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First record of *Eupteryx decemnotata* Rey, 1891 from Hungary – a Trojan horse in leafhopper skin (Hemiptera: Auchenorrhyncha: Cicadellidae)

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Abstract – The first Hungarian record of *Eupteryx decemnotata* Rey, 1891 (Hemiptera: Auchenorrhyncha: Cicadellidae: Typhlocybinae), the Ligurian leafhopper, is based on specimens collected on herbs grown in balcony boxes, in Budapest, May 2021. Voucher specimens are deposited in the Hungarian Natural History Museum. The species is a potential horticultural pest exhibiting a rapid range expansion in many parts of the world.

Key words – herb, alien, pest, antropochorous dispersion

INTRODUCTION

The genus *Eupteryx* Curtis, 1829 (Hemiptera: Auchenorrhyncha: Cicadellidae: Typhlocybinae) includes nearly 120 species and is widely distributed in the Palaearctic, Nearctic, Oriental, and Ethiopian regions (Dworakowska 1979, Hou *et al*. 2012). Nymphs and adults of *Eupteryx* species suck sap from aromatic plants of the families Lamiaceae, Asteraceae and Malvaceae. The signs of their activity are indicated by wilting, mottling and partial drying of the leaves of their host plants. Chlorotic spots are caused by damaging the mesenchymal cells with their stylets. There is no evidence that these species transmit plant pathogens or that the host plant would produce substances toxic to humans in response to feeding. The damage caused by leafhoppers is usually tolerated by the host plants, but under favourable conditions they can become invasive and cause serious economic damage for horticulture, in monocultural plantations and greenhouses (Pollard 1968, Nickel & Holzinger 2006, Rung *et al*. 2009).

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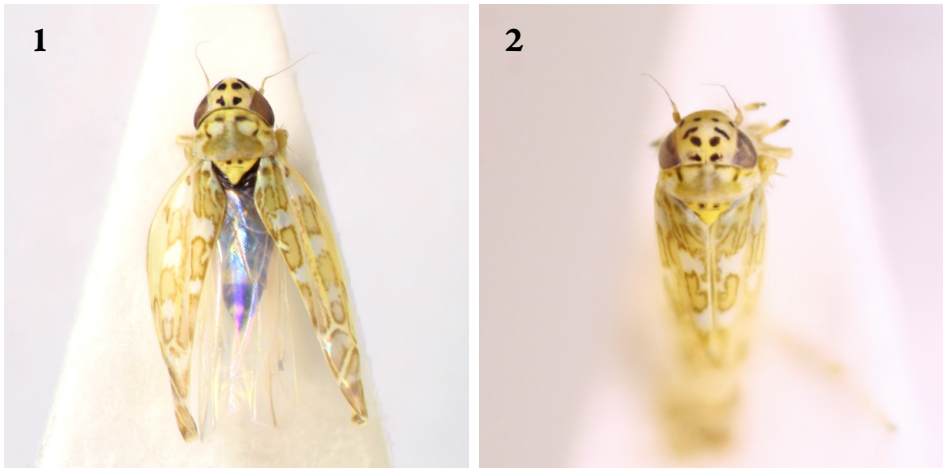
A factor that complicates chemical control of many cicadellids using contact insecticides is that their bodies are covered with a water repellent and anti-adhesive protective layer of brochosomes (Rakitov 2002, Rakitov & Gorb 2012).

The Ligurian leafhopper, *Eupteryx decemnotata* Rey, 1891, is a very small typhlocybine (body length 2.5–3 mm) of rather cryptic habits. Its slender body of yellowish-olive ground colouration with rosette-like pattern on the forewings (Figs 1–2) is highly similar to several other *Eupteryx* species. The presence of five pairs of dark spots on the frons and vertex, even though their size and shape are variable, and the spots are sometimes fused, is an important feature that allows a reliable identification of this species. The aedeagus having serrated lateral ridges, a subapical process, and moderately curved but not crossed lateral appendages is also diagnostic (Nickel & Holzinger 2006).



