Cicadina 13 (2013): 59-67

The invasive lilac leafhopper, *Igutettix oculatus* (Lindberg, 1929), continues to spread in Europe: new host plant and new findings (Hemiptera: Cicadellidae, Typhlocybinae)

Arturs Stalažs[1]

Summary: This paper reports the first records of the alien lilac leafhopper, *Igutettix oculatus* (Lindberg, 1929), in Latvia and Lithuania. The species was found on plants belonging to three genera – *Fraxinus*, *Ligustrum* and *Syringa* (all members of the family Oleaceae) in Kurzeme, Vidzeme and Zemgale regions of Latvia and in north-eastern parts of Lithuania. The most serious damage was observed on some lilacs (*Syringa* spp.) and on *Ligustrum vulgare*. Injuries on *Fraxinus excelsior* were observed mainly on young trees, especially in shaded habitats. To date, this East Asian leafhopper is known from six European countries – Belarus, Estonia, Finland, Latvia, Lithuania and the Russian Federation (European part) and can be a serious plant pest during warm and dry summers. *Ligustrum vulgare* is recorded as a new host plant. As lilac leafhopper produces highly dense populations on *Fraxinus excelsior* and causes notable injuries on young trees, it can be treated as an invasive species in Europe.

Keywords: alien species, plant pest, Latvia, Lithuania, *Fraxinus*, *Ligustrum*, *Syringa*, Oleaceae

1. Introduction

To date more than 10 alien Auchenorrhyncha species are recorded from Europe (Gnezdilov et al. 2008; Nickel 2008; Nickel et al. 2013). In recent years the lilac leafhopper, *Igutettix oculatus* (Lindberg, 1929), (Hemiptera: Cicadellidae) has become established in Belarus, Estonia, Finland and the European part of the Russian Federation (Söderman 2005, Söderman et al. 2009; Borodin 2009; Huusela-Veistola & Söderman 2010). The first European record is reported from Moscow in the late 1980s (Tishechkin 1988). The most likely way of introduction was with lilac planting material (Huusela-Veistola & Söderman 2010; Vännienen et al. 2011). Previously this species was only known from its native range in Japan and the Russian Far East where it is associated with *Syringa reticulata* (Matsumura 1931, 1932; Anufriev & Emelyanov 1988). In Europe, *Igutettix oculatus* is also known to feed on other lilac species, notably *Syringa* ×*henryi, S. josikaea, S. komarowii* subsp. *reflexa, S.* × *persica* and *S. vulgaris*, and moreover, a host plant shift from *Syringa* to native

[1] Corresponding author; e-mail: arturs.stalazs@lvai.lv

published online 23 December 2013

Fraxinus excelsior has been reported (Söderman 2005, 2007 and pers. comm.; Söderman et al. 2009).

There have been several nomenclatural changes. After Dmitriev (2003) synonyms of the species include: *Dicraneura oculata* Lindberg, 1929; *Igutettix pulverosus* Matsumura, 1932; *Dikraneura maculosa* Vilbaste, 1968; *Vilbasteana oculata* (Lindberg, 1929). Adult specimens photographed in Finland are shown in Figs. 1 and 2.

2. Material and methods

For the first time injuries made by an unknown leafhopper species were noted on *Fraxinus excelsior, Ligustrum vulgare* and *Syringa* spp. during a survey on pests of ornamental plants in parks of Latvia in year 2012. The additional observation of a new leafhopper species was provided during summer (July – September) of 2012 and 2013. In 2013 (August 2–3) a survey on ornamental plant pests in parks of north-eastern parts of Lithuania was carried out, and the same leafhopper species was found. From some localities samples of leafhoppers were collected from the host plant leaves.

