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ORIGINAL ARTICLE

Ecological and molecular diversity of Eulachnini aphids (Hemiptera: Aphididae: Lachninae) on coniferous plants in Lithuania

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Abstract. Based on research carried out from 2016 to 2018 there are twenty-six species of aphids of the tribe Eulachnini in Lithuania. Seventeen are members of the subgenus *Cinara* of the genus *Cinara*, three of the subgenus *Cupressobium* and two of the subgenus *Schizolachnus*. In addition, there are four species of the genus *Eulachnus*. Summarized information on the distribution and host specificity of Eulachnini in Lithuania is presented. Nine species were in all climatic regions of Lithuania: *C.* (*Cinara*) *brauni, C.* (*Cinara*) *hyperophila, C.* (*Cinara*) *neubergi, C.* (*Cinara*) *piceicola, C.* (*Cinara*) *pinea, C.* (*Cinara*) *pini, C.* (*Cinara*) *pruinosa*, *C.* (*Cupressobium*) *cupressi* and *C.* (*Cupressobium*) *juniperi*. Five species of Lithuanian Eulachnini inhabit host plants of the genus *Picea*, three live on *Larix*, thirteen on *Pinus,* one on *Abies*, one on *Thuja* and three on *Juniperus*. *Cinara* (*Cinara*) *piniphila* was recorded on *Pinus mugo* and *C.* (*Cinara*) *nuda* on *Pinus heldreichii* for the first time. Partial COI and EF-1α sequences of *C.* (*Cinara*) *hyperophila*, *C.* (*Cinara*) *pilosa* and *C.* (*Cinara*) *piceicola* were obtained for the first time. Partial sequences of mitochondrial (COI) and nuclear (EF-1α) DNA of Lithuanian samples were used to explore molecular diversity using NJ trees, Automatic Barcode Gap Discovery (ABGD), General Mixed Yule Coalescent (GMYC) and Poisson Tree Processes (PTP). Species delimitation using GMYC (both on COI and EF-1α sequences), PTP (BI on COI) and ABGD (EF-1α) were the most consistent with traditional classifications. Pairwise between-species sample divergences (COI and EF-1α fragments) of the samples of the species complex *C.* (*Cinara*) *pinea* – *C.* (*Cinara*) *piniphila* indicate it is composed of a single species. Of the species of aphids that live on conifers, there are seven species of the tribe Eulachnini that are likely to shortly colonize Lithuania.

INTRODUCTION

Aphids of the tribe Eulachnini Baker, 1920 (Hemiptera: Aphididae: Lachninae) are phloem feeding insects inhabiting plants of the families Pinaceae and Cupressaceae. They are adapted to feed on particular parts of their host plants. Of the species of Eulachnini, those of the genus *Eulachnus* del Guercio, 1909 and subgenus *Schizolachnus* Mordvilko, 1909 of the genus *Cinara* Curtis, 1835, prefer the needles of their host plants. Other species of the genus *Cinara* inhabit the bark of roots, trunks, branches, twigs and shoots (Binazzi & Scheurer, 2009; Chen et al., 2016b; Albrecht, 2017; Blackman & Eastop, 2019). Aphids of the tribe Eulachnini can cause serious damage in tree nurseries, parks, forests and cultivated areas (Watson et al., 1999; Hopmans & Elms, 2013; Dara et al., 2019). The honeydew of these aphids, however, is the raw material for the so called “forest honey”, which is an important commercial product in Europe (Binazzi & Scheurer, 2009).

Forests cover approximately 30% of Lithuania. Most consist of pine and spruce stands (https://www.forestgen.mi.lt). Nevertheless, information about the species of Eulachnini inhabiting coniferous plants in Lithuania consists mainly of fragmentary faunistic records reporting the presence of 19 species of this tribe (for details, see Rakauskas et al., 1992, 2008). Our pilot study in 2017 revealed the presence of 27 species of the tribe Eulachnini in Lithuania (Danilov et al., 2019). In the surrounding countries there are 34 species in Poland, 19 in Latvia, 21 in Belarus and 9 in the Kaliningrad region of Russia (Osiadacz & Hałaj, 2009; Nieto Nafria et al., 2013; Hałaj & Osiadacz, 2015; Wojciechowski et al., 2015). Forty species of Eulachnini are recorded in the Czech Republic, Slovakia and Austria (Holman & Pintera, 1977; Holman, 2009; Nieto Nafria et al., 2013; Wojciechowski et al., 2016; Kanturski et al., 2017), which are in the southernmost part of the Central European floristic province according to Frey & Lösch (2010). Lithuania is in the northernmost part of this floristic province. Due to global climate change, the Lithuanian fauna is expected to be enriched by species of Eulachnini from the South.

For the successful exploration of regional species diversity it is inevitable that DNA-based methods will have to be used in addition to ecological and morphological ones. These methods have proved to be a powerful tool in large-scale studies delimitating species and on speciation in the Eulachnini (Durak, 2011; Jousselin et al., 2013; Durak et al., 2014; Meseguer et al., 2015, 2017; Chen et al., 2016a, b). In this study, partial mitochondrial COI and nuclear EF-1α sequences were used to investigate within- and between-species genetic diversity of species of Eulachnini in Lithuania. Despite its small area (65,300 km^2), there are four climatic regions in Lithuania (Galvonaitė et al., 2007) (Fig. 1). The coastal region is currently the coolest in summer and mildest in winter. The greatest seasonal fluctuation in temperature is recorded in the South eastern highlands. The wettest area is in the Coastal and Samogitian regions. Average annual precipitation in both these regions (1981–2010 data) is 850–950 mm, whereas it is 550–650 in South eastern highlands (Galvonaitė et al., 2013). According to Buivydaitė et al. (2001), the least fertile soils are in the South eastern Highlands due to the predominance there of a thin layer of organic material (mostly arenosol and regosol soil types), and the most fertile are in the Middle Lithuanian Lowlands (mostly luvisols and cambisols). This accounts for the distribution of conifers in Lithuania, with pine stands most common in the South eastern highlands and spruce stands scattered mostly in the Middle Lithuanian and Samogitian regions (https://www.forestgen.mi.lt). In addition to natural stands of conifers, commercial forests, decorative plantings and gardens, also ensure a high host plant diversity. In this paper, we summarize information on the diversity, ecological and molecular specificity of aphids of the Eulachnini in Lithuania, present some taxonomic remarks and discuss the possible future development of the conifer-inhabiting aphid fauna in Lithuania.

MATERIAL AND METHODS

Aphid material for this study was collected by examining plants in situ (Blackman & Eastop, 2000) from 2016 to 2018 (some unpublished samples from 2012 were also included) at 70 localities in all four climatic regions in Lithuania (Table 1, Fig. 1). Detailed information on the material sampled is presented in Table S1. Colonies of 17 species of Eulachnini (in bold in Table 1) were monitored monthly from September 2017 until October 2019 (monitoring sites shown as black circles in Fig. 1). Microscope slides of aphids mounted in Canada balsam were prepared according to Blackman & Eastop (2000). For morphology based identification the keys of Blackman & Eastop (2019), Heie

Table 1. Number of samples collected / number used in the molecular analysis of 26 species of the tribe Eulachnini collected from four climatic regions in Lithuania in 2016–2018. * – samples collected by Jan Havelka in 2012 and 2017, n = 1 for each asterisk. *C. – Cinara*, *Cu. – Cupressobium, S. – Schizolachnus, E. – Eulachnus*. Species that were monitored monthly from September 2017 until October 2019 (monitoring sites shown as black circles in Fig. 1) are in bold.

Species	Coastal	Samogitian	Middle Lithuanian Lowlands	Southeastern Highlands	Host plants	Microhabitat
			Abies			
C. (*C.*) *pectinatae*	0/0	0/0	1/1	0/0	*koreana*	Shoots
			Juniperus			
C.* (*Cu.*) *juniperi	4/1	2/2	3/2*	4/4	*communis*	Shoots
C. (*Cu.*) *cupressi*	0/0	0/0	1/1*	0/0	*virginiana*	Twigs
C.* (*Cu.*) *mordvilkoi	0/0	0/0	0/0	3/3	*communis*	Branches, stem, root collar
			Thuja			
C. (*Cu.*) *cupressi*	1/1	1/1	2/2*	1/1	*occidentalis*	Twigs
			Larix			
C.* (*C.*) *cuneomaculata	1/1	0/0	1/1	2/1	*decidua (1), kaempferi* (1), sp. (1)	Shoots, twigs
C.* (*C.*) *kochiana	0/0	0/0	0/0	1/1	*decidua*	Branches, stem
C.* (*C.*) *laricis	1/1*	0/0	0/0	2/2	*decidua* (2), sp. (1)	Twigs, branches
			Picea			
C. (*C.*) *costata*	1/1	1/1	1/1	0/0	*abies*	Twigs
C. (*C.*) *piceae*	6/4	0/0	2/2	1/1	*abies* (7), *omorika* (1), *alcoquiana* (1)	Branches, stem
C.* (*C.*) *piceicola	1/1	1/1	3/1	4/4	*abies* (8), *montigena* (1)	Shoots, twigs, branches, stem
C.* (*C.*) *pilicornis	1/1	0/0	5/2	6/4	*abies* (11), *montigena* (1)	Shoots, twigs
C.* (*C.*) *pruinosa	2/2	2/2	3/1	4/3	*abies*	Twigs, branches, stem
			Pinus			
C.* (*C.*) *brauni	5/2*	1/1	3/3	2/2	*nigra* (1), aff. *nigra* (10)	Shoots, twigs
C.* (*C.*) *hyperophila	3/3	2/2	6/2	9/4	*sylvestris* (19), *mugo* (1)	Shoots, twigs
C.* (*C.*) *neubergi	4/2	5/3	7/2	6/3	*mugo*	Shoots
C.* (*C.*) *nuda	3/2	0/0	2/2	7/4	*sylvestris*	Shoots, twigs, branches, stem
C.* (*C.*) *pilosa	2/1	0/0	1/1	8/5	*sylvestris*	Shoots
C.* (*C.*) *pinea	2/2	2/2	9/2	10/3	*sylvestris* (19), *mugo* (4)	Shoots
C.* (*C.*) *pini	4/2	1/1	7/2	12/5	*sylvestris* (23), *mugo* (1)	Shoots, twigs, branches, stem
C.* (*C.*) *piniphila	8/6	2/2	0/0	4/4	*sylvestris* (11), *mugo* (3)	Shoots, twigs
C. (*S.*) *obscura*	4/4	0/0	1/1	0/0	aff. *nigra*	Needles
C. (*S.*) *pineti*	2/1	0/0	5/2	10/5	*sylvestris* (13), *nigra* (1), *mugo* (1)	Needles
E. agilis	1/1	0/0	3/1	4/3*	*sylvestris* (5), *P. mugo* (1)	Needles
E. brevipilosus	4/3	0/0	1/1	1/1	*sylvestris* (7), *P. mugo* (1)	Needles
E. nigricola	1/1	0/0	0/0	0/0	*heldreichii*	Needles
E. rileyi	2/2	0/0	1/1	1/1	*sylvestris* (1), aff. *nigra* (2), sp. (1)	Needles

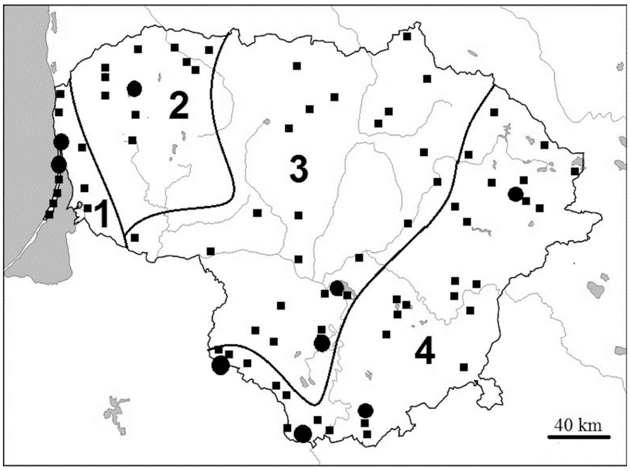

Fig. 1. Map showing the sites where aphids were collected in 2016–2018 in four Climatic regions in Lithuania. Localities also used for monitoring aphid colonies are shown as black circles. 1 – Coastal, 2 – Samogitian, 3 – Middle Lithuanian lowlands, 4 – Southeastern highlands.

(1995), Binazzi & Scheurer (2009), Albrecht (2017) and Kanturski et al. (2017) were used. NIKON ECLIPSE E200 microscope with INFINITY ANALYSE 6.1 software was used for the microscopic analysis. Aphid material is deposited in the Life Sciences Centre of Vilnius University (Lithuania).

For the molecular analysis, 161 samples of species of Eulachnini from many host plants and four climatic regions were used. A single aphid from a sample was considered to be a unique sample. A non-destructive extraction method was used so that each aphid could be mounted on a slide and used to confirm its identity when the morphological and DNA identification appeared to differ. Total genomic DNA was extracted from a single aphid using DNeasy Blood & Tissue kit (Qiagen). For the amplification of COI fragments the primers LCO-1490 and HCO-2198 (Folmer et al., 1994) were used. For the amplification of EF-1α fragments the primers Ef3 and Ef6 (Jousselin et al., 2013) were used. PCR amplification was carried out in a thermal cycler (Eppendorf) in 50 µl volumes containing 2 µl genomic DNA, 2.5 µl of each primer (0.5 µM), 25 µl of DreamTaq PCR master mix (Thermo Scientific) and 18 µl of nuclease free water (Thermo Scientific). The cycling parameters were as follows: denaturizing at 95°C for 5 min (1 cycle), denaturizing at 95°C for 30 s, annealing at 47°C (COI) or 50°C (EF-1α) for 30 s, extension at 72°C for 30–90 s (34 cycles in total) and final extension at 72°C for 5 min (1 cycle). PCR products were purified using Gene Jet PCR purification kit (Thermo Scientific) and then sequenced at Macrogen Europe (Amsterdam, the Netherlands) and the Institute of Biotechnology (Life Sciences Centre, Vilnius University). The amplification primers were also used as sequencing primers. DNA sequences for each specimen were confirmed using both sense and anti-sense strands and aligned in the BioEdit Sequence Alignment Editor (Hall, 1999). Partial COI sequences were tested for stop codons and none were found. The GenBank Accession numbers are MH396414–MH396434, MK829820–MK829825, MN178356–MN178483 and MN192192–MN192351.

