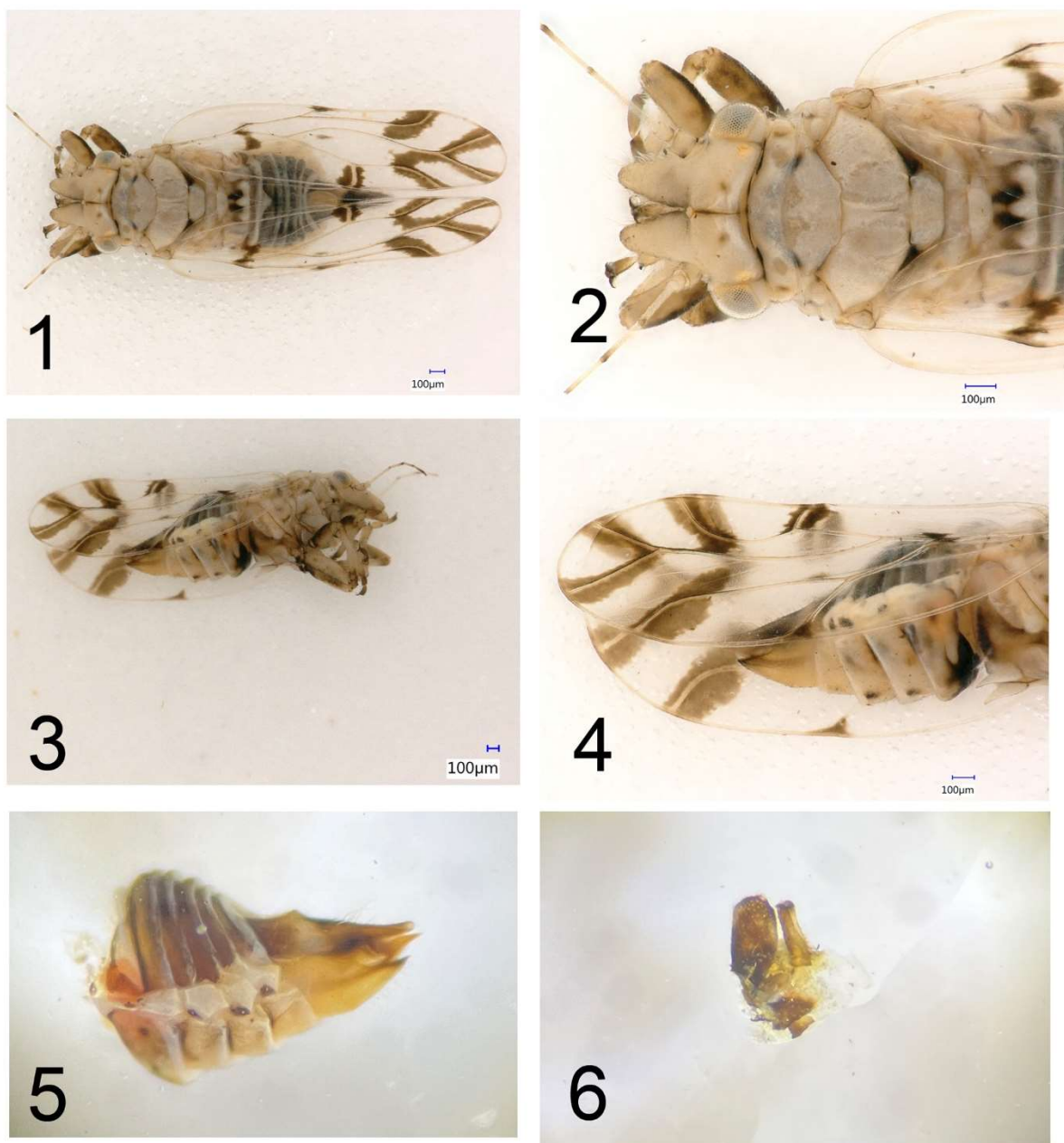
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The jumping plant lice (Hemiptera, Psylloidea) are a most important group of phytophagous insects from economically of view, which contain many significant pests, vectors, and invasive species. So far more than 70 jumping plant louse species have been reported from Hungary (Kontschán & Ripka 2020), but many species have been found only rarely or were recorded only at the end of the 19th century (Ripka 2008). The several jumping plant lice species are in association with different species of Fabaceae. Some of the Hungarian species are alien and non-indigenous in Hungary and associated with non-native planted ornamental trees, like *Albizia julibrissin* Durazz with *Acizzia jamatonica* (Kuwayama, 1908), *Cercis siliquastrum* L. with *Cacopsylla pulchella* (Löw, 1877) or *Laburnum* spp. with *Livilla variegata* (Löw, 1881) (see Kontschán 2023, Kontschán et al. 2022). Another part of the Fabaceae-associated psyllids lives on the indigenous plants of Hungary. However, these species are rarely collected, and the major Hungarian records originated at the end of the 19th century (Ripka 2008).