Specimens of the following records are preserved in the scientific collection of the Latvia State Institute of Fruit-Growing: **Latvia:** from *Ligustrum vulgare*, loc. Ēdole, Ēdoles pagasts, Kuldīgas novads (08-07-2012, 2 ind.); from *Ligustrum vulgare*, loc. J. Čakstes iela, Dobele, Dobeles novads (N 56.61634; E 023.29063) (02-08-2012., 1 ind.); from *Ligustrum vulgare*, loc. Mātera iela (surroundings of Jelgava Bus Station), Jegava (02-08-2013, 4 ind.); from *Syringa vulgaris*, loc. "Valguma pasaule", Smārdes pagasts, Engures novads (13-08-2013, 11 ind.); from *Syringa vulgaris*, loc. near Brīvības iela, Dobele, Dobeles novads (N 56.62628; E 023.28496) (16-08-2013., 11 ind.); from *Syringa* spp., loc. lilac collection of Latvia State Institute of Fruit-Growing, Krimūnu pagasts, Dobeles novads (N 56.62628; E 023.28496) (21-08-2013, 16 ind.); from *Ligustrum vulgare*, loc. J. Čakstes iela, Dobele, Dobeles novads (N 56.61634; E 023.29063) (22-08-2013, 4 ind.); from *Syringa vulgaris*, loc. J. Čakstes iela, Dobele, Dobeles novads (N 56.61634; E 023.29063) (22-08-2013, 5 ind.); from *Syringa vulgaris*, loc. Krišjāņa Barona iela 25, Dobele, Dobeles novads (N 56.62063; E 023.29171) (23-08-2013., 5 ind.); from *Syringa vulgaris*, loc. city park near Brīvības iela, Dobele, Dobeles novads (N 56.62700; E 023.28448) (27-08-2013., 4 ind.); from *Fraxinus excelsior*, loc. Krišjāņa Barona iela 6A, Dobele, Dobeles novads (N 56.62151; E 023.28591) (27-08-2013, 4 ind.); from *Syringa vulgaris*, loc. H. Vīkas iela 13, Dobele, Dobeles novads (N 56.60475; E 023.27953 (28-08-2013, 13 ind.); from *Fraxinus excelsior*, loc. city forest park, Dobele, Dobeles novads (N 56.60761; E 023. 28731) (28-08-2013, 8 ind.); from *Syringa* spec., loc. Zaļā iela 87, Dobele, Dobeles novads (N 56.61282; E 023.29178) (28-08-2013, 8 ind.); from *Syringa* spec., loc. Graudu iela 1A, Krimūnu pagasts, Dobeles novads (28-08-2013, 12 ind.); from *Syringa* spec., loc. bus stop "Balvas" on Dobele-Tērvete road, Krimūnu pagasts, Dobeles novads

(N 56.59202; E 023.28578) (28-08-2013, 2 ind.); from *Fraxinus excelsior*, loc. valley of river Gribulīte (Gribuļupīte), Lielvārdes pagasts, Lielvārdes novads (14-09-2013, 3 ind.); from *Fraxinus excelsior* (large trees), loc. city park (near Uzvaras iela), Dobele, Dobeles novads (18-09-2013, 5 ind.); from *Syringa vulgaris*, loc. city park (near Uzvaras iela), Dobele, Dobeles novads (18-09-2013, 13 ind.); **Lithuania:** from *Ligustrum vulgare*, loc. Burbiškis, Utenos apskritis (04-08-2013, 5 ind.); from *Syringa vulgaris*, loc. Burbiškio Dvaro sodyba, Utenos apskritis (04-08-2013, 10 ind.). The new localities and the currently known distribution in Europe and the Western Palaearctic are shown in Fig. 3.

3. Results

During surveys carried out in 2012 and 2013 a mass occurrence of leafhoppers on plants belonging to three genera, *Fraxinus, Ligustrum* and *Syringa*, was observed in many parts of Latvia (regions: Kurzeme, Vidzeme and Zemgale) and in several places in north-eastern part of Lithuania. All observed and collected leafhoppers were identified as *Igutettix oculatus* (Lindberg). Host plants in Latvia were *Fraxinus excelsior, Ligustrum vulgare, Syringa reticulata, S. vulgaris, S, josikaea* and *S.* spec., in Lithuania only *Ligustrum* and *Syringa*.

In Latvia there were no field trips to Latgale region in the eastern part of the country, but there is a photograph of *Syringa villosa* leaf with injuries typical for *I. oculatus* published by Balalaikins and Bukejs (2011, p. 265, fig. 2-B, locality: Daugavpils city). Observations in other parts of Latvia allow the assumption that *I. oculatus* is widely distributed in the whole country, and the same is likely for most of Lithuania.