Figs 1–2. *Eupteryx decemnotata* Rey, 1891, male, Budapest, Hungary, 1 = dorsal view, 2 = frontal view (photos by Anna Ágnes Somogyi)

The Ligurian leafhopper overwinters as egg on its host plants, and it is active from April to October, indicating at least two generations per year. Oligophagous, the following food plants (in alphabetic order) were recorded in Central Europe and North America: *Lavandula* sp., *Melissa officinalis*, *Mentha* sp., *Monarda* sp., *Nepeta* sp., *Ocimum basilicum*, *Origanum majorana*, *Origanum vulgare*, *Rosmarinus officinalis*, *Salvia officinalis*, and *Thymus* sp. (Nickel & Holzinger 2006, Rung *et al*. 2009, Lubiarz & Musik 2015).

The Ligurian leafhopper is thought to be native in the coastal zone of the Ligurian Sea, in Italy and France. Its food plants are, however, popular ornamental and spice herbs which are widely distributed in the Mediterranean

climate zone of Europe, Asia, Africa, and North America; thus, the native area could be larger. These herbs are transported frequently all around the world and the Ligurian leafhopper shows a rapid antropochorous expansion by travelling together with the host plants. Recently colonised countries (listed in alphabetical order) include Austria, Argentina, Czech Republic, Denmark, Finland, France, Germany, Greece, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Sweden, Switzerland, Tunisia, United Kingdom, and the United States (Nickel & Holzinger 2006, Rung *et al.* 2009, Malenovsky & Lauterer 2010, Chaieb *et al.* 2013, Lubiarz & Musik 2015, Bieman & Klink 2015, Thanou *et al.* 2018, Dietrich & Perreira 2019, Janský & Šestáková 2020, de Borbón *et al.* 2022). This species was not included in checklists of the Hungarian Auchenorrhyncha (Horváth 1897, Győrffy *et al.* 2009) and no subsequent records have been published; hence, the present paper is the first record of this alien species in the Hungarian fauna.

MATERIAL AND RESULTS

The first breeding population of the Ligurian leafhopper was discovered and investigated on the private balcony of the authors in 2021, in Káposztásmegyer, a northern district of Budapest. The size of the balcony is only 8 m^2, and, due to its southern exposure, a relatively high altitude above the ground level (eight floor), and the urban heat island effects, it can be considered as a kind of "Mediterranean island" in ecological terms. According to this microclimate, there are mostly warm and drought-tolerant plants cultivated in the balcony boxes and potteries such as geranium, snapdragon (*Antirrhinum* sp.), cacti and other succulents, tuberous plants, and Mediterranean herbs.

The presence of the species in the balcony was first detected well before the appearance of symptoms on the plants by an intense bustle of ants that engaged in a mutualistic relationship with the leafhoppers. Ants used to breed and migrate freely on the balcony up to a tolerable level, but their activity increased very significantly both in 2021 and 2022. The ants' farming activity has become too effective when *Eupteryx* appeared. The outbreak of nymphs and adults was detected in 2021 (April to August) and 2022 (May). The authors tried to exterminate the pest by using bio-insecticide spray containing pine oil, but the colony survived our attempts and multiplied massively. The first colonised food plant was rosemary; later the leafhopper also appeared on the mint and basil plants growing aside the rosemary, but they did not colonise lavender and thyme. The first symptoms caused by the feeding were chlorotic spots, then the density of spots increased and wilting from the tip of the leaf was detected, and finally drying of leaves and partly the stems was observed (Figs 3–5).

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Figs 3–5. Food plants with damages caused by *Eupteryx decemnotata* Rey, 1891, 1 = chlorotic spots on leaves of rosemary, 2 = dried leafy stem of rosemary, 3 = chlorotic spots on leaves of basil (photos by Mária Tóth)

Adults were found to be active only in the daytime. Intensive light trapping was conducted on the balcony in the last 15 years to study the diversity of urbanising insect fauna. The trapping periods in the last two years were from 4 March to 30 October (2021) and rom 23 March to 27 November (2022), using 8 W hyperactinic UV tube. The light trapping resulted in an extensive material of various insect groups, including a diverse leafhopper material. This material included, for example, several specimens of *Tautoneura polymitusa* Oh & Jung, 2016, an Asiatic typhlocybine species firstly found in Europe in this balcony (Tóth *et al*. 2017, Kosovac *et al*. 2020). Despite the large number of adults of *Eupteryx decemnotata* found on the plants, not a single individual appeared on the UV light. A collapse of the leafhopper population was recorded only in the unusually hot period in May 2022, following a chemical treatment. On this occasion the nymphs of leafhopper died, but the associated ants survived and flourished on a neighbouring aphid population.