One of most characteristic species of the Fabaceae-associated jumping plant lice is the *Livilla radiata* (Foerster, 1848), the first Hungarian record of this specie was presented by Horváth (1880) from Sátoraljajhely. Six years later, Horváth (1886) added other four localities from different regions of Hungary. After it, Löw (1888) mentioned this species from Hungary with his note “everywhere in Hungary”. After these records, no other finding of this species was presented from Hungary till 2023. At the last year, *Livilla radiata* was collected using by beating methods from an unknown *Cytisus* brush close to Lovasberény (47°17'50.9"N 18°33'53.0"E). The collected specimens are cleared by lactic acid and investigated on half-covered slides on Leica 1000 microscope. The photos were taken by Keyence 1000 digital microscope. The specimens examined are deposited in the collection of Plant Protection

Institute, HUN-REN Centre for Agricultural Research and in the Hemiptera Collection of Hungarian Natural History Museum. The presented system followed Burckhardt et al. (2021).

The adults of *Livilla radiata* (Figs 1–6) has yellowish brown head and thorax, abdomen brown with yellow intersegmental membranes. Forewing membrane is translucent white, veins are white yellow, and its markings are brown. Antennae is yellow, apices of segments 3-8 are brown, segments 9 and 10 are completely brown. Legs are yellowish brown; apices of tibiae and tarsi are dark brown. Genal cones are long and slender, they are much longer than the vertex. Forewing are oblong-oval, very short and broad; costal break and pterostigma are absent, spinules are present on all cells. Vein *Rs* is short, strongly curved to wing margin; *M* is short, M_{1+2} is meeting wing margin above apex. Metatibia has 5 apical spurs; basal metatarsus has 1 black spur (Hodkinson & Hollis 1987). Male proctiger and paramere are illustrated in Figure 6, female terminalia is presented in Fig. 5.



Figures 1–6. Photos about *Livilla radiata* (Foerster, 1848). 1: Body in dorsal view. 2: Head and pronotum in dorsal view. 3: Body in lateral view. 4: Wing colorization. 5: Female terminalia. 6: Male proctiger and paramere.

This species are listed from Austria, from Bulgaria, from the former Czechoslovakia, from Hungary, from Italy, from Poland, from Romania, from the former Soviet Union and from the former

Yugoslavia, and from Germany (Hodkinson & Hollis 1987), later are reported from Belarus (Serbina 2012), from Czech Republic (Malenovszký & Lauterer 2012), from Slovenia (Seljak 2020) and from Serbia (Jerinić-Prodanović 2010) as well and the *Chamaecytisus ratisbonensis* (Schaeffer) Rothm., the *Chamaecytisus austriacus* (L.) Link, the *Chamaecytisus borysthenicus* (Gruner) A. Klaskova, and the *Cytisus nigricans* (L.) Griseb. are known as its host plants (Hodkinson & Hollis 1987). It is a rare, xerothermophilous species, which is found in dry grassland and at forest margins in the Czech Republic (Malenovszký & Lauterer 2012), it is mentioned as univoltine species, whose overwintering stage is unknown (Seljak 2020).