Host plants and level of injuries: The impact of *I. oculatus* on its host plants was highly variable. Notable injuries were observed on plants with dense foliage or those growing in hedgerows or in more closed stands or groups. In open areas *Syringa vulgaris* is more resistant to *I. oculatus* compared to other lilac species (Figs. 4, 5 and 6), but in protected and shaded places it can be strongly infested and loss of natural green leaf colour can reach even 90% or more, as observed in parks of Dobele city, Latvia (Fig. 7). As a result damaged leaf parts may become dry. On *S. vulgaris* drying was observed on leaf tips when infestation was small, and with the entire leaf drying when infestation was heavy. Drying and near-death of leaves was also observed in some other *Syringa* species.

Injuries on other host plants: *Ligustrum vulgare* was recorded as a new host plant for *Igutettix oculatus*. Most infested plants were found in hedgerows and small plant groups (Fig. 8). The level of injuries on *L. vulgare* was more similar to injuries observed on *Syringa vulgaris*. On *Fraxinus excelsior* the leafhopper was found on trees of different size, but mainly on young ones in parks as well as in near-natural forests, especially in protected and shaded areas (Fig. 9).

Fig. 1: *Igutettix oculatus* (Ldb.), adult individual in dorsal view on lilac, Hila, Kirkkonummi, Finland, 18.VIII. 2013 (Photo by courtesy of Olli Pihlajamaa)

Fig. 2: *Igutettix oculatus* (Ldb.), adult individual in lateral view on lilac Hila, Kirkkonummi, Finland, 18.VIII. 2013 (Photo by courtesy of Olli Pihlajamaa)

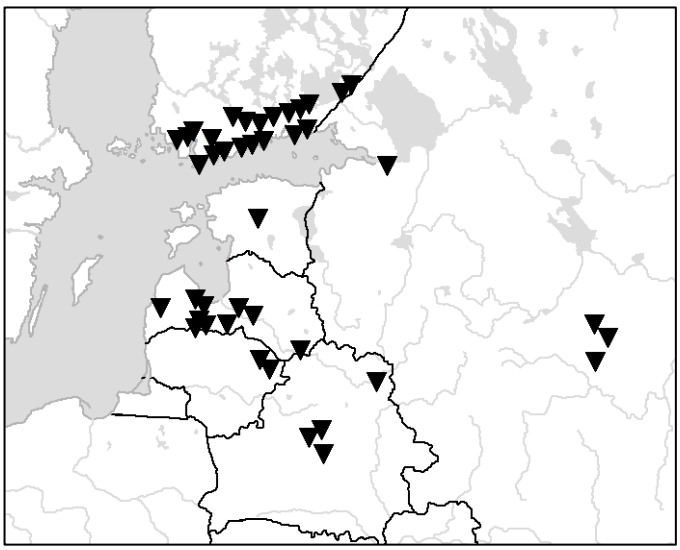

Fig. 3: Records of *Igutettix oculatus* (Ldb.) in Europe. Sources: Söderman (2013), Borodin, Dmitriev & Tishechkin (personal communication)

4. Biology

After Söderman (2005) and the results of this study *Igutettix oculatus* hibernates in the egg stage. In late summer and in autumn females oviposit into dormant leaf buds. The first generation nymphs appear in early June, adults in late June and early July. The first generation females oviposit into the central leaf vein, the second generation nymphs hatch at the beginning of August. The second generation adults appear in the second part of August (in Latvia) or in the beginning of September (in Finland). Adults of the second generation are found until early October. Both nymphs and adults feed on the underside of leaves, adults can also be seen on the upper side.

5. Discussion

Finnish and Belarus authors reported several lilac species except *Syringa vulgaris* as host plants of *I. oculatus* (Söderman 2005, 2007; Borodin 2009; Huusela-Veistola & Söderman 2010; Vännienen et al. 2011). Söderman et al. (2009) were the first to notice an expansion of the host range and attack of *Fraxinus excelsior* (Söderman 2005, and pers. communication). During this study *Ligustrum vulgare* was recorded as a new hostplant. All hosts recorded so far belong to the family Oleaceae, tribe Oleaee and two subtribes – Fraxininae (*Fraxinus*) and Ligustrinae (*Syringa* and *Ligustrum*) (Wallander & Albert 2000). So far there are no feeding records from *Forsythia* which is – according to (Wallander & Albert 2000) – another member of the Oleaceae family, tribe Forsythieae. During future field studies more attention should be payed to this plant, as well as to other members of the Oleaceae such as *Jasminum*.