Voucher specimens of *Eupteryx decemnotata* were collected in May 2022: 3 males, 7 females, one nymph (exuvia). They were identified using the publications of Biedermann & Niedringhaus (2009) and Nickel & Holzinger (2006). The collected material is deposited in the Hungarian Natural History Museum, Budapest (HNHM).

DISCUSSION

Main factors supporting the rapid spreading and successful colonisation of the Ligurian leafhopper in new countries and continents are as follows.

The "self-defence strategy": their bodies are covered with brochosomes, and this superhydrophobous material makes their extirpation difficult (Rakitov & Gorb 2012).

The "hitchhiker strategy": the females oviposit in the tissues of host plant; since the eggs overwinter and are resistant, it therefore helps the expansion together with the host plant, which is also accelerated by human commercial activity.

The "hopping strategy": they can maintain breeding population within very small, isolated urban habitats if the host plants are available; these patches can serve as stepping-stones for expansion. Most of the first detections of their occurrences were made in urban environment (gardens and botanical gardens, parks, balconies, see e.g. Nickel & Holzinger (2006)). The reason for this is understandable since damage to a few plants which are cherished is obvious to a gardener. This hopping strategy can be observed in other Typhlocybinae species, too. The authors' balcony is close to some small, permanent but not localised colonies of *Tautoneura polymitusa* around the house, between the blocks of flats; this species native to East Asia has appeared here every year at the UV light

since 2012. There were new records of *Tautoneura polymitusa*, but contrary to expectations, it has not become invasive.

The appearance of the Ligurian leafhopper in Hungary was expected since it was already recorded in most of the surrounding countries. Its first recognition on the balcony in 2021 was helped by the characteristic farming behaviour of an undetermined species of ant. It was also very likely that ants contributed to the successful breeding of the species. A large ant nest with a queen ant in the same pot was noticed where rosemary and mint grew during the transplantation of herbs in September 2022. *Balcanocerus balcanicus* (Horváth, 1903) was the first leafhopper species reported as ant-attendant in Europe (Gjonov 2002), but participation of similar mutualistic relationships with ants were documented in several other species (Delabie 2001, Gjonov & Lapeva-Gjonova 2013).

The invasive behaviour of the Ligurian leafhopper seems to be unpredictable, but even its small, isolated populations may cause significant damage to the host plantations. To prevent and/or manage the damages monitoring and studying the ecology of this species are required.

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REFERENCES

Biedermann R. & Niedringhaus R. 2009: *The Plant- and Leafhoppers of Germany. Identification Key to all Species.* – Wissenschaftlicher Akademischer Buchvertrieb-Fründ, Scheeßel, Germany, 409 pp.

Bieman C. F. M. & Klink R. 2015: Een forse uitbreiding van de Nederlandse dwergcicadenfauna met vijftien soorten (Hemiptera: Auchenorrhyncha: Cicadellidae). (A considerable increase of the Dutch cicadellid fauna with fifteen species (Hemiptera: Auchenorrhyncha: Cicadellidae).) – *Entomologische Berichten* **75**(5): 211–226.

de Borbón C. M., Catalano M. I. & d'Innocenzo S. H. 2022: Primer registro de Eupteryx decemnotata (Cicadellidae: Typhlocybinae) en la Argentina. – *Revista de la Sociedad Entomológica Argentina* **81**(2): 60–62.

Chaieb I., Bouhachem-Boukhris S. & Nussilard B. 2013: Eupteryx decemnotata Rey: A new pest for aromatic plants in Tunisia. – *Acta Horticulturae* **997**: 215–218.

Delabie J. H. C. 2001: Trophobiosis between Formicidae and Hemiptera (Sternorrhyncha and Auchenorrhyncha): An overview. – *Neotropical Entomology* **30**(4): 501–516.

Dietrich C. H. & Perreira W. D. 2019: Eight leafhoppers (Hemiptera: Cicadellidae) newly recorded from Hawaii, including a new species. – *Annals of the Entomological Society of America* **112**: 281–287.

Dworakowska I. 1979: On some Typhlocybini (Auchenorrhyncha, Cicadellidae, Typhlocybinae). – *Bulletin de l'Academie Polonaise des Sciences Biologiques* **26**(10): 703–713.

Gjonov I. 2002: Data on the bionomics and distribution of Balcanocerus balcanicus (Horváth, 1903) (Homoptera, Cicadina, Cicadellidae) in Bulgaria. – *Entomological Review* **81**: 338–339.