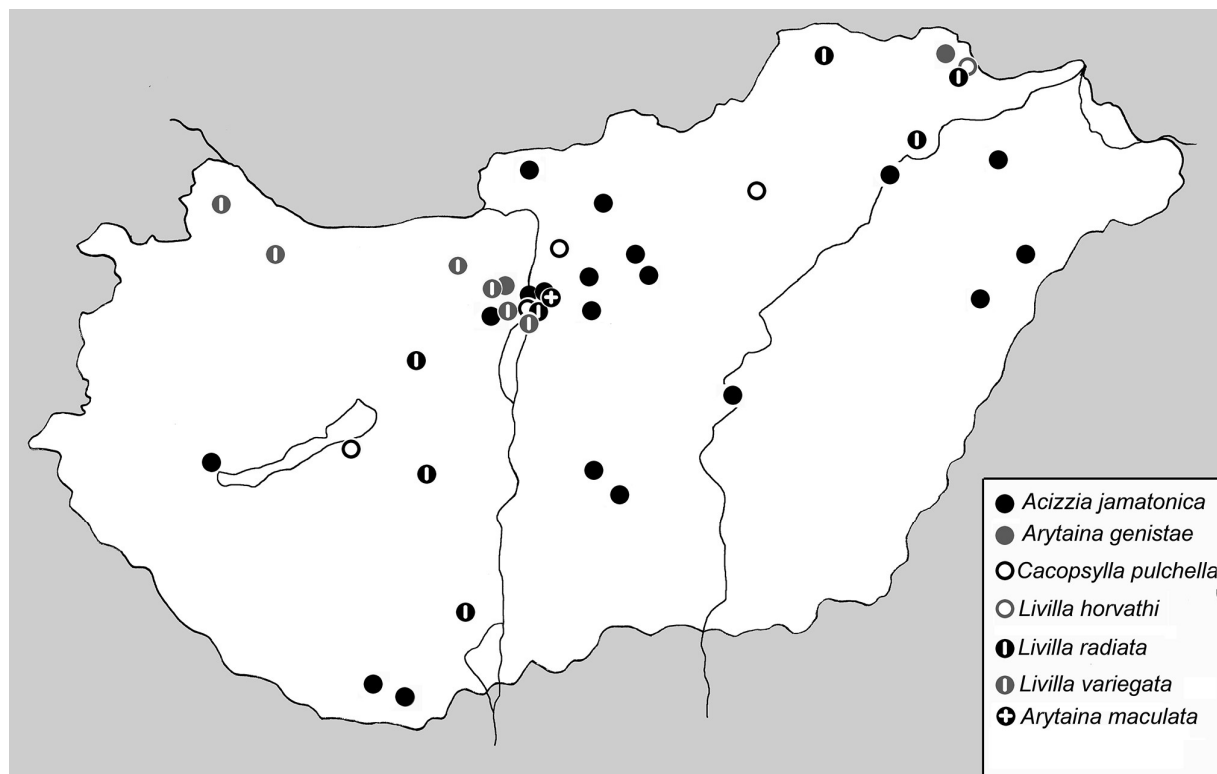


Figure 7. Occurrences of Fabaceae-associated psyllids in Hungary.