Apart from very few records of polyphagous leafhoppers such as *Empoasca vitis* (Göthe), *Alebra wahlbergi* (Boh.) and *Fagocyba cruenta* (H.-S.) many of which may refer only to stray individuals from neighbour trees no native Auchenorrhyncha species were found so far on any of the central European Oleaceae species (Nickel 2003). Even on *Olea europaea* and *Phillyrea* which are both very common and widespread in the Mediterranean regions there are no known monophages (Guglielmino & Bückle, pers. comm.). *Igutettix oculatus* is therefore the only specialist feeder on members of this plant family in the Western Palaearctic (Table 1).

Söderman (2005, 2007) reports that lilac leaves become yellow-spotted after infestation, in particular along margins and mainly in late summer and autumn. Huusela-Veistola & Söderman (2010) report "no harm to the growth of lilacs" in Finland. The results of this study show, however, that in Latvia and Lithuania the level of injuries is associated with leafhopper densities and especially with habitat conditions (hedgerows, solitary plants, plant stand or group density, or density of shrub foliage) and host plant species. On some lilac species drying and dying of leaves and a serious reduction of plant health was observed.

Fig. 4: Leaf damages caused by *Igutettix oculatus* on *Syringa vulgaris* (lilac collection of the Latvia State Institute of Fruit-Growing).

Fig. 5: As previous. Same locality, but different hostplant species (*Syringa* spec.).

Fig. 6: *I. oculatus* nymphs on *Syringa vulgaris* (Burbiškio Dvaro sodyba, Lithuania). On this species leaf drying was rare.

Fig. 7 Leaf drying and dying on *Syringa* spec. caused by high densities of *I. oculatus* (Dobele, Latvia).

Fig. 8. Leaf injuries on *Ligustrum vulgare* caused by *I. oculatus* (Ēdole, Latvia)

Fig. 9: Leaf damages on *Fraxinus excelsior* caused by *I. oculatus* (Dobele, Latvia).

Table 1: Auchenorrhyncha species associated with Oleaceae species in Europe

Species	*Fraxinus excelsior*	*Ligustrum vulgare*	*Syringa* spp.	Diet width	Reference
Centrotus cornutus (L.)*		adults only		polyphagous	Nickel (2003)
Empoasca vitis (Göthe)*	**nymphs & adults			polyphagous	Nickel (2003, and pers. comm.)
Fieberiella florii (Stål)		nymphs & adults		polyphagous	Nickel (2003)
Fieberiella septentrionalis W.Wg.*		nymphs & adults		polyphagous	Nickel (2003)
Igutettix oculatus (Ldb.)*	nymphs & adults	nymphs & adults	nymphs & adults	oligophagous	this study, Söderman et al. (2009)

* = Species is recorded also in the fauna of Latvia and Lithuania (Söderman et al. 2009); ** = only rarely, perhaps mostly as a result of individuals dropped from other tree species (Nickel pers. comm.)

These results demonstrate that *I. oculatus* which is presently known from 6 European countries continues its range expansion from eastern Europe towards its central parts. Entomologists should be aware of further possible records in Sweden, Poland, Ukraine and elsewhere. It is also possible that more host species of the Oleaceae family might be attacked, including *Forsythia* spp., *Jasminum* spp., *Olea europaea* (olive tree) and *Phillyrea* spp. (mock privet). However, it is uncertain to which extent a further westward and southward spread in Europe might be constrained by mild and rainy winters quite unlike the more continental winters of Eastern Asia. A notable level of injuries on young trees and high population densities on the native *F. excelsior* allows classifying *I. oculatus* as an invasive species in Europe which deserves further attention.

At present several strains of '*Candidatus* Phytoplasma fraxini' inducing ash yellows disease on *Fraxinus* and lilac witches'-broom on *Syringa* are known in North America (Sinclair et al. 1996; Griffiths et al. 1999; Sinclair & Griffiths 2000) and 12 species of *Fraxinus* (including the European *F. excelsior*) and 19 species of *Syringa* are known as hosts of '*Candidatus* Phytoplasma fraxini' (Sinclair et al., 1996). So far there is neither any information about *I. oculatus* transmitting plant pathogens (Mifsud et al. 2010) nor about '*Candidatus* Phytoplasma fraxini' presence in Europe. However, more attention should be paid to this leafhopper species and its possible vector role concerning plant pathogens in Europe.