To evaluate within-species sequence diversity uncorrected p-distances were calculated for the COI and EF-1α fragments. Both exons and introns of EF-1α were included in the analyses. Sequences were also collapsed into haplotypes using FaBox 1.5 (Villesen, 2007). Neighbour-Joining (NJ) trees for each of analysed fragments were constructed based on within- and between-species distance matrices. MEGA 7 (Kumar et al., 2016) was used for calculating the distances and tree construction.

We used three methods of molecular species delimitation: distance-based Automatic Barcode Gap Discovery (ABGD) (Puillandre et al., 2012), tree-based General Mixed Yule Coalescent (GMYC) (Pons et al., 2006) and the Poisson Tree Processes (PTP) models (Zhang et al., 2013). Partial COI sequences and coding part of EF-1α fragment of Lithuanian samples were analysed using the graphic web version of the ABGD method (http://wwwabi.snv.jussieu.fr/public/abgd/abgdweb.html). Distances for each gene were calculated using MEGA 7 (Kumar et al., 2016) and a Kimura 2-parameter (K2P) model. The value of the relative gap width (X) was 1.00 for both fragments, with P_{min} = 0.001 and P_{max} = 0.02 for both fragments and other parameters by default. For tree-based methods, the following substitution models were used along with jmodeltest (Posada, 2008): HKY+I+G for COI and GTR+G for EF-1α fragment. One ultra metric tree for each fragment was constructed using the uncorrelated lognormal relaxed clock method implemented in BEAST v1.7.4 (Drummond & Rambaut, 2007), assuming a Yule tree prior. One run of 50 million generations with sampling every 5000 generations was performed. Convergence was checked for using Tracer 1.5 (Drummond & Rambaut, 2007). Sampled posterior trees were summarized using TreeAnnotator 1.7.4 (Drummond & Rambaut, 2007) to generate a maximum clade credibility (MCC) tree without the removal of burn-in. The GMYC method, as implemented in the R package SPLITS (http://www.rforge.r-project.org/projects/splits/) was then applied to the MCC tree and a lists of species derived from this phylogenetic tree. Contrary to GMYC, the PTP method does not require ultra metric trees as an input (Zhang et al., 2013). Bayesian inference trees for each fragment were built using MrBayes 3.2.1 (Ronquist & Huelsenbeck, 2003). One run of 1,000,000 MCMC generations with tree sampling every 1,000 generations was performed. Consensus trees with posterior probabilities were visualized using TreeView (Page, 1996). Trees were saved as newick format files and analysed using the bPTP web server (http://species.h-its.org/ptp/). All parameters used were those given by default, except for the number of generations (300,000).

RESULTS

Distribution, host plants and life cycles of species of Eulachnini in Lithuania

Our study revealed twenty-six aphid species of the tribe Eulachnini in Lithuania (Table 1). We failed to find *Cinara* (*Cinara*) *pinihabitans* (Mordvilko, 1895), which was previously reported from the Curonian spit of Lithuania (Rakauskas et al., 2008). Most of the species (17) are members of the subgenus *Cinara* of the genus *Cinara*. There are 3 species of the subgenus *Cupressobium* and 2 of the subgenus *Schizolachnus*. The four climatic regions in Lithuania differ in terms of the diversity of Eulachnini (Figs 2–3): The highest species diversity was recorded in the Coastal region (23 species), whereas only 10 species were recorded in the Samogitian region. Species of the subgenus *Cinara* were placed in six ecological groups, each of which was associated with a different host plant. Species complex inhabiting host plants of the genus *Pinus* was the most common and numerous (8 aphid species). Of these species, five were among the most common species of Eulachnini in all regions in Lithuania: *C.* (*Cinara*) *brauni* Börner, 1940, *C.* (*Cinara*) *hyperophila* (Koch, 1855), *C.* (*Cinara*) *neuber-*

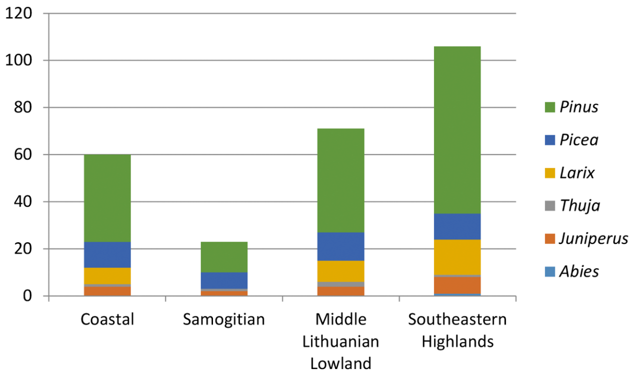

Fig. 2. Histogram of the numbers of aphid samples collected from different host plant genera in four climatic regions in Lithuania.

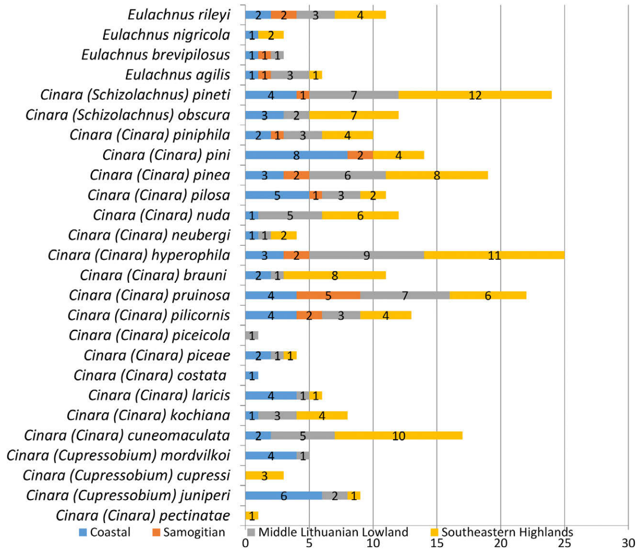

Fig. 3. Numbers of each of the species of aphids sampled in the four climatic regions in Lithuania.

gi (Arnhart, 1930), *C.* (*Cinara*) *pinea* (Mordvilko, 1894) and *C.* (*Cinara*) *pini* (Linnaeus, 1758). Three of them (*C.* (*Cinara*) *hyperophila, C.* (*Cinara*) *pinea* and *C.* (*Cinara*) *pini*) mostly inhabited *Pinus sylvestris* Linnaeus 1753, which is the most common conifer in Lithuania. Two other widespread species of the subgenus *Cinara*, *C.* (*Cinara*) *brauni* and *C.* (*Cinara*) *neubergi* inhabited species of *Pinus* that are exotic to Lithuania: *Pinus nigra* J.F. Arnold 1785 group and *P*. *mugo* Turra 1765, respectively.

Six species of the subgenus *Cinara* coexist on native *Pinus sylvestris. C.* (*Cinara*) *hyperophila* usually feeds on shoots and twigs of mostly young pines and sometimes older trees. In autumn, it also inhabits needle-free parts of branches. Colonies are quite dense in spring, but become scattered later in the season. *C.* (*Cinara*) *piniphila* (Ratzeburg, 1844), *C.* (*Cinara*) *pinea* and *C.* (*Cinara*) *pilosa* (Zetterstedt, 1938) usually form small colonies or occur solitarily. *C.* (*Cinara*) *piniphila* occurred mostly on both fresh shoots and 1–2 year-old twigs throughout the entire season. Noticeably, we found this species on pines growing on poor sandy soil, mostly on dunes. *C.* (*Cinara*) *pilosa* and *C.* (*Cinara*) *pinea* occupy shoots and occasionally form mixed colonies on shoots of the lower branches of old trees. *C.* (*Cinara*) *pilosa* usually live on small shoots of old trees, but might also occur on mature (about 20 years old) pines. *C.* (*Cinara*) *pinea* occurs on both young and old trees. *C.* (*Cinara*) *pini* and *C.* (*Cinara*) *nuda* (Mordvilko, 1895) live in dense large colonies. *C.* (*Cinara*) *pini* commonly inhabits shoots and twigs both on young and old pines. Trunk and basal parts of old branches of immature trees are preferred by *C.* (*Cinara*) *nuda*. However, it can also be found on shoots and twigs in spring. Apart from *P. sylvestris*, we also found *C.* (*Cinara*) *nuda* on *Pinus heldreichii* Christ 1863 and *C.* (*Cinara*) *hyperophila, C.* (*Cinara*) *pini*, *C.* (*Cinara*) *pinea* and *C.* (*Cinara*) *piniphila* on *P. mugo* in Lithuania.

Five species of the subgenus *Cinara* inhabit *Picea abies* (Linnaeus) Karsten 1881, which is the second most common conifer in Lithuania. They coexist on the same host plant by utilizing specific microhabitats. The most common species were *C.* (*Cinara*) *pruinosa* (Hartig, 1841) and *C.* (*Cinara*) *piceicola* (Cholodkovsky, 1896). *C.* (*Cinara*) *pruinosa* occurred exclusively on *Picea abies* where it formed dense and often large colonies on old twigs, branches and the upper parts of the trunk in spring and autumn. They did not occur in the canopies of trees from mid-July to mid-August, probably due to migration to lower parts of the trunk and big roots as is reported by Blackman & Eastop (2019). *C.* (*Cinara*) *piceicola* inhabits twigs and young branches of *Picea abies* and sometimes the trunks and shoots. These two species sometimes form mixed colonies, although *C.* (*Cinara*) *piceicola* prefers the younger parts of trees. *C.* (*Cinara*) *piceae* (Panzer, 1800) was less common than the two above-mentioned species. The main reason is that this species may be overlooked due to its summer migration from branches and trunks to roots. These aphids were observed on trunks and branches of old and young trees in June–July and ovipositing oviparae on shoots and twigs in October. Apart from on *Picea abies*, *C.* (*Cinara*) *piceae* was also recorded on the exotic species *Picea omorika* (Pančić) Purkyne 1877 and *P. alcoquiana* (Veitch ex Lindley) Carrière 1867 in Lithuania. The rarest species of spruce-inhabiting aphid in Lithuania was *C.* (*Cinara*) *costata* (Zetterstedt, 1928) (Table 1), which lives in scarce colonies on small woody twigs on the lower branches in the crown and is covered in wax. The most common species on shoots and young twigs of *Picea abies* was *C.* (*Cinara*) *pilicornis* (Hartig, 1841).

Of the three species recorded on *Larix* in Lithuania, *C.* (*Cinara*) *cuneomaculata* (Del Guercio, 1909) was the most common. We recorded it living in small colonies on shoots and young woody twigs of *Larix decidua* Miller 1768, *Larix kaempferi* (Lambert) Carrière 1856 and on some unidentified species of larch in the Costal Lowland, Middle Lithuanian Lowland and South eastern Highland regions. Dense colonies of *C.* (*Cinara*) *laricis* (Hartig, 1839) were found on young and old trees of *Larix decidua* where they occurred on the shoots in spring and branches and trunk later in the season. It was recorded at sites in the Costal Lowland and South eastern Highland regions. *C.* (*Cinara*) *kochiana* (Börner, 1939) forms dense and large colonies on branches and trunk of young and old *Larix decidua* from midsummer until autumn. It was recorded only at one locality (Kapčiamiestis) in the southernmost part of the South eastern Highlands.

The only species of Eulachnini currently feeding on *Abies* in Lithuania is *C.* (*Cinara*) *pectinatae* (Nördlinger, 1880). The single finding of this aphid was recorded in the Kaunas botanical garden (Middle Lithuanian Lowland) on the exotic species *Abies koreana* E.H. Wilson 1920. Aphids were scattered individually on small branches among needles.

Three species of the subgenus *Cupressobium* of the genus *Cinara* are present in Lithuania, and *C.* (*Cupressobium*) *juniperi* (De Geer, 1773) is the most common. We found it in all climatic regions, where it formed small colonies on young shoots of the native conifer *Juniperus communis* Linnaeus 1753. Another species, *C.* (*Cupressobium*) *mordvilkoi* that inhabits the same host plant, was much rarer (three samples from the southernmost part of the South eastern Highlands, Table 1). These aphids feed on branches and stems in spring, root collar in summer and thin twigs at the end of September. A third species of the subgenus, *C.* (*Cupressobium*) *cupressi* (Buckton, 1881) was rather common feeding on shoots and small twigs of the exotic conifers *Thuja occidentalis* Linnaeus 1753 and *Juniperus virginiana* Linnaeus 1753 in Lithuania.

Of the two species of the subgenus *Schizolachnus* of the genus *Cinara*, the most common was *C.* (*Schizolachnus*) *pineti* (Fabricius, 1781). We found it in all climatic regions in Lithuania, except Samogitian, feeding in dense rows along the mature needles of mostly *Pinus sylvestris*. Some samples were also collected from *P. mugo* and *P. nigra.* Another species, *C.* (*Schizolachnus*) *obscura* (Börner, 1940), was much rarer and recorded mostly from *P. nigra* in the Coastal Lowland region, with one sample from the Middle Lithuanian Lowland region.