Til today seven Fabaceae-associated psyllids are collected in Hungary. The alien *Acizzia jamatonica* (Kuwayama, 1908) were collected in Budapest (Rédei & Péntzes 2006), in Hévíz (Bürgés & Németh 2015), in Kék (Kontschán & Ripka 2019), in Bercel, in Budapest, in Nagyarsány, in Nagyoroszi, in Túrony, (Kontschán & mtsai 2020), in Debrecen, in Bugac, in Isaszeg, in Püspökladány, in Tápióbicske, in Kecskemét, in Tiszaföldvár, in Ecséd, in Jászberény and in Tiszalök (Kontschán 2023). This species was found only from *Albizia julibrissin* (Rédei & Péntzes 2006, Bürgés & Németh 2015, Kontschán et al. 2020, Kontschán 2023), but Kontschán & Ripka (2019) collected it on overwintering plants. Another non-indigenous species, the *Cacopsylla pulchella* (Löw, 1877) were reported from Budapest (Péntzes 2004, Ripka 2004, 2005, 2009, Kontschán et al 2020); from Budapest and from Vácrtót, (Kontschán et al. 2020); from Eger (Kontschán & Ripka 2021) and from Siófok (Kontschán et al. 2023). This species was only found on *Cercis siliquastrum* (Péntzes 2004, Ripka 2004, 2005, 2009, Kontschán & Ripka 2021, Kontschán et al 2020, 2023). *Livilla variegata* (Löw, 1881) is an alien jumping plant lice, which was reported from Budapest (Ripka 1997, 2009, Ripka et al. 2018), from Budapest, from Nagykovácsi and from Érd (Kontschán & Ripka 2021); from the Arrabona and Moson rest stops on highway M1 (Kontschán et al. 2021) and from Herceghalom (Kontschán et al. 2022). This species was collected on *Laburnum anagyroides* (Ripka 1997, 2009, Kontschán & Ripka 2021, Kontschán et al. 2022) and *Laburnum watereri* (Ripka et al. 2018). The native *Arytaina genistae* (Latreille, 1804) was reported some years ago from Hungary, from Nagykovácsi (Kontschán & Ripka 2020), where it was found on *Cytisus scoparius* (Kontschán & Ripka 2020). We found two new collection records based on the collection of HNHM (Rostalló, 07.VII. 1970, leg. Vásárhelyi, T.; Barcs,

23.IX. 1981, leg. Vásárhelyi, T.). The herein reported *Livilla radiata* (Foerster, 1848) was found in Sátoraljaújhely (Horváth 1880), in Budapest, in Szekszárd, in Simontornya, in Szendrő and in Tarcal (Horváth 1886), and Löw (1888) mentioned it „everywhere” and we collected it in Lovasberény. This species is reported in Hungary from *Cytisus austriacus*, *Cytisus nigricans* (Horváth 1880), *Cytisus heuffelii* (Horváth 1886), *Cytisus heuffelii*, *Cytisus austriacus*, *Cytisus nigricans* (Löw 1888). *Livilla horvathi* (Scott, 1879) seems to be a very rare species, which has not been collected since 1888 in Hungary. The all known data is originated from Sátoraljaújhely (Horváth 1880, 1886, Löw 1888), from *Genista tinctoria* (Horváth 1880), from *Cytisus austriacus* (Horváth 1886) and from *Cytisus austriacus* (Löw 1888). The *Arytaina maculata* (Löw, 1886) was found close to Budapest (Rákospalota) in the end of the XIX. century (see Horváth 1888), after it nobody collected this species again, and the Hungarian host plant is also unknown. Another Fabaceae-associated jumping plant lice (*Livilla ulicis* Curtis, 1836) is reported by Horváth (1888) from Hungary, but the mentioned records are not within present border of Hungary, these localities are in Romania and Slovakia.

The native Fabaceae-associated jumping plant lice are rarely found and occur on native plant species. Two of them (*Livilla horvathi* and *Arytaina maculata*) have not been collected since the end of the XIX century in Hungary, but based on the case of the newly re-discovered *Livilla radiata*, we need to suppose these two species can live in scarcely investigated habitats of Hungary.

But all known alien species in Hungary are common and usually found on all investigated host species; they are real invasive plant pest species. The reason for the few Hungarian records is the position of the host plants. These trees are planted in private gardens, which are not visitable by the researchers. Due to the unavailable plants, a project was started using social media to investigate where the alien *Acizzia jamatonica* species can be found in private gardens. However, the activity of the social media users was not outstanding, but the previously known records have doubled (Kontschán 2023).

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