6. Zusammenfassung

Die invasive Fliederblattzikade *Igutettix oculatus* (Lindberg, 1929) breitet sich weiter in Europa aus: Neue Wirtspflanze und neue Befunde. – Die ersten Funde der aus Ostasien stammenden Fliederblattzikade, *Igutettix oculatus* (Lindberg,

1929), in Lettland und Litauen werden vorgestellt. Die Art wurde in den Regionen Kurzeme, Vidzeme und Zemgale (Lettland) und im Nordosten von Litauen nachgewiesen und lebt dort auf Wirtspflanzen der Gattungen *Syringa* (Flieder), *Fraxinus* (Esche) und *Ligustrum* (Liguster), alle der Familie Oleaceae zugehörig. Die gravierendsten Schäden wurden auf manchen Flieder-Arten und Liguster beobachtet. Schäden auf Esche wurden besonders auf jungen Bäumen an schattigen Standorten festgestellt. Derzeit ist die Fliederblattzikade aus 6 europäischen Ländern bekannt – Weißrussland, Estland, Finnland, Lettland, Litauen und Russland. In warmen und trockenen Sommern kann sie zu einem ernsthaften Pflanzenschädling werden. Liguster wurde als neue Wirtspflanze nachgewiesen. Da auf Esche auch in naturnahen Lebensräumen hohe Dichten und beachtliche Schäden auftreten können, kann die Art als invasiv im engeren Sinne bezeichnet werden.

Acknowledgements

Dāvis Kļaviņš, Romāns Strelčuns, Juris Stalažs, Māris Opmanis, Laima Kļaviņa and car drivers organized field trips in Latvia and Lithuania. Dmitrij Dmitriev, Herbert Nickel, Guy Söderman provided literature and gave helpful comments on an earlier version of this paper. Oleg Borodin and Dmitrij Tishechkin sent information about the occurrence of *I. oculatus* in Belarus and Russia. Olli Pihlajamaa kindly allowed reprint of the leafhopper photographs. The author wishes to express his thanks to these colleagues. This study was partly financed from the research project "Improvement of environment and rural landscape", ELFLA no. 211211/C-120 funds.

7. References

Anufriev G.A., Emelyanov A.F. (1988): Cicadinea (Auchenorrhyncha). – In: Ler P.A. (chief ed.), Opredelitel' nasekomyh Dal'nego Vostoka SSSR 2, Ravnokrylye i polužestokrylye, pp. 12–495. Nauka, Leningrad.

Balalaikins M., Bukejs A. (2011): *Otiorhynchus smreczynskii* (Coleoptera: Curculionidae) – a new to Estonia and Lithuania weevil species with notes on its occurrence and bionomy in the East Baltic region. – Acta Zoologica Lituanica 21: 263-267.

Borodin O.I. (2009): Cikadovye (Homoptera: Auchenorrhyncha) Belarusi. Sovremennoe sostoânie izučennosti [Auchenorrhyncha homopterans in Belarus. Today's situation of study]. – In: Problemy sohraneniâ biologičeskogo raznoobraziâ i ispol'zovaniâ biologičeskih resursov: materialy meždunarodnoj naučno -praktičeskoj konferencii i X zoologyčeskoj konferencii (18–20 noâbrâ 2009 g.), čast' 1, Medžik, Minsk (Belarus): 47-50.

Dmitriev D.A. (2003 onward): 3i Typhlocybinae database: *Igutettix oculatus* (Lindberg, 1929). – http://imperialis.inhs.illinois.edu/dmitriev

Gnezdilov V.M., Sugonyaev E.S., Artokhin K.S. (2008) *Arboridia kakogawana*: a new pest of grapevine in southern Russia. – Bulletin of Insectology 61: 203-204.

Griffiths H.M., Sinclair W.A., Smart C.D., Davis R.E. (1999): The phytoplasma associated with ash yellows and lilac witches'-broom: '*Candidatus* Phytoplasma fraxini'. – International Journal of Systematic Bacteriology 49: 1605-1614.