Of the four species of the genus *Eulachnus* the most common were *E. agilis* (Kaltenbach, 1843) and *E. brevipilosus* Börner, 1940, which were mostly associated with *Pinus sylvestris* and feed solitary on old needles. Some samples of both species were also collected from *Pinus mugo*. Our samples of *E. rileyi* (Williams, 1911) were mostly from *Pinus nigra*, but also *P. mugo* and *P. sylvestris*. We found this species in the Coastal Lowland, Middle Lithuanian Lowland and South eastern Highland regions, the same as the two above-mentioned species of *Eulachnus*. The only sample of *Eulachnus nigricola* (Pašek, 1953) was collected in the Coastal Lowland region (Botanical garden at Klaipėda) from the needles of *P. heldreichii*.

Table 2. Average and range of within-species genetic diversity (p-distances) calculated for COI (668 bp) and EF-1α fragments (1017 bp) of 26 species of the tribe Eulachnini from Lithuania. *C. – Cinara*, *Cu. – Cupressobium*, *S. – Schizolachnus*, *E. – Eulachnus*.

Aphid species	COI fragment		EF-1alpha fragment	
	p-distances, average, min–max	Haplotypes, n / Samples, n	p-distances, average, min–max	Haplotypes, n / Samples, n
		Abies		
C. (*C.*) *pectinatae*	n/c	1 / 1	n/c	1 / 1
		Juniperus and *Thuja*		
C. (*Cu.*) *juniperi*	1.21; 0.15–1.98	8 / 8	0.39; 0–0.76	7 / 9
C. (*Cu.*) *mordvilkoi*	0	1 / 3	0	1 / 3
C. (*Cu.*) *cupressi*	0	1 / 5	0.41; 0–1.24	3 / 6
		Larix		
C. (*C.*) *cuneomaculata*	1.26; 0.31–1.73	3 / 3	0	1 / 2
C. (*C.*) *kochiana*	n/c	1 / 1	n/c	1 / 1
C. (*C.*) *laricis*	1.68; 0.63–2.36	3 / 3	0.10; 0–0.2	3 / 3
		Picea		
C. (*C.*) *costata*	0.42; 0.31–0.63	3 / 3	0	1 / 3
C. (*C.*) *piceae*	0.17; 0–0.61	3 / 7	0.22; 0–0.65	4 / 7
C. (*C.*) *piceicola*	0.20; 0–0.45	4 / 7	0.12; 0–0.32	4 / 7
C. (*C.*) *pilicornis*	0.14; 0–0.32	4 / 7	0.58; 0.11–1.19	7 / 7
C. (*C.*) *pruinosa*	0.08; 0–0.15	3 / 8	0.37; 0–0.64	7 / 8
		Pinus		
C. (*C.*) *brauni*	0.17; 0–0.30	5 / 7	0.24; 0–0.96	3 / 8
C. (*C.*) *hyperophila*	1.22; 0–3.92	9 / 11	0.15; 0–0.41	4 / 10
C. (*C.*) *neubergi*	0.19; 0–0.94	2 /10	0.23; 0–0.93	4 / 10
C. (*C.*) *nuda*	0.17; 0–0.45	4 / 7	0.08; 0–0.22	3 / 7
C. (*C.*) *pilosa*	0.04; 0–0.16	2 / 7	0.17; 0–0.31	4 / 7
C. (*C.*) *pinea*	0.76; 0–1.25	6 / 8	0.42; 0–0.74	4 / 9
C. (*C.*) *pini*	0.75; 0–1.67	9 / 10	0.09; 0–0.32	4 / 10
C. (*C.*) *piniphila*	0.43; 0–1.41	6 / 12	0.27; 0–1.08	6 / 13
C. (*S.*) *obscura*	0	1 / 4	0.38; 0–0.86	4 / 5
C. (*S.*) *pineti*	0.22; 0–0.49	4 / 6	0.03; 0–0.11	2 / 8
E. agilis	0.18; 0–0.30	4 / 5	0.23; 0.11–0.32	5 / 5
E. brevipilosus	0	1 / 5	0	1 / 5
E. nigricola	n/c	1 / 1	n/c	1 / 1
E. rileyi	0.15; 0–0.30	3 / 4	0.27; 0–0.54	3 / 4

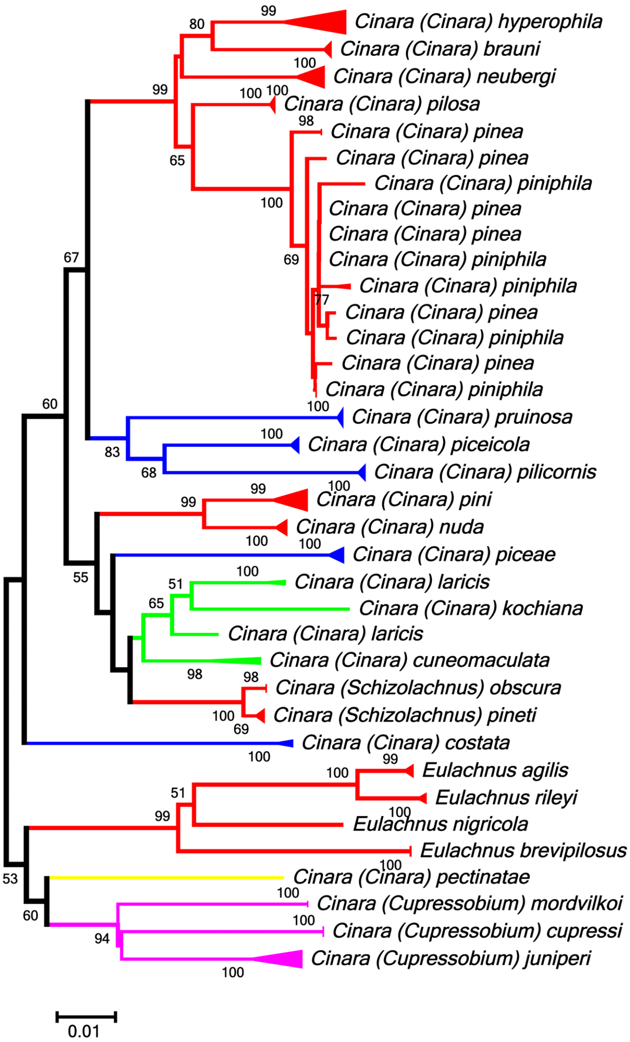

Fig. 4. Neighbour-joining (NJ) tree showing relationships among partial sequences of mitochondrial cytochrome oxidase subunit I (COI) in samples of 26 species of aphids of the tribe Eulachnini collected in Lithuania. ■ – *Pinus*, ■ – *Abies*, ■ – *Larix*, ■ – *Picea*, ■ – Cupressaceae. See Fig. S1 for details.

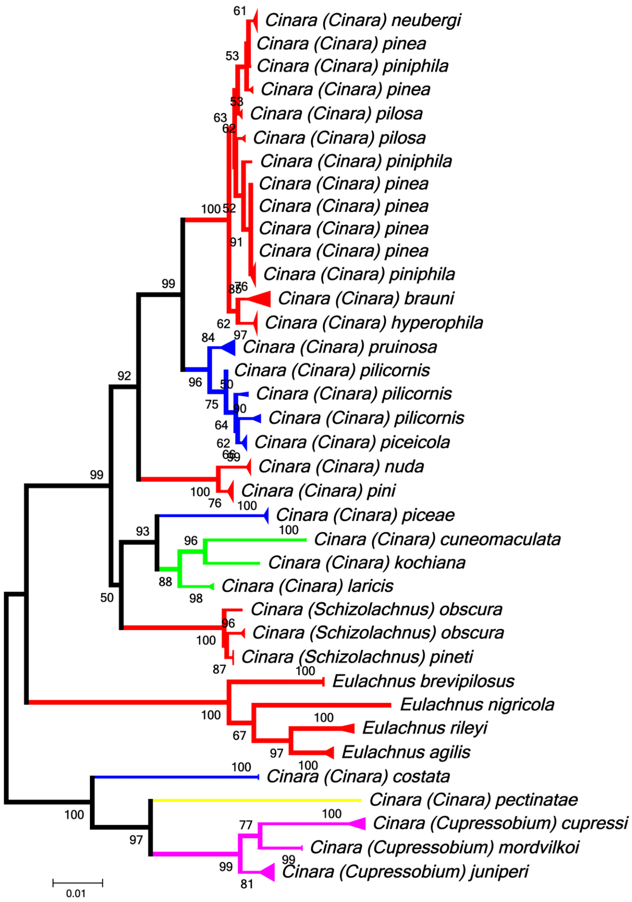

Fig. 5. Neighbour-joining (NJ) tree showing relationships among partial sequences of nuclear elongation factor 1 alpha (EF-1α) in samples of 26 species of aphids of the tribe Eulachnini collected in Lithuania. ■ – *Pinus*, ■ – *Abies*, ■ – *Larix*, ■ – *Picea*, ■ – Cupressaceae. See Fig. S2 for details.

Molecular diversity and taxonomy of species of Eulachnini in Lithuania

Average and range of within-species genetic diversity (p-distances) based on COI (668 bp) and EF-1α fragments (1017 bp) of 26 species of the tribe Eulachnini from Lithuania are given in Table 2. It is noteworthy, that this is the first record of the partial COI and EF-1α sequences of *C.* (*Cinara*) *hyperophila*, *C.* (*Cinara*) *pilosa* and *C.* (*Cinara*) *piceicola*. The values of average intraspecific p-distances for the COI fragment were higher than for EF-1α fragment and ranged from 0% to 1.68% and 0% to 0.58%, respectively. The number of haplotypes varied from 1 to 7 (for EF-1α) or 9 (for COI) (Table 2). Only one COI haplotype was detected in samples of *C.* (*Schizolachnus*) *obscura*. Identical EF-1α sequences were recorded in samples of *C.* (*Cinara*) *cuneomaculata* and *C.* (*Cinara*) *costata*. Samples of *C.* (*Cupressobium*) *mordvilkoi* and *E. brevipilosus* were represented by a single haplotype of each fragment. The proportion of differences (p-distances) between our Eulachnini samples are represented by the NJ trees based on both fragments (Figs 4–5). Average intrageneric p-distances were 4.73% (COI) and 2.58% (EF-1α) for the genus *Eulachnus*, and 7.69% (COI) and 5.48% (EF-1α) for the genus *Cinara*. Mean values of intergeneric p-distances were 11.71% for COI and 10.94% for EF-1α. Within each subgenus of the genus *Cinara* the average values of p-distances were: 7.00% (COI) and 3.62% (EF-1α) for the subgenus *Cinara*, 4.64% (COI) and 1.82% (EF-1α) for the subgenus *Cupressobium* and 0.51% (COI) and 0.34% (EF-1α) for the subgenus *Schizolachnus*. Mean values of p-distances were lowest between the subgenera *Cinara* and *Schizolachnus* and reached 7.40% for COI and 5.52% for EF-1α. Average p-distances between the subgenera *Cinara* and *Cupressobium* were 10.55% for COI and 10.95% for EF-1α. The values of mean p-distances between subgenera *Cupressobium* and *Schizolachnus* were 9.07% for COI and 11.43% for EF-1α.

Species delimitation based on COI and EF-1α sequences gave different numbers of candidate species. The Automatic Barcode Gap Discovery (ABGD) method generated 24 and 19 candidate species based on partial COI sequences and the coding part of the EF-1α fragment, respectively (Tables 3–4). General Mixed Yule Coalescent (GMYC) method resulted in 29 species based on COI fragment and

Table 3. Species delimitation based on COI fragment data using Automatic Barcode Gap Discovery (ABGD), General Mixed Yule Coalescent (GMYC) and Poisson Tree Processes (PTP). Species names are those of the morphospecies identified. For more details, see Table S2. Species names, where molecular species delimitation definitely contradict the morphospecies status, are in bold.

Morphospecies: 26 altogether	ABGD: 24	GMYC: 29	PTP BI: 34	PTP ML: 32
n = number of sequences used	N of candidate species: n of sequences per species			
Cinara (*Cinara*) *pectinatae* n = 1	1	1	1	1
Cinara* (*Cupressobium*) *juniperi n = 8	1	2: 3+5	3: 2+1+5	3: 2+1+5
Cinara (*Cupressobium*) *mordvilkoi* n = 3	1	1	1	1
Cinara (*Cupressobium*) *cupressi* n = 5	1	1	1	1
Cinara (*Cinara*) *kochiana* n = 1	1	3: 3+1+3	1	1
Cinara (*Cinara*) *laricis* n = 3	1		2: 2+1	2: 2+1
Cinara (*Cinara*) *cuneomaculata* n = 3			2: 1+2	2: 1+2
Cinara (*Cinara*) *costata* n = 3	1	1	2: 1+2	1
Cinara (*Cinara*) *piceae* n = 7	1	1	1	1
Cinara (*Cinara*) *piceicola* n = 7	1	1	1	1
Cinara (*Cinara*) *pilicornis* n = 7	1	1	1	1
Cinara (*Cinara*) *pruinosa* n = 8	1	1	1	1
Cinara (*Cinara*) *brauni* n = 7	1	1	1	
Cinara* (*Cinara*) *hyperophila n = 11	2: 10+1	2: 9+2	5: 7+1+1+1+1	5: 7+1+1+1+1
Cinara (*Cinara*) *neubergi* n = 10	1	1	1	1
Cinara (*Cinara*) *nuda* n = 7	1	1	1	1
Cinara (*Cinara*) *pilosa* n = 7	1	1	1	1
Cinara* (*Cinara*) *pinea n = 8	1	2: 4+8	1	1
Cinara* (*Cinara*) *piniphila n = 12				
Cinara (*Cinara*) *pini* n = 10	1	2: 6+4	1	1
Cinara (*Schizolachnus*) *obscura* n = 4	1	1	1	1
Cinara (*Schizolachnus*) *pineti* n = 6		1	1	
Eulachnus agilis n = 5	1	1	1	1
Eulachnus brevipilosus n = 5	1	1	1	1
Eulachnus nigricola n = 1	1	1	1	1
Eulachnus rileyi n = 4	1	1	1	1

Table 4. Species delimitation based on EF-1α fragment data using Automatic Barcode Gap Discovery (ABGD), General Mixed Yule Coalescent (GMYC) model and Poisson Tree Processes (PTP). Species names are those of the morphospecies identified. For more details, see Table S3. Species names, where molecular species delimitation definitely contradict the morphospecies status, are in bold.