Gjonov I. & Lapeva-Gjonov A. 2013: New data on ant-attendance in leafhoppers (Hemiptera: Cicadellidae). – *North-Western Journal of Zoology* **9**(2): 433–437.

Győrffy Gy., Kiss B., Koczor S. & Orosz A. 2009: *Checklist of the fauna of Hungary. Vol. 4. Hemiptera, Archaeorrhyncha, Clypeorrhyncha*. – Hungarian Natural History Museum, Budapest, 79 pp.

Horváth G. 1897: Ordo Hemiptera. – In: Paszlavszky J. (ed.): *A Magyar Birodalom Állatvilága. A Magyar Birodalomból eddig ismert állatok rendszeres lajstroma. Fauna Regni Hungariae. Animalium Hungariae hucusque cognitorum enumeratio systematica. Vol. III.* – Királyi Magyar Természettudományi Társulat, Budapest, 72 pp.

Janský V. & Šestáková A. 2020: Prvé nálezy inváznej cikádoćky Eupteryx decemnotata (Auchenorrhyncha, Cicadellidae) na Slovensku. (The first record of invasive leafhopper Eupteryx decemnotata (Auchenorrhyncha, Cicadellidae) in Slovakia.) – *Acta Rerum Naturalium Musei Nationalis Slovaci, Bratislava* **66**: 57–62.

Kosovac A., Šćiban M., Pančić I., Tóth M., Ronkay L. & Orosz A. 2020: Revealing the presence of the East Asian leafhopper Tautoneura polymitusa (Hemiptera: Auchenorrhyncha: Cicadellidae: Typhlocybinae) in Serbia through DNA barcoding. – *Acta entomologica serbica* **25**(1): 83–86.

Lubiarz M. & Musik K. 2015: First record in Poland of the Ligurian leafhopper, Eupteryx decemnotata Rey 1891 (Cicadomorpha, Cicadellidae) - an important pest of herbs. – *Journal of Plant Protection Research* **55**: 324–326.

Malenovsky I. & Lauterer P. 2010: Additions to the fauna of planthoppers and leafhoppers (Hemiptera: Auchenorrhyncha) of the Czech Republic. – *Acta Musei Moraviae, Scientiae Biologicae* **95**: 49–122.

Nickel H. & Holzinger W. E. 2006: Rapid range expansion of Ligurian leafhopper, Eupteryx decemnotata Rey, 1891 (Hemiptera: Cicadellidae), a potential pest of garden and greenhouse herbs, in Europe. – *Russian Entomological Journal* **15**: 57–63.

Pollard D. 1968: Stylet penetration and feeding damage of Eupteryx melissae Curtis (Hemiptera, Cicadellidae) on sage. – *Bulletin of Entomological Research* **58**(1): 55–71.

Rakitov R. A. 2002: What are brochosomes for? An enigma of leafhoppers (Hemiptera, Cicadellidae). – *Denisia* **4**: 411–432.

Rakitov R. A. & Gorb S. N. 2012: Brochosomal coats turn leafhopper (Insecta, Hemiptera, Cicadellidae) integument to superhydrophobic state. – *Proceedings of the Royal Society B: Biological Sciences* **280**: 2012–2391.

Rung A., Halbert S. E., Ziesk D. C. & Gill R. J. 2009: A leafhopper pest of plants in the mint family, Eupteryx decemnotata Rey (Hemiptera: Auchenorrhyncha: Cicadellidae), Ligurian leafhopper, new to North America. – *Insecta Mundi* **88**: 1–4.

Thanou Z. N., Afentoulis D. G., Koufopoulou P., Ampatzi A. P., Lekkou S. D., Koutsogiannopoulou A., Bravou A. A., Stamatakou G. D., Voulgaraki K. N., Piperkas A., Chaldaiou A., Kalaitzaki A. P. & Tsagkarakis A. E. 2018: New records and updated checklist of Cicadomorpha (Hemiptera: Auchenorrhyncha) species from Greece. – *Zootaxa* **4413**(1): 133–157.

Tóth M., Orosz A. & Rédei D. 2017: Another alien on the horizon? First European record of Tautoneura polymitusa, an East Asian leafhopper (Hemiptera: Auchenorrhyncha: Cicadellidae). – *Zootaxa* **4311**(1): 137–144.