Huusela-Veistola E., Söderman G. (2010): Climate change and range shift of *Igutettix oculatus*: NJF Seminar 430, Climate Change and Agricultural Production in the Baltic Sea Re-

gion – Focus on Effects, Vulnerability and Adaptation, Uppsala, Sweden, 4–6 May 2010. Nordic Association of Agricultural Scientists. NJF Report 6: 123.

Matsumura S. (1931): A revision of the Palaearctic and Oriental Typhlocybid genera with descriptions of new species and new genera. – Insecta Matsumurana 6: 55-91.

Matsumura S. (1932): A revision of the Palaearctic and Oriental Typhlocybid-genera with descriptions of new species and new genera (Pt. II). – Insecta Matsumurana 6: 93-120.

Mifsud D., Cocquempot C., Mühlethaler R., Wilson M., Streito J.-C. (2010): Other Hemiptera Sternorrhyncha (Aleyrodidae, Phylloxeroidea, and Psylloidea) and Hemiptera Auchenorrhyncha. – BioRisk 4: 511-552.

Nickel H. (2003): The leafhoppers and planthoppers of Germany (Hemiptera, Auchenorrhyncha): patterns and strategies in a highly diverse group of phytophagous insects. – Pensoft, Sofia und Moskau. 460 pp.

Nickel H. (2008): Tracking the elusive: leafhoppers and planthoppers (Insecta: Hemiptera) in tree canopies of European deciduous forests. – In: Floren A., Schmidl J. (eds), Canopy arthropod research in Europe, pp. 175-214. Bioform entomology, Nuremberg.

Nickel H., Callot H., Knop E., Kunz G. (2013): *Penestragania apicalis* (Osborn & Ball, 1898), another invasive Nearctic leafhopper found in Europe (Hemiptera: Cicadellidae, Iassinae). – Cicadina 13: 5-15.

Sinclair W.A., Griffiths H.M. (2000): Variation in aggressiveness of ash yellows phytoplasmas. – Plant Disease 84: 282-288.

Sinclair W.A., Griffiths H.M., Davis R.E. (1996): Ash yellows and lilac witches'-broom: phytoplasmal diseases of concern. – Plant Disease 80: 468-475.

Söderman G. (2005): The eastern Palaearctic leafhopper *Igutettix oculatus* (Lindberg, 1929) in Finland: morphology, phenology and feeding (Insecta, Hemiptera, Cicadellidae, Typhlocybinae). – Beiträge zur Zikadenkunde 8: 1-4.

Söderman G. (2007): Taxonomy, distribution, biology and conservation status of Finnish Auchenorrhyncha (Hemiptera: Fulgoromorpha et Cicadomorpha). – The Finnish Environment 7: 1-98.

Söderman G., Albrecht A., Rinne V. (2012): Atlas of the Auchenorrhyncha of Finland / Suomen kaskasatlas / Atlas över Finlands stritar 2012: *Igutettix oculatus* (Lindberg, 1929). – http://www2.sci.utu.fi/projects/biologia/elainmuseo/hemi/ auch/Igutocul.pdf [accessed 16 Nov 2013]

Söderman G., Gillerfors G., Endrestöl A. (2009): An annotated catalogue of the Auchenorrhyncha of Northern Europe (Insecta, Hemiptera: Fulgoromorpha et Cicadomorpha). – Cicadina 10: 33-69.

Tishechkin D.Yu. (1988): Cikadovye (Homoptera, Cicadinea) Moskovskoj oblasti. – In: Nasekomye Moskovskoj oblasti. Problemy kadastra i ohrany, pp. 3-18. Nauka, Moscow.

Vännienen I., Worner S., Huusela-Veistola E., Tuovinen T., Nissinen A., Saikkonen K. (2011): Recorded and potential alien invertebrate pests in Finnish agriculture and horticulture. Agricultural and Food Science 20: 96-114 and supplementary material 1-10.

Wallander E., Albert V.A. (2000): Phylogeny and classification of Oleaceae based on rps16 and trnL-F sequence data. – American Journal of Botany 87: 1827-1841.

Author's address

Arturs Stalažs, Unit of Plant Pathology and Entomology, Latvia State Institute of Fruit-Growing, Graudu iela 1, Dobele, Dobeles nov., LV-3701, Latvia, e-mail: arturs.stalazs@lvai.lv