Morphospecies: 26 altogether	ABGD: 19	GMYC: 32	PTP BI: 22	PTP ML: 20
n = number of sequences used	N of candidate species: n of sequences per species			
Cinara (*Cinara*) *pectinatae* n = 1	1	1	1	1
Cinara* (*Cupressobium*) *juniperi n = 9	4: 2+5+1+1	2: 4+4	1	1
Cinara (*Cupressobium*) *mordvilkoi* n = 3	1	1	1	1
Cinara (*Cupressobium*) *cupressi* n = 6	2: 1+1+4	1	2: 1+5	2: 1+5
Cinara (*Cinara*) *kochiana* n = 1	1	1	1	1
Cinara (*Cinara*) *cuneomaculata* n = 2	1	1	1	1
Cinara (*Cinara*) *laricis* n = 3	1	1	1	1
Cinara (*Cinara*) *costata* n = 3	1	1	1	1
Cinara (*Cinara*) *piceae* n = 7	1	1	2: 6+1	2: 6+1
Cinara (*Cinara*) *piceicola* n = 7	1	1	1	1
Cinara (*Cinara*) *pilicornis* n = 7		2: 4+3		
Cinara (*Cinara*) *pruinosa* n = 8		2: 3+5	2: 7+1	
Cinara (*Cinara*) *brauni* n = 8		2: 7+1	1	1
Cinara* (*Cinara*) *hyperophila n = 10		1		
Cinara (*Cinara*) *neubergi* n = 10		1		
Cinara (*Cinara*) *pilosa* n = 7		2: 4+3		
Cinara* (*Cinara*) *pinea n = 8		2: 5+15		
Cinara* (*Cinara*) *piniphila n = 13		1		
Cinara (*Cinara*) *nuda* n = 7		1	1	1
Cinara (*Cinara*) *pini* n = 10		1	1	1
Cinara (*Schizolachnus*) *obscura* n = 5	2: 1+4	1	1	1
Cinara (*Schizolachnus*) *pineti* n = 8	1	1		
Eulachnus agilis n = 5	1	1	1	1
Eulachnus rileyi n = 4		1	1	1
Eulachnus brevipilosus n = 5	1	1	1	1
Eulachnus nigricola n = 1	1	1	1	1

32 species on partial EF-1α sequences. Poisson Tree Processes (PTP) method generated 34 (BI) and 32 (ML) species for COI and 22 (BI) and 20 (ML) species for the EF-1α fragment. The best match with number of morphospecies (26 species) was from COI-based ABGD procedures (24 species). EF-1α fragment based species delimitation resulted in the highest mismatch with number of morphospecies: 19 candidate species in ABGD, 20(ML)/22 (BI) in PTP and 32 in GMYC. The three COI and EF-1α sequences for *C.* (*Cupressobium*) *mordvilkoi* were grouped as one candidate species by all delimitation methods. The same result emerged for *Eulachnus brevipilosus*. At least five out of eight delimitation analyses (COI and EF-1α data and four delimitation methods) coincided with the morphospecies *C.* (*Cupressobium*) *cupressi, C.* (*Cinara*) *costata, C.* (*Cinara*) *piceae, C.* (*Cinara*) *piceicola, C.* (*Cinara*) *neubergi, C.* (*Cinara*) *nuda, C.* (*Cinara*) *pini, Eulachnus agilis*, *E. nigricola* and *E. rileyi. C.* (*Cupressobium*) *juniperi* was identified as a complex of genospecies by five out of eight delimitation analyses. Sequences of the *C.* (*Cinara*) *pinea* and *C.* (*Cinara*) *piniphila* morphospecies were grouped as one genospecies by six out of eight delimitation analyses. *Cinara* (*Cinara*) *hyperophila* was grouped with several other species based on EF-1α data, but was separated from them when based on COI fragment analyses (Tables 3–4).

Based on the morphological, ecological and molecular data, four distinct groups of species of Eulachnini inhabit pines (*Pinus* spp.) in Lithuania: four species of the genus *Eulachnus*, two species of the subgenus *Schizolachnus* and two distinct groups of the subgenus *Cinara*. *C.* (*Cinara*) *piniphila, C.* (*Cinara*) *pinea, C.* (*Cinara*) *pilosa*, *C.* (*Cinara*) *neubergi*, *C.* (*Cinara*) *brauni* and *C.* (*Cinara*) *hyperophila*, are broad egg-shaped aphids, which mostly live sparsely on fresh shoots and 1–2 year-old twigs of *P. sylvestris*. Two other species, *C.* (*Cinara*) *nuda* and *C.* (*Cinara*) *pini*, are narrow and elongate, and usually form dense large colonies on stems and branches of *P. sylvestris*. They also appear separate on NJ trees (Figs 4–5). Three groups of *Cinara* species inhabit spruce (*Picea* spp.) in Lithuania. One group consists of three well-defined species, *C.* (*Cinara*) *piceicola*, *C.* (*Cinara*) *pilicornis* and *C.* (*Cinara*) *pruinosa*, which are common throughout Lithuania (Table 1). Remaining two clades of spruce inhabiting *Cinara* species are based on the sequences of two species (Figs 4–5). Sequences of *C.* (*Cinara*) *piceae* appeared to be closer to the larch (*Larix* spp.) dwelling *Cinara* species, *C.* (*Cinara*) *laricis*, *C.* (*Cinara*) *kochiana* and *C.* (*Cinara*) *cuneomaculata*, and *Pinus* inhabiting species of the subgenus *Schizolachnus*. Sequences of *C.* (*Cinara*) *costata* were closer to fir (*Abies* spp.) inhabiting *C.* (*Cinara*) *pectinatae* and species of the subgenus *Cupressobium*.

DISCUSSION AND CONCLUSIONS

The values of average intraspecific and interspecific p-distances for COI and EF-1α fragments recorded in this study coincide with previously published data (Kim & Lee, 2008; Bašilova & Rakauskas, 2012; Coeur d'Acier et al., 2014; Rakauskas et al., 2014; Chen et al., 2016a; Arnal et al., 2019). Consequently, the NJ trees based on partial sequences of both fragments coincide rather well with the morphospecies (Figs 4–5), as does the grouping of the COI sequences using Automatic Barcode Gap Discovery (ABGD) and General Mixed Yule Coalescent (GMYC) methods (Table 3). These analyses reveal the taxonomic similarity of *C.* (*Cinara*) *piniphila* and *C.* (*Cinara*) *pinea*. Their average between-species sequence divergences were 0.73% (0–1.88%) for COI and 0.44% (0–1.19%) for EF-1α, which is the lowest among the species pairs analysed in this study. Sequences of both species were intermixed forming a mutual clade on both NJ trees, despite the presence of introns in the partial sequences of EF-1α (Figs 4–5). Samples of *C.* (*Cinara*) *pinea* and *C.* (*Cinara*) *piniphila* were also intermixed or merged into one group by the PTP, GMYC and ABGD analyses (Tables 3–4). Such discrepancies between morphospecies and genospecies strongly supports the synonymy of both species and coincides with reference data (Chen et al., 2012; 2016b; Arnal et al., 2019). Actually, minor differences and overlapping values of some characters are presented in the identification keys for both species as well as the data on their morphology and feeding site, see Table 5. In addition, our data reveal that the number of hairs on antennal segment II is 10–13 for *C.* (*Cinara*) *piniphila* compared with 5–10 for *C.* (*Cinara*) *pinea*. Maximum length of the hair on the fifth abdominal tergite in our material was 108–191 µm for *C.* (*Cinara*) *pinea* and 26–70 µm for *C.* (*Cinara*) *piniphila*. Reference data also indicate subtle differences in the host plant preference of both species. *C.* (*Cinara*) *piniphila* prefers young pines growing in costal dunes attended by *Formica cinerea*, whilst *C.* (*Cinara*) *pinea* prefers open habitats: forest margins, clearings, rocks and dry meadows (Albrecht, 2017). The samples collected and monitoring data also

Table 5. Characters used in this study to discriminate between the apterous viviparous females of *C.* (*Cinara*) *pinea* and *C.* (*Cinara*) *piniphila* (after **Blackman & Eastop, 2019** and Albrecht, 2017).

Character	*C.* (*Cinara*) *pinea*	*C.* (*Cinara*) *piniphila*
Longest hair on the fifth abdominal tergite	**60–230 µm long, those on the largest scleroites usually exceed the diameter of a scleroite**	**70–80 µm, those on the largest scleroites do not or hardly exceed the diameter of these scleroites**
Hairs on abdominal dorsum	Longer than 0.1 mm	Not longer than 0.1 mm
Hairs on legs	More or less upright, on tibiae equal or longer than width of tibia	Oblique, on tibiae about half as long as width of tibia
Longest hairs on hind tibiae	**70–230 µm**	**60–90 µm**
No of hairs on antennal segment II	**5–10**	**Not specified**
Feeding site	Young shoots, terminal twigs, cone and flower bases. **New shoots.**	Young shoots and 1–2 year–old twigs. **Bark of 1- or 2-year-old twigs, among needles.**

indicates *C.* (*Cinara*) *piniphila* inhabits young pines (*P. sylvestris*, *P. mugo*) in costal and continental dunes, attended by *Formica cinerea*, whilst *C.* (*Cinara*) *pinea* inhabits the same species of pine, but older trees growing on more fertile soils, attended by other species of ants. Therefore, more data are needed, including a morphological analysis of all morphs based on clonal material originating from hypothesized species-specific environmental conditions: 1–2 years-old twigs of young pines growing on poor sandy soil (*C.* (*Cinara*) *piniphila*) versus shoots of mature plants (*C.* (*Cinara*) *pinea*). In particular, the morphological analysis of male genitalia might be of great importance in the case of Lachninae aphids due to previously unknown valuable peculiarities (Wieczorek et al., 2012).

Based on the samples from Lithuania, *C.* (*Schizolachnus*) *obscura* and *C.* (*Schizolachnus*) *pineti* seem to be problematic taxa. Both species formed separate well-supported clades on the NJ trees (Fig. 4), yet values of between-species p-distances between samples were low (average 0.81%, range 0.65–0.98% for COI; average 0.55%, range 0.43–0.75% for EF-1α). Morphological identification of the samples (based on Albrecht, 2017; Blackman & Eastop, 2019) coincide with the species delimitation results of GMYC (COI and EF-1α), PTP BI (COI) and ABGD (EF-1α) methods, but were mismatched by the others (Tables 3–4). Our data confirm the differences in host specificity of both species already reported by Albrecht (2017) and Blackman & Eastop (2019). Most of our samples of *C.* (*Schizolachnus*) *pineti* were from *Pinus sylvestris*, whereas those of *C.* (*Schizolachnus*) *obscura* were from the *P. nigra* group. Therefore, the taxonomic status of these species awaits a proper analysis as was recently suggested by Kaszyca-Taszakowska et al. (2019).

From the ecological viewpoint, pine-dwelling species of the subgenus *Cinara* co-exist in Lithuania by exploiting different species of pine or different microhabitats on the same host plant. This is reflected in our NJ trees based on COI and EF-1α fragments (Figs 4–5) and coincides with the Bayesian tree based on six gene fragments, including both aphid (COI, Cytb, Aph and EF-1α) and *Buchnera aphidicola* (GroEL and His) DNA sequences (Jousselin et al., 2013; Meseguer et al., 2015). The evidence that speciation of the Eulachnini was mostly host plant mediated is very strong. Nevertheless, one should not ignore the possible role of climatic niche, landscape history and geographic barriers (Jousselin et al., 2013; Meseguer et al., 2015; Arnal et al., 2019).

Our data provide information relevant to the discussion on the reliability of molecular markers and molecular species delimitation (Chen et al., 2012, 2016a, b; Jousselin et al., 2013; Arnal et al., 2019). Namely, our data indicate that most species are distinct in their ecological and morphological characteristics. Accepting that the "traditional" species delimitation is correct, the most reliable molecular species delimitation was that based on the Automatic Barcode Gap Discovery (ABGD) method and COI sequence data set. It correctly delimited 24 of the 26 morphospecies used in the present study (Table 3). It also confirmed the taxonomic uncertainty of the above-mentioned *C.* (*Cinara*) *piniphila* – *C.* (*Cinara*) *pinea* species complex. In addition, it confirmed that *C.* (*Schizolachnus*) *obscura* and *C.* (*Schizolachnus*) *pineti* are closely related taxa (see above for more details). In summary, it correctly identified all the material sampled. COI partial sequences were reliable also in combination with the General Mixed Yule Coalescent (GMYC) model (29 genospecies and 26 morphospecies, Table 3). In contrast, molecular species delimitation using EF-1α fragment analysis was least compatible with traditional taxonomy of all the methods used in this study (Table 4). Noticeably, the PTP method was most reliable when used with the EF-1α data matrix: it generated 20 (BI) and 21 (ML) candidate species against 26 morphospecies. In the case of the COI data it was 32 (ML) and 34 (BI) against 26 (Tables 3–4). In conclusion, niche analysis was the best way to delimit species. Morphological, molecular and other information is important, however, when diagnosing species already delimited on ecological grounds.

Currently the Lithuanian fauna of Eulachnini is rather poor compared with that of the southernmost Central European floristic province (27 species against 40 species in the Czech Republic, Slovakia and Austria). This is due to the poorer biodiversity of coniferous plants with only four conifers listed in the native flora of Lithuania: *Pinus sylvestris, Picea abies, Juniperus communis* and *Taxus baccata* Linnaeus 1753, the latter of which is a rare relict species (Ozolinčius et al., 2003). Currently, sixteen species of Eulachnini occur exclusively on native species of conifers in Lithuania (6 species) or mostly on native conifers (10 species, Table 1). Nine species of Eulachnini were recorded only on exotic species of conifers in Lithuania. Of the four samples of *Eulachnus rileyi*, three were collected from exotic species of pine and one from native *P. sylvestris*. Nevertheless, succession in plant communities due to global warming and increasing introductions of exotic plants (both natural and anthropogenic) might shortly enrich the Lithuanian fauna of Eulachnini. One of the possible exotic Lithuania newcomers is *C.* (*Cinara*) *curvipes* (Patch, 1912), a non-native species of Eulachnini of North American origin. The typical host plants of this species are *Abies balsamea* (Linnaeus) Miller 1768, *A. concolor* (Gordon & Glendinning) Lindley ex Hildebrand 1861, *A. grandis* (Douglas ex D. Don) Lindley 1833, *A. lasiocarpa* (Hooker) Nuttall 1849, *Picea engelmannii* Parry ex Engelmann 1863 and *P. glauca*, which are already in Lithuania. In addition, some native and exotic species of conifers in Europe, such as *Abies alba* Miller 1759, *A. koreana*, *A. nordmanniana* (Steven) Spach 1841 and *A. veitchii* Lindley 1861, are reported to be suitable for this aphid, and are also present in Lithuania. Finally, *C.* (*Cinara*) *curvipes* has already colonized most countries in the Central European floristic province south of Lithuania, including central Poland (Halaj & Osiadacz, 2015). The same is the case for *C.* (*Cupressobium*) *tujafilina* (Del Guercio, 1909), which is already in Poland and is reported producing sexual morphs important for spreading northwards. In addition, this species can overwinter on roots anholocyclically (Durak & Durak, 2015).

Boreomontaneous species of Eulachnini currently in mountainous regions in the southernmost territories of the Central European floristic province, are expected to spread into Lithuania. For example, *C.* (*Cinara*) *neubergi*, which occurs in mountainous regions in Europe (Blackman & Eastop, 2019) colonized Lithuania in 2017 (Danilov et al., 2019). Other possible candidates are the montaneous species *C.* (*Cinara*) *montanicola* Börner, 1939, *C.* (*Cinara*) *carnica* Binazzi, 1995 and *C.* (*Cinara*) *covassii* Binazzi, 1991 living on *Pinus mugo*, a species of conifer already in Lithuania and *C.* (*Cinara*) *cembrae* (Seitner, 1936), a boreomontaneous species living on *Pinus cembra* Linnaeus, 1753 in mountainous regions of Europe and in the St. Petersburg district of Russia (Blackman & Eastop, 2019). Some species of Eulachnini are expected to colonize Lithuania from the north. A good example is *C.* (*Cupressobium*) *smolandiae* Danielsson & Carter, 1993, which lives on *Juniperus communis* in Sweden (Danielsson & Carter, 1993) and is reported in Finland (Albrecht, 2017) and the Scottish Highlands (Baker & Blackman, 2014). In conclusion, seven additional species of the tribe Eulachnini are likely to shortly colonize both native and exotic coniferous plants in Lithuania.

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Unpaginated supplementary material follows (Tables S1–S3, Figs S1–S2).

Table S1. Aphid samples used in the molecular analysis.

Sample ID	Climatic region	County	Locality	Latitude	Longitude	Collection date	Host plant genus	Host plant species	Microhabitat	Aphid genus	Aphid subgenus	Aphid species	Author, year	DNA sample ID	COI haplotype	EF-1a haplotype	COI GB Accession	EF1a GB Accession
Da17-320	Coastal	Klaipėda	Klaipėda BG	N 55° 45' 4"	E 21° 8' 5"	24/06/2017	*Pinus*	*aff. nigra*	shoots, twigs	*Cinara*	*Cinara*	*brauni*	Börner, 1940	536	C-brauni-2	E-brauni-3	MH396419	MN192225
12HA03711	Coastal	Palanga	Palanga BG	no data	no data	19/08/2012	*Pinus*	*nigra*	shoots, twigs	*Cinara*	*Cinara*	*brauni*	Börner, 1941	555	C-brauni-3	E-brauni-2	MH396418	MN192226
Ra18-14	Samogitian	Kretinga	Salantai	N 56° 3' 31.9"	E 21° 34' 11.2"	16/07/2018	*Pinus*	*aff. nigra*	shoots	*Cinara*	*Cinara*	*brauni*	Börner, 1942	670	C-brauni-1	E-brauni-2	MN178356	MN192227
Da18-321	MidLith	Raseiniai	Raseiniai	N 55° 22' 39.9"	E 23° 7' 23.7"	08/07/2018	*Pinus*	*aff. nigra*	shoots, twigs	*Cinara*	*Cinara*	*brauni*	Börner, 1943	671	C-brauni-2	E-brauni-1	MN178357	MN192228
Ra 18-5	MidLith	Pakruojis	Pakruojis	N 55° 58' 53.23"	E 23° 50' 32.23"	11/07/2018	*Pinus*	*aff. nigra*	shoots	*Cinara*	*Cinara*	*brauni*	Börner, 1944	672	C-brauni-4	E-brauni-2	MN178358	MN192229
Da18-350	MidLith	Anykščiai	Anykščiai	N 55° 31' 33.2"	E 25° 6' 42.3"	18/07/2018	*Pinus*	*aff. nigra*	shoots, twigs	*Cinara*	*Cinara*	*brauni*	Börner, 1945	673	C-brauni-5	E-brauni-2	MN178359	MN192230
Da18-373	Southeast	Molėtai	Molėtai	N 55° 13' 42.1"	E 25° 24' 34.8"	18/07/2018	*Pinus*	*aff. nigra*	shoots, twigs	*Cinara*	*Cinara*	*brauni*	Börner, 1946	674	No data	E-brauni-2	No data	MN192231
Da18-298a	Southeast	Lazdijai	Lazdijai	N 54° 14' 7.9"	E 23° 30' 46.7"	23/06/2018	*Pinus*	*aff. nigra*	shoots, twigs	*Cinara*	*Cinara*	*brauni*	Börner, 1947	675	C-brauni-2	E-brauni-2	MN178360	MN192232
Da17-186b	MidLith	Panevėžys	Paliūniškis	N 55° 48' 55"	E 24° 27' 13"	08/06/2017	*Picea*	*abies*	twigs	*Cinara*	*Cinara*	*costata*	(Zetterstedt, 1928)	676	C-costata-2	E-costata-1	MN178361	MN192233
Da17-204	Samogitian	Mažeikiai	Gyvoliai	N 56° 11' 58"	E 22° 33' 8"	09/06/2017	*Picea*	*abies*	twigs	*Cinara*	*Cinara*	*costata*	(Zetterstedt, 1928)	677	C-costata-1	E-costata-1	MN178362	MN192234
Da17-384	Coastal	Klaipėda	Endriejavas	N 55° 42' 12.5"	E 21° 38' 7.4"	29/06/2017	*Picea*	*abies*	twigs	*Cinara*	*Cinara*	*costata*	(Zetterstedt, 1928)	678	C-costata-3	E-costata-1	MN178363	MN192235
Da16-357	MidLith	Prienai	Žydaviškis	N 54° 33' 12.8"	E 23° 53' 24"	01/09/2016	*Larix*	*decidua*	shoots, twigs	*Cinara*	*Cinara*	*cuneomaculata*	(del Guercio, 1909)	523	C-cuneomaculata-1	No data	MN178364	No data
Da18-270b	Coastal	Klaipėda	Klaipėda	N 55° 45' 3.3"	E 21° 8' 4"	15/06/2018	*Larix*	*kaempferi*	shoots, twigs	*Cinara*	*Cinara*	*cuneomaculata*	(del Guercio, 1909)	679	C-cuneomaculata-2	E-cuneomaculata-1	MN178365	MN192236
Da17-114	Southeast	Lazdijai	Kapčiamiestis	N 54° 0' 20.6"	E 23° 38' 13.6"	31/05/2017	*Larix*	sp.	shoots, twigs	*Cinara*	*Cinara*	*cuneomaculata*	(del Guercio, 1909)	681	C-cuneomaculata-3	E-cuneomaculata-1	MN178366	MN192237
Da16-072	Samogitian	Mažeikiai	Gyvoliai	N 56° 11' 57"	E 22° 33' 7"	11/06/2016	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	524	C-hyperophila-1	E-hyperophila-4	MN178372	MN192238
Da17-714	Coastal	Neringa	Juodkrantė	N 55° 30' 49.5"	E 21° 6' 42.9"	16/10/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	553	C-hyperophila-5	E-hyperophila-1	MN178373	MN192239
Da18-457	MidLith	Vilkaviškis	Gižai	N 54° 37' 21.6"	E 23° 12' 22.3"	05/10/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	682	C-hyperophila-5	E-hyperophila-2	MN178374	MN192240
Da17-189	MidLith	Panevėžys	Paliūniškis	N 55° 48' 56"	E 24° 27' 12"	08/06/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	683	C-hyperophila-6	E-hyperophila-2	MN178375	MN192241
Da17-082	Southeast	Švenčionys	Pabradė	N 54° 58' 55"	E 25° 48' 39"	25/05/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	684	C-hyperophila-7	E-hyperophila-3	MN178376	MN192242
Da17-386	Southeast	Elektrėnai	Pastrėvys	N 54° 43' 55"	E 24° 40' 1"	01/07/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	685	C-hyperophila-7	E-hyperophila-2	MN178377	MN192243
Da17-331	Coastal	Šilutė	Saugos	N 55° 28' 3"	E 21° 29' 22"	25/06/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	686	C-hyperophila-8	E-hyperophila-1	MN178378	MN192244
Da17-351	Coastal	Palanga	Šventoji	N 56° 1' 51"	E 21° 7' 10"	02/06/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	687	C-hyperophila-2	E-hyperophila-1	MN178379	MN192245
Da18-283	Samogitian	Plungė	Platakiai	N 56° 3' 17.6"	E 21° 56' 9.6"	19/06/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	688	C-hyperophila-9	No data	MN178380	No data
Da18-53	Southeast	Varėna	Puvočiai	N 54° 7' 6.7"	E 24° 18' 21.8"	17/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	689	C-hyperophila-3	E-hyperophila-1	MN178381	MN192246
Da18-57a	Southeast	Druskininkai	Leipalingis	N 54° 5' 9.1"	E 23° 53' 16.9"	18/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*hyperophila*	(Koch, 1855)	690	C-hyperophila-4	E-hyperophila-1	MN178382	MN192247
Da17-550	Southeast	Lazdijai	Kapčiamiestis	N 54° 0' 20"	E 23° 38' 9"	07/08/2017	*Larix*	*decidua*	Stem, branches	*Cinara*	*Cinara*	*kochiana*	(Börner, 1939)	548	C-kochiana-1	E-kochiana-1	MH396420	MN192248
Da17-684	Southeast	Lazdijai	Kapčiamiestis	N 54° 0' 20"	E 23° 38' 9.1"	28/09/2017	*Larix*	*decidua*	branches	*Cinara*	*Cinara*	*laricis*	(Hartig, 1839)	550	C-laricis-1	E-laricis-3	MH396421	MN192249
12HA03707	Coastal	Palanga	Palanga BG	no data	no data	16/08/2012	*Larix*	*decidua*	branches	*Cinara*	*Cinara*	*laricis*	(Hartig, 1839)	558	C-laricis-2	E-laricis-2	MH396422	MN192250
Da18-360a	Southeast	Zarasai	Zarasai	N 55° 43' 56.7"	E 26° 14' 43.3"	17/07/2018	*Larix*	sp.	shoots, twigs	*Cinara*	*Cinara*	*laricis*	(Hartig, 1839)	680	C-laricis-3	E-laricis-1	MN178391	MN192251

Da 17-311	MidLith	Kauno r.	Girionys DA	N 54° 51' 15"	E 24° 2' 45"	23/06/2017	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	604	C-neubergi-1	E-neubergi-2	MH396423	MN192252
Da 17-356A	Coastal	Klaipėdos m.	Smiltynė	N 55° 41' 3.1"	E 21° 7' 43.6"	27/06/2017	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	606	C-neubergi-1	E-neubergi-2	MH396424	MN192253
Da 17-436B	Southeast	Vilniaus m.	Kairėnai BG	N 54° 44' 5.2"	E 25° 24' 24.6"	07/07/2017	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	610	C-neubergi-1	E-neubergi-2	MH396425	MN192254
Da 17-515B	Coastal	Neringos	Juodkrantė	N 55° 32' 35.3"	E 21° 7' 20.7"	22/07/2017	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	613	C-neubergi-1	E-neubergi-2	MH396426	MN192255
Ra18-10	Samogitian	Plungė	Plateliai	N 56° 2' 49.47"	N 21° 49' 5.59"	14/07/2018	*Pinus*	sp.	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	669	C-neubergi-4	E-neubergi-4	MN178395	MN192256
Da18-363	MidLith	Rokiškis	Rokiškis	N 55° 56' 41.7"	E 25° 35' 4.9"	17/07/2018	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	691	C-neubergi-1	E-neubergi-1	MN178396	MN192257
Da18-372	Southeast	Molėtai	Molėtai	N 55° 13' 40.4"	E 25° 24' 34.8"	18/07/2018	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	692	C-neubergi-2	E-neubergi-3	MN178397	MN192258
Da18-301	Southeast	Lazdijai	Lazdijai	N 54° 14' 7.6"	E 23° 30' 49"	23/06/2018	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	693	C-neubergi-1	E-neubergi-2	MN178398	MN192259
Da18-292	Samogitian	Skuodas	Mosėdis	N 56° 9' 49.2"	E 21° 34' 22.5"	20/06/2018	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	694	C-neubergi-3	E-neubergi-2	MN178399	MN192260
Da18-293	Samogitian	Mažeikiai	Mažeikiai	N 56° 18' 50.8"	E 22° 20' 42.8"	20/06/2018	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*neubergi*	(Arnhart, 1930)	695	C-neubergi-1	E-neubergi-1	MN178400	MN192261
Da16-292	Coastal	Klaipėda	Klaipėda BG	N 55° 45' 4"	E 21° 8' 5"	14/06/2016	*Pinus*	*heldreichii*	stem, branches	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1895	525	No data	E-nuda-3	No data	MN192262
Da17-328	Coastal	Šilutė	Saugos	N 55° 28' 3.3"	E 21° 29' 22"	25/06/2017	*Pinus*	*sylvestris*	stem	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1896	696	C-nuda-3	E-nuda-1	MN178401	MN192263
Da18-55	Southeast	Varėna	Puvočiai	N 54° 7' 7.5"	E 24° 18' 16.7"	17/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1897	697	C-nuda-1	No data	MN178402	No data
Da17-425	Southeast	Lazdijai	Kapčiamiestis	N 54° 2' 24.4"	E 23° 31' 52.5"	06/07/2017	*Pinus*	*sylvestris*	stem	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1898	698	C-nuda-2	E-nuda-1	MN178403	MN192264
Da17-443	Southeast	Vilnius	Raudondvaris	N 54° 52' 43"	E 25° 31' 54"	07/07/2017	*Pinus*	*sylvestris*	stem	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1899	699	C-nuda-2	E-nuda-2	MN178404	MN192265
Da18-71	MidLith	Anykščiai	Andrioniškis	N 55° 35' 0.3"	E 25° 2' 15.9"	21/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1900	700	C-nuda-4	E-nuda-2	MN178405	MN192266
Da17-470	MidLith	Prienai	Prienlaukys	N 54° 35' 48"	E 23° 53' 24"	09/07/2017	*Pinus*	*sylvestris*	stem, branches	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1901	701	C-nuda-2	E-nuda-1	MN178406	MN192267
Da18-13	Southeast	Vilkaviškis	Žirgėnai	N 54° 25' 24.2"	E 22° 45' 25.1"	06/05/2018	*Pinus*	*sylvestris*	branches	*Cinara*	*Cinara*	*nuda*	Mordvilko, 1902	702	C-nuda-2	E-nuda-1	MN178407	MN192268
Da17-446	MidLith	Kaunas	VDU BG	N 54° 52' 12.2"	E 23° 54' 22.2"	08/07/2017	*Abies*	*koreana*	shoots	*Cinara*	*Cinara*	*pectinatae*	(Nördlinger, 1880)	543	C-pectinatae-1	E-pectinatae-1	MH396427	MN192269
Da16-358	MidLith	Prienai	Žydaviškis	N 54° 33' 33"	E 23° 53' 14"	01/09/2016	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	526	C-piceae-2	E-piceae-4	MH396434	MN192270
Da17-227	Coastal	Palanga	Būtingė	N 56° 7' 37"	E 21° 35' 25"	12/06/2017	*Picea*	*abies*	stem, branches	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	533	C-piceae-1	E-piceae-2	MH396431	MN192271
Da17-347	Coastal	Palanga	Šventoji	N 56° 1' 51"	E 21° 7' 10"	26/06/2017	*Picea*	*abies*	stem, branches	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	538	C-piceae-1	E-piceae-3	MH396430	MN192272
Da17-353	Coastal	Palanga	Birutės parkas	N 55° 54' 22"	E 21° 3' 28"	26/06/2017	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	540	C-piceae-1	E-piceae-2	MH396429	MN192273
Da17-445	MidLith	Kaunas	VDU BS	N 54° 52' 11.2"	E 23° 54' 16.8"	08/07/2017	*Picea*	*abies*	stem	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	542	C-piceae-1	E-piceae-3	MH396432	MN192274
Da17-715	Coastal	Klaipėda	Klaipėda BG	N 55° 45' 3.7"	E 21° 8' 5.7"	17/10/2017	*Picea*	*omorika*	twigs	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	554	C-piceae-3	E-piceae-2	MH396428	MN192275
Ra06-10a	Southeast	Vilnius	Skirgiškės	N 54° 50' 12.71"	E 25° 22' 11.98"	31/05/2006	*Taxus*	*baccata*	stem, branches	*Cinara*	*Cinara*	*piceae*	(Panzer, 1801)	599	C-piceae-1	E-piceae-1	MH396433	MN192276
Da16-034	Southeast	Visaginas	Visaginas	N 55° 34' 54"	E 26° 28' 40"	09/06/2016	*Picea*	*abies*	twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	521	C-piceicola-3	E-piceicola-4	MN178408	MN192277
Da17-076	Southeast	Vilnius	Raudondvaris	N 54° 52' 43.5"	E 25° 31' 51"	25/05/2017	*Picea*	*abies*	twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	703	C-piceicola-3	E-piceicola-3	MN178409	MN192278
Da17-091	Southeast	Utena	Šuminai	N 55° 23' 52.5"	E 26° 3' 40.2"	25/05/2017	*Picea*	*abies*	twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	704	C-piceicola-1	E-piceicola-2	MN178410	MN192279
Da17-159B	Southeast	Vilkaviškis	Pavištytis	N 54° 25' 33"	E 22° 46' 7"	05/06/2017	*Picea*	*abies*	shoots, twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	705	C-piceicola-3	E-piceicola-2	MN178411	MN192280
Da17-187	MidLith	Panevėžys	Paliūniškis	N 55° 48' 56"	E 24° 27' 12"	08/06/2017	*Picea*	*abies*	shoots, twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	706	C-piceicola-4	E-piceicola-2	MN178412	MN192281
Da17-214	Samogitian	Plungė	Platakiai	N 56° 2' 50.7"	E 21° 57' 42.2"	10/06/2017	*Picea*	*abies*	shoots, twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	707	C-piceicola-1	E-piceicola-2	MN178413	MN192282
Da17-322b	Coastal	Klaipėda	Klaipėda	N 55° 45' 5"	E 21° 8' 6"	24/06/2017	*Picea*	*monticena*	shoots, twigs	*Cinara*	*Cinara*	*piceicola*	(Cholodkovsky, 1896)	708	C-piceicola-2	E-piceicola-1	MN178414	MN192283

Da17-108	MidLith	Kaunas	Girionys	N 55° 51' 19"	E 24° 2' 47"	29/05/2017	*Picea*	*abies*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	566	C-pilicornis-1	E-pilicornis-5	MN178415	MN192288
Da17-440a	Southeast	Vilnius	Raudondvaris	N 54° 52' 44"	E 25° 31' 55"	07/07/2017	*Picea*	*abies*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	709	C-pilicornis-1	E-pilicornis-1	MN178416	MN192284
Da17-509a	Southeast	Utena	Minčia	N 55° 28' 30"	E 25° 58' 37"	20/07/2017	*Picea*	*abies*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	710	C-pilicornis-2	E-pilicornis-7	MN178417	MN192290
Da17-171	Southeast	Vilkaviškis	Pavištytis	N 54° 25' 33"	E 22° 46' 7"	05/06/2017	*Picea*	*abies*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	711	C-pilicornis-1	E-pilicornis-4	MN178418	MN192287
Da17-196	MidLith	Panevėžys	Paliūniškis	N 55° 50' 3"	E 24° 29' 41"	08/06/2017	*Picea*	*abies*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	712	C-pilicornis-3	E-pilicornis-3	MN178419	MN192286
Da17-322a	Coastal	Klaipėda	Klaipėda	N 55° 45' 5"	E 21° 8' 6"	24/06/2018	*Picea*	*monticena*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	713	C-pilicornis-4	E-pilicornis-6	MN178420	MN192289
Da17-549	Southeast	Lazdijai	Kapčiamiestis	N 54° 2' 24"	E 23° 31' 28.5"	07/08/2017	*Picea*	*abies*	shoots	*Cinara*	*Cinara*	*pilicornis*	(Hartig, 1841)	714	C-pilicornis-1	E-pilicornis-2	MN178421	MN192285
Da16-032	Southeast	Utena	Rūgšteliškis	N 55° 27' 43.7"	E 26° 0' 9.6"	09/06/2016	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	522	C-pilosa-1	E-pilosa-1	MN178422	MN192291
Da 17-485	Southeast	Vilkaviškis	Duonelaičiai	N 54° 29' 17.2"	E 22° 54' 20"	10/07/2017	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	611	C-pilosa-1	E-pilosa-4	MN178423	MN192292
Da 17-510	Southeast	Utena	Rūgšteliškis	N 55° 27' 43.7"	E 26° 0' 9.6"	21/07/2017	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	612	C-pilosa-2	E-pilosa-2	MN178424	MN192293
Da18-177	Southeast	Šalčininkai	Šalčininkėliai	N 54° 22' 11.1"	E 25° 22' 41.8"	05/06/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	715	C-pilosa-1	E-pilosa-3	MN178425	MN192294
Da18-202	MidLith	Jurbarkas	Jurbarkas	N 55° 4' 40.9"	E 22° 46' 36.1"	10/06/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	716	C-pilosa-1	E-pilosa-2	MN178426	MN192295
Da18-216	Coastal	Neringa	Nida	N 55° 18' 3.2"	E 21° 0' 16.4"	11/06/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	717	C-pilosa-1	E-pilosa-2	MN178427	MN192296
Da18-451	Southeast	Varėna	Musteika	N 53° 51' 15.7"	E 24° 19' 41"	27/09/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pilosa*	(Zetterstedt, 1840)	718	C-pilosa-1	E-pilosa-1	MN178428	MN192297
Da 17-339A	Coastal	Palanga	Paliepgiriai	N 55° 58' 45.4"	E 21° 6' 13.4"	26/06/2017	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	605	C-pinea-3	E-pinea-5	MN178431	MN192300
Da 17-374	Coastal	Neringa	Nida	N 55° 18' 3"	E 20° 39' 26"	28/06/2017	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	608	C-pinea-4	E-pinea-2	MN178432	MN192301
Da18-146	Southeast	Zarasai	Tolimėnai	N 55° 31' 24.2"	E 26° 3' 24.2"	29/05/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	719	C-pinea-5	E-pinea-2	MN178433	MN192302
Da18-169	MidLith	Marijampolė	Marijampolė	N 54° 33' 8.1"	E 23° 20' 43.1"	04/06/2018	*Pinus*	*mugo*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	720	C-pinea-6	E-pinea-4	MN178434	MN192303
Da17-199	MidLith	Biržai	Nemunėlio Radviliškis	N 56° 24' 38.2"	E 24° 48' 6.9"	09/06/2017	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	721	C-pinea-7	E-pinea-2	MN178435	MN192304
Da18-130	Samogitian	Plungė	Platakiai	N 56° 3' 15.7"	E 21° 56' 13.8"	27/05/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	722	C-pinea-8	E-pinea-1	MN178436	MN192305
Da17-212	Samogitian	Mažeikiai	Gyvoliai	N 56° 12' 24"	E 22° 33' 19"	09/06/2017	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	723	C-pinea-5	E-pinea-3	MN178437	MN192306
Da18-52	Southeast	Varėna	Puvočiai	N 54° 7' 6.7"	E 24° 18' 21.8"	17/05/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	724	C-pinea-5	E-pinea-2	MN178438	MN192307
Da18-309	Southeast	Lazdijai	Kapčiamiestis	N 54° 0' 20.3"	E 23° 38' 11"	05/07/2018	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pinea*	(Mordvilko, 1895)	725	C-pinea-6	E-pinea-1	MN178439	MN192308
Da16-016	Southeast	Vilnius	Raudondvaris	N 54° 52' 44"	E 25° 31' 59"	08/06/2016	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	529	C-pini-3	E-pini-4	MN178440	MN192309
Da16-251	Southeast	Druskininkai	Švendubrė	N 53° 58' 48"	E 23° 55' 46"	20/08/2016	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	568	C-pini-4	E-pini-1	MN178441	MN192310
Da18-139	Southeast	Visaginas	Visaginas	N 55° 34' 55.4"	E 26° 28' 38.8"	28/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	726	C-pini-5	E-pini-2	MN178442	MN192311
Da18-170	MidLith	Marijampolė	Marijampolė	N 54° 33' 9"	E 23° 20' 42.6"	04/06/2018	*Pinus*	*mugo*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	727	C-pini-2	E-pini-2	MN178443	MN192312
Da18-389	MidLith	Akmenė	Akmenė	N 56° 14' 44.7"	E 22° 44' 52.5"	24/07/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	728	C-pini-1	E-pini-2	MN178444	MN192313
Da17-208	Samogitian	Mažeikiai	Gyvoliai	N 56° 12' 24"	E 22° 33' 19"	09/06/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	729	C-pini-6	E-pini-2	MN178445	MN192314
Da17-329	Coastal	Šilutė	Saugos	N 55° 28' 3"	E 21° 29' 22"	25/06/2017	*Pinus*	*sylvestris*	shoots	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	730	C-pini-7	E-pini-3	MN178446	MN192315
Da17-345	Coastal	Palanga	Šventoji	N 56° 1' 51"	E 21° 7' 10"	26/06/2017	*Pinus*	*sylvestris*	twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	731	C-pini-8	E-pini-2	MN178447	MN192316
Da18-19	Southeast	Varėna	Puvočiai	N 54° 7' 7.2"	E 24° 18' 17"	07/05/2018	*Pinus*	*sylvestris*	twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	732	C-pini-9	E-pini-2	MN178448	MN192317
Da17-424	Southeast	Lazdijai	Kapčiamiestis	N 54° 2' 24"	E 23° 31' 52"	06/07/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*pini*	(Linnaeus, 1758)	733	C-pini-2	E-pini-1	MN178449	MN192318

Da16-101	Coastal	Neringa	Alksnynė	no data	no data	13/06/2016	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	530	No data	E-piniphila-2	No data	MN192319
Da17-698	Coastal	Neringa	Alksnynė	N 55° 38' 22.3"	E 21° 7' 22.3"	15/10/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	551	C-piniphila-2	E-piniphila-2	MK829820	MN192320
Da 17-307	Southeast	Varėna	Puvočiai	N 54° 7' 6"	E 24° 18' 20"	22/06/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	603	C-piniphila-4	E-piniphila-5	MK829821	MN192321
Da 17-361	Coastal	Neringa	Alksnynė	N 55° 40' 53.3"	E 21° 7' 10"	27/06/2017	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	607	C-piniphila-2	E-piniphila-5	MK829822	MN192322
Da 17-376	Coastal	Neringa	Nida	N 55° 19' 9"	E 21° 1' 16.5"	28/06/2017	*Pinus*	*mugo*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	609	C-piniphila-2	E-piniphila-5	MK829823	MN192323
Da 18-193	Southeast	Varėna	Puvočiai	N 54° 6' 52"	E 24° 18' 28.1"	08/06/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	734	C-piniphila-5	E-piniphila-5	MN178450	MN192324
Da18-454	Southeast	Varėna	Puvočiai	N 54° 7' 6.3"	E 24° 18' 20.2"	27/09/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	735	C-piniphila-1	E-piniphila-4	MN178451	MN192325
Da18-325	Coastal	Neringa	Alksnynė	N 55° 38' 4"	E 21° 6' 54.3"	09/07/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	736	C-piniphila-2	E-piniphila-3	MN178452	MN192326
Da18-436	Coastal	Neringa	Alksnynė	N 55° 38' 19.9"	E 21° 7' 3.7"	24/09/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	737	C-piniphila-2	E-piniphila-2	MK829824	MN192327
Da18-281	Samogitian	Plungė	Platakiai	N 56° 3' 17.8"	E 21° 56' 11.4"	19/06/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	738	C-piniphila-2	E-piniphila-2	MN178453	MN192328
Da18-134	Samogitian	Plungė	Platakiai	N 56° 3' 17.8"	E 21° 56' 11.4"	27/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	739	C-piniphila-2	E-piniphila-2	MK829825	MN192329
Da18-140	Southeast	Visaginas	Visaginas	N 55° 34' 54.5"	E 26° 28' 38"	28/05/2018	*Pinus*	*sylvestris*	shoots, twigs	*Cinara*	*Cinara*	*piniphila*	(Ratzeburg, 1844)	740	C-piniphila-3	E-piniphila-1	MN178454	MN192330
Da16-355	MidLith	Kaunas	Dubrava	N 54° 48' 12"	E 24° 6' 50"	01/09/2016	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	527	C-pruinosa-1	E-pruinosa-7	MN178455	MN192331
Da16-087	Samogitian	Plungė	Platakiai	N 56° 3' 18"	E 21° 56' 11"	12/06/2016	*Picea*	*abies*	branches, stem	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	531	C-pruinosa-2	E-pruinosa-5	MN178456	MN192332
Da17-84	Southeast	Švenčionys	Pabradė	N 54° 58' 36.4"	E 25° 55' 46.6"	25/05/2017	*Picea*	*abies*	twigs, branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	741	C-pruinosa-1	E-pruinosa-6	MN178457	MN192333
Da17-441b	Southeast	Vilnius	Raudondvaris	N 54° 52' 44"	E 25° 31' 55"	07/07/2017	*Picea*	*abies*	twigs, branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	742	C-pruinosa-1	E-pruinosa-5	MN178458	MN192334
Da17-172	Southeast	Vilkaviškis	Pavištytis	N 54° 25' 33"	E 22° 46' 7"	05/06/2017	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	743	C-pruinosa-1	E-pruinosa-4	MN178459	MN192335
Da17-215	Samogitian	Plungė	Platakiai	N 56° 2' 50.7"	E 21° 57' 42.2"	10/06/2017	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	744	C-pruinosa-3	E-pruinosa-3	MN178460	MN192336
Da17-355	Coastal	Palanga	Palanga	N 55° 54' 22"	E 21° 3' 28"	26/06/2017	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	745	C-pruinosa-1	E-pruinosa-2	MN178461	MN192337
Da17-369	Coastal	Neringa	Alksnynė	N 55° 37' 20.6"	E 21° 7' 13.2"	28/06/2017	*Picea*	*abies*	branches	*Cinara*	*Cinara*	*pruinosa*	(Hartig, 1841)	746	C-pruinosa-1	E-pruinosa-1	MN178462	MN192338
Da17-449	MidLith	Kaunas	VDU BS	N 54° 52' 11"	E 23° 54' 16"	08/07/2017	*Thuja*	*occidentalis*	twigs	*Cinara*	*Cupressobium*	*cupressi*	(Buckton, 1881)	544	No data	E-cupressi-2	No data	MN192192
17HA04527	MidLith	Kaunas	Girionys	no data	no data	29/05/2017	*Juniperus*	*virginiana*	shoots	*Cinara*	*Cupressobium*	*cupressi*	(Buckton, 1881)	563	C-cupressi-1	E-cupressi-3	MN178367	MN192193
17HA04521	MidLith	Kaunas	Girionys	no data	no data	29/05/2017	*Thuja*	*occidentalis*	shoots	*Cinara*	*Cupressobium*	*cupressi*	(Buckton, 1881)	564	C-cupressi-1	E-cupressi-2	MN178368	MN192194
Da17-232	Coastal	Klaipėda	Klaipėda	N 55° 45' 4"	E 21° 8' 5"	12/05/2017	*Thuja*	*occidentalis*	twigs	*Cinara*	*Cupressobium*	*cupressi*	(Buckton, 1881)	747	C-cupressi-1	E-cupressi-2	MN178369	MN192195
Da17-213	Samogitian	Skuodas	Ylakiai	N 56° 17' 48.7"	E 21° 53' 55.2"	10/06/2017	*Thuja*	*occidentalis*	twigs	*Cinara*	*Cupressobium*	*cupressi*	(Buckton, 1881)	748	C-cupressi-1	E-cupressi-2	MN178370	MN192196
Da17-298	Southeast	Vilnius	Kairėnai	N 54° 44' 5"	E 25° 24' 25"	22/06/2017	*Thuja*	*occidentalis*	twigs	*Cinara*	*Cupressobium*	*cupressi*	(Buckton, 1881)	749	C-cupressi-1	E-cupressi-1	MN178371	MN192197
Da16-078	Samogitian	Skuodas	Šaukliai	N 56° 7' 36.7"	E 21° 35' 25"	12/06/2016	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	520	C-juniperi-1	E-juniperi-2	MN178383	MN192201
17HA04522	MidLith	Kaunas	Girionys	no data	no data	29/05/2017	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	562	C-juniperi-2	E-juniperi-6	MN178384	MN192202
Da17-92	Southeast	Utena	Šuminai	N 55° 23' 52"	E 26° 3' 40"	25/05/2017	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	750	C-juniperi-8	E-juniperi-5	MN178385	MN192203
Da17-296	Southeast	Vilnius	Kairėnai	N 54° 44' 5"	E 25° 24' 25"	21/06/2017	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	751	C-juniperi-3	E-juniperi-4	MN178386	MN192204
Da17-197	MidLith	Biržai	Papilys	N 56° 7' 55.5"	E 25° 4' 5.5"	09/06/2017	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	752	No data	E-juniperi-3	No data	MN192205
Da17-30	Southeast	Lazdijai	Kapčiamiestis	N 54° 2' 48"	E 23° 31' 38.5"	18/05/2017	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	754	C-juniperi-4	E-juniperi-3	MN178387	MN192206
Da18-41	Southeast	Varėna	Musteika	N 53° 57' 41.2"	E 24° 22' 58"	17/05/2018	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	755	C-juniperi-5	E-juniperi-2	MN178388	MN192207

Da18-285	Samogitian	Skuodas	Šaukliai	N 56° 7' 36.7"	E 21° 35' 25"	20/06/2018	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	756	C-juniperi-6	E-juniperi-7	MN178389	MN192208
Da17-342	Coastal	Palanga	Šventoji	N 56° 1' 51"	E 21° 7' 10"	26/06/2017	*Juniperus*	*communis*	shoots	*Cinara*	*Cupressobium*	*juniperi*	(de Geer, 1773)	757	C-juniperi-7	E-juniperi-1	MN178390	MN192209
Da17-028	Southeast	Lazdijai	Ivoškai	N 54° 2' 47.3"	E 23° 31' 38.3"	18/05/2017	*Juniperus*	*communis*	branches, stem	*Cinara*	*Cupressobium*	*mordvlkoi*	(Pašek, 1954)	532	C-mordvilkoi-1	E-mordvilkoi-1	MN178392	MN192198
Da17-427	Southeast	Lazdijai	Ivoškai	N 54° 0' 45.4"	E 23° 30' 34.6"	06/07/2017	*Juniperus*	*communis*	root collar	*Cinara*	*Cupressobium*	*mordvlkoi*	(Pašek, 1954)	541	C-mordvilkoi-1	E-mordvilkoi-1	MN178393	MN192199
Da17-680 B	Southeast	Varėna	Margionys	N 53° 59' 34.9"	E 24° 16' 31.9"	28/09/2017	*Juniperus*	*communis*	twigs	*Cinara*	*Cupressobium*	*mordvlkoi*	(Pašek, 1954)	549	C-mordvilkoi-1	E-mordvilkoi-1	MN178394	MN192200
Da17-318	MidLith	Kaunas	Girionys	N 55° 51' 19"	E 24° 2' 47"	23/06/2017	*Pinus*	*nigra*	needles	*Cinara*	*Schizolachnus*	*obscura*	Börner, 1940	569	C-obscurus-1	E-obscurus-4	MN178474	MN192339
Da18-244	Coastal	Neringa	Pervalka	N 55° 24' 51.3"	E 21° 5' 40.2"	13/06/2018	*Pinus*	*aff. nigra*	needles	*Cinara*	*Schizolachnus*	*obscura*	Börner, 1941	759	C-obscurus-1	E-obscurus-2	MN178475	MN192340
Da18-258b	Coastal	Neringa	Juodkrantė	N 55° 32' 41"	E 21° 7' 18.6"	14/06/2018	*Pinus*	*Pinus nigra*	needles	*Cinara*	*Schizolachnus*	*obscura*	Börner, 1942	761	C-obscurus-1	E-obscurus-1	MN178476	MN192341
Da18-326	Coastal	Neringa	Alksnynė	N 55° 38' 4.6"	E 21° 6' 54.9"	09/07/2018	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*obscura*	Börner, 1943	769	No data	E-obscurus-5	No data	MN192342
Da18-254b	Coastal	Neringa	Juodkrantė	N 55° 31' 58.1"	E 21° 7' 8.2"	14/06/2018	*Pinus*	*aff. nigra*	needles	*Cinara*	*Schizolachnus*	*obscura*	Börner, 1944	775	C-obscurus-1	E-obscurus-3	MN178477	MN192343
Da17-457	Southeast	Elektrėnai	Geibonys	N 54° 45' 44.8"	E 24° 41' 27.5"	08/07/2017	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	570	C-pineti-4	E-pineti-1	MN178478	MN192344
Da17-74	Southeast	Vilnius	Raudondvaris	N 54° 52' 43"	E 25° 31' 51"	25/05/2017	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	762	No data	E-pineti-1	No data	MN192345
Da18-149a	Southeast	Utena	Rūgšteliškis	N 55° 27' 43.7"	E 26° 0' 9.6"	29/05/2018	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	763	No data	E-pineti-1	No data	MN192346
Da18-151	MidLith	Kalvarija	Jurgežeriai	N 54° 24' 54.4"	E 23° 9' 37.5"	31/05/2018	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	764	C-pineti-1	E-pineti-1	MN178479	MN192347
Da18-317b	MidLith	Kėdainiai	Skinderiškis	N 55° 18' 58.1"	E 23° 39' 11.7"	08/07/2018	*Pinus*	*mugo*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	765	C-pineti-1	E-pineti-1	MN178480	MN192348
Da17-301b	Southeast	Varėna	Musteika	N 53° 57' 40"	E 24° 21' 59"	22/06/2017	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	766	C-pineti-1	E-pineti-1	MN178481	MN192349
Da18-298b	Southeast	Lazdijai	Lazdijai	N 54° 14' 7.9"	E 23° 30' 46.7"	23/06/2018	*Pinus*	*aff. nigra*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	767	C-pineti-2	E-pineti-2	MN178482	MN192350
Da17-330	Coastal	Šilutė	Saugos	N 55° 28' 3"	E 21° 29' 22"	25/06/2017	*Pinus*	*sylvestris*	needles	*Cinara*	*Schizolachnus*	*pineti*	(Fabricius, 1781)	768	C-pineti-3	E-pineti-1	MN178483	MN192351
Da17-312	MidLith	Kaunas	Girionys	N 55° 51' 19"	E 24° 2' 47"	23/06/2017	*Pinus*	*sylvestris*	needles	*Eulachnus*		*agilis*	(Kaltenbach, 1843)	534	C-agilis-1	E-agilis-5	MN178463	MN192210
Da17-348	Coastal	Palanga	Šventoji	N 56° 1' 51"	E 21° 7' 10"	26/06/2017	*Pinus*	*sylvestris*	needles	*Eulachnus*		*agilis*	(Kaltenbach, 1843)	539	C-agilis-2	E-agilis-4	MN178464	MN192211
Da17-462	Southeast	Trakai	Aukštadvaris	N 54° 35' 19.4"	E 24° 31' 29.5"	09/07/2017	*Pinus*	*sylvestris*	needles	*Eulachnus*		*agilis*	(Kaltenbach, 1843)	545	C-agilis-3	E-agilis-3	MN178465	MN192212
12HA03889	Southeast	Molėtai	Kraujeliai	no data	no data	10/07/2012	*Pinus*	*sylvestris*	needles	*Eulachnus*		*agilis*	(Kaltenbach, 1843)	565	C-agilis-4	E-agilis-2	MN178466	MN192213
Da18-369b	Southeast	Molėtai	Molėtai	N 55° 13' 53"	E 25° 25' 10"	18/07/2018	*Pinus*	*mugo*	needles	*Eulachnus*		*agilis*	(Kaltenbach, 1843)	770	C-agilis-3	E-agilis-1	MN178467	MN192214
Da17-524	Coastal	Neringa	Alksnynė	N 55° 38' 11.3"	E 21° 7' 1.5"	22/07/2017	*Pinus*	*sylvestris*	needles	*Eulachnus*		*brevipilosus*	Börner, 1940	546	C-brevipilosus-1	E-brevipilosus-1	MH396417	MN192215
Da17-528 A	Coastal	Palanga	Būtingė	N 56° 4' 22.1"	E 21° 7' 19.6"	22/07/2017	*Pinus*	*sylvestris*	needles	*Eulachnus*		*brevipilosus*	Börner, 1941	547	C-brevipilosus-1	E-brevipilosus-1	MH396416	MN192216
Da17-710	Coastal	Neringa	Alksnynė	N 55° 38' 5"	E 21° 6' 57"	15/10/2017	*Pinus*	*sylvestris*	needles	*Eulachnus*		*brevipilosus*	Börner, 1942	552	C-brevipilosus-1	E-brevipilosus-1	MH396415	MN192217
Da18-359b	Southeast	Zarasai	Zarasai	N 55° 43' 58.8"	E 26° 14' 50.4"	17/07/2018	*Pinus*	*mugo*	needles	*Eulachnus*		*brevipilosus*	Börner, 1943	772	C-brevipilosus-1	E-brevipilosus-1	MN178468	MN192218
Da18-456b	MidLith	Vilkaviškis	Gižai	N 54° 37' 21.6"	E 23° 12' 22.1"	05/10/2018	*Pinus*	*sylvestris*	needles	*Eulachnus*		*brevipilosus*	Börner, 1944	773	C-brevipilosus-1	E-brevipilosus-1	MN178469	MN192219
Da17-324	Coastal	Klaipėda	Klaipėda BG	N 55° 45' 4"	E 21° 8' 5"	24/06/2017	*Pinus*	*heldreichii*	needles	*Eulachnus*		*nigricola*	(Pašek, 1953)	537	C-nigricola-1	E-nigricola-1	MH396414	MN192220
Da18-254	Coastal	Neringa	Juodkrantė	N 55° 31' 58.1"	E 21° 7' 8.2"	14/06/2018	*Pinus*	*aff. nigra*	needles	*Eulachnus*		*rileyi*	(Williams, 1911)	760	C-rileyi-1	E-rileyi-1	MN178470	MN192221
Da18-253b	Coastal	Neringa	Juodkrantė	N 55° 33' 25.5"	E 21° 6' 59.7"	14/06/2018	*Pinus*	*aff. nigra*	needles	*Eulachnus*		*rileyi*	(Williams, 1911)	774	C-rileyi-2	E-rileyi-3	MN178471	MN192222
Da18-458a	MidLith	Vilkaviškis	Gižai	N 54° 37' 21.7"	E 23° 12' 21.1"	05/10/2018	*Pinus*	*sylvestris*	needles	*Eulachnus*		*rileyi*	(Williams, 1911)	776	C-rileyi-3	E-rileyi-2	MN178472	MN192223
Da18-369c	Southeast	Molėtai	Molėtai	N 55° 13' 53"	E 25° 25' 10"	18/07/2018	*Pinus*	*mugo*	needles	*Eulachnus*		*rileyi*	(Williams, 1911)	777	C-rileyi-1	E-rileyi-1	MN178473	MN192224

Table S2. Species delimitation results using Automatic Barcode Gap Discovery (ABGD), General Mixed Yule Coalescent (GMYC) model and Poisson Tree Processes (PTP) methods based on COI fragment data. Species names are given in accordance with morphospecies identification results. DNA sample ID numbers are the same as in Table S1.

<table>
<tr><th>Morphology and ecology
based species identification</th><th>ABGD COI</th><th>GMYC COI</th><th>PTP COI BI</th></tr>
<tr><td>Cinara (Cinara) pectinatae
n=1</td><td>543</td><td>543</td><td>543</td></tr>
<tr><td rowspan="3">Cinara (Cupressobium) juniperi
n=8</td><td rowspan="3">520, 562, 750, 751, 754, 755, 756, 757</td><td>755, 562, 751</td><td>562, 751</td></tr>
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<tr><td>750, 754, 757, 520, 756</td></tr>
<tr><td>Cinara (Cupressobium) mordvilkoi
n=3</td><td>532, 541, 549</td><td>549, 532, 541</td><td>532, 541, 549</td></tr>
<tr><td>Cinara (Cupressobium) cupressi
n=5</td><td>563, 564, 747, 748, 749</td><td>749, 748, 747, 564, 563</td><td>563, 564, 747, 748, 749</td></tr>
<tr><td>Cinara (Cinara) kochiana
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548
C. (C.) laricis
550, 558</td><td>548</td></tr>
<tr><td rowspan="2">Cinara (Cinara) laricis
n=3</td><td rowspan="4">C. (C.) laricis
550, 558, 680
C. (C.) cuneomaculata
523, 679, 681</td><td>550, 558</td></tr>
<tr><td>680</td><td>680</td></tr>
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n=3</td><td rowspan="2">679, 523, 681</td><td>681</td></tr>
<tr><td>523, 679</td></tr>
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<tr><td>Cinara (Cinara) pruinosa
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n=7</td><td>536, 555, 670, 671, 672, 673,675</td><td>675, 673, 671, 672, 536, 555, 670</td><td>536, 555, 670, 671, 672, 673, 675</td></tr>
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<tr><td>Cinara (Cinara) nuda
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<tr><td>Cinara (Cinara) pilosa
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<tr><td rowspan="2">Cinara (Cinara) pinea
n=8</td><td rowspan="3">C. (C.) pinea
608, 720, 721, 722, 725, 719, 723, 724
C. (C.) piniphila
551, 603, 607, 609, 737, 739, 734, 735, 736, 738, 740, 605</td><td>C. (C.) pinea
608, 724, 723, 719</td><td rowspan="3">C. (C.) pinea
608, 721,719, 723, 724, 720, 722, 725
C. (C.) piniphila
551, 607, 609, 737, 739, 736, 738, 603, 605, 735, 734, 740</td></tr>
<tr><td rowspan="2">C. (C.) pinea
720, 721, 722, 725
C. (C.) piniphila
551, 603, 605, 607, 609, 734, 735, 736, 737, 738, 739, 740</td></tr>
<tr><td>Cinara (Cinara) piniphila
n=12</td></tr>
<tr><td rowspan="2">Cinara (Cinara) pini
n=10</td><td rowspan="2">529, 568, 726, 727, 728, 729, 730, 731, 732, 733</td><td>726, 529, 729, 732, 730, 568</td><td rowspan="2">726, 727, 728, 731, 733, 529, 729, 732, 568, 730</td></tr>
<tr><td>731, 733, 727, 728</td></tr>
<tr><td>Cinara (Schizolachnus) obscura
n=4</td><td rowspan="2">C. (S.) obscurus
569, 759, 761, 775
C. (S.) pineti
570, 764, 765, 766, 767, 768</td><td>761, 569, 775, 759</td><td>569, 759, 761, 775</td></tr>
<tr><td>Cinara (Schizolachnus) pineti
n=6</td><td>768, 764, 766, 765, 570I, 767</td><td>767, 570I, 764, 765, 766, 768</td></tr>
<tr><td>Eulachnus agilis
n=5</td><td>534, 539, 545, 565, 770</td><td>545, 534, 770, 565, 539</td><td>534, 539, 545, 565, 770</td></tr>
<tr><td>Eulachnus brevipilosus
n=5</td><td>546, 547, 552, 772, 773</td><td>546, 772, 552, 547, 773</td><td>546, 547, 552, 772, 773</td></tr>
<tr><td>Eulachnus nigricola
n=1</td><td>537</td><td>537</td><td>537</td></tr>
<tr><td>Eulachnus rileyi
n= 4</td><td>760, 774, 776, 777</td><td>774, 760, 777, 776</td><td>760, 774, 776, 777</td></tr>
</table>

Table S3. Species delimitation results using Automatic Barcode Gap Discovery (ABGD), General Mixed Yule Coalescent (GMYC) model and Poisson Tree Processes (PTP) methods based on EF-1α fragment data. Species names are given in accordance with morphospecies identification results. DNA sample ID numbers are the same as in Table S1.

<table>
<tr><th>Morphology and ecology
based species identification</th><th>ABGD EF-1α</th><th>GMYC EF-1α</th><th>PTP EF-1α BI</th></tr>
<tr><td>Cinara (Cinara) pectinatae
n=1</td><td>543</td><td>543</td><td>543</td></tr>
<tr><td rowspan="4">Cinara (Cupressobium) juniperi
n=8</td><td>562, 751</td><td>562, 752, 754, 756</td><td rowspan="2">562, 756, 752, 754, 750, 520, 755, 751, 757</td></tr>
<tr><td>752, 754, 750, 520, 755</td><td rowspan="3">750, 751, 757, 520</td></tr>
<tr><td>756</td><td></td></tr>
<tr><td>757</td><td></td></tr>
<tr><td>Cinara (Cupressobium) mordvilkoi
n=3</td><td>549, 541, 532</td><td>549, 541, 532</td><td>532, 541, 549</td></tr>
<tr><td rowspan="3">Cinara (Cupressobium) cupressi
n=6</td><td>749</td><td rowspan="3">748, 544, 749, 747, 564, 563</td><td rowspan="2">749</td></tr>
<tr><td>563</td></tr>
<tr><td>544, 564, 747, 748</td><td>544, 563, 564, 747, 748</td></tr>
<tr><td>Cinara (Cinara) kochiana
n=1</td><td>548</td><td>548</td><td>548</td></tr>
<tr><td>Cinara (Cinara) cuneomaculata
n=2</td><td>679, 681</td><td>679, 681</td><td>679, 681</td></tr>
<tr><td>Cinara (Cinara) laricis
n=3</td><td>550, 680, 558</td><td>550, 680, 558</td><td>550, 558, 680</td></tr>
<tr><td>Cinara (Cinara) costata
n=3</td><td>678, 676, 677</td><td>678, 676, 677</td><td>676, 677, 678</td></tr>
<tr><td rowspan="2">Cinara (Cinara) piceae
n=7</td><td rowspan="2">533, 540, 526, 554, 599, 542, 538</td><td rowspan="2">533, 540, 526, 554, 599, 542, 538</td><td>533, 540, 554, 538, 542, 599</td></tr>
<tr><td>526</td></tr>
<tr><td>Cinara (Cinara) piceicola
n=7</td><td rowspan="6">C. (C.) piceicola
521, 703, 704, 705, 706, 707, 708
C. (C.) pilicornis
709, 712, 714, 711, 713, 566, 710
C. (C.) pruinosa
527, 746, 745, 744, 741, 531, 742, 743
C. (C.) brauni</td><td>521, 707, 706, 705, 704, 703, 708</td><td rowspan="3">C. (C.) piceicola
521, 703, 704, 705, 706, 707, 708
C. (C.) pilicornis
709, 712, 714, 711, 713, 566, 710</td></tr>
<tr><td rowspan="2">Cinara (Cinara) pilicornis
n=7</td><td>709, 711, 714, 712</td></tr>
<tr><td>710, 713, 566</td></tr>
<tr><td rowspan="2">Cinara (Cinara) pruinosa
n=8</td><td>527, 746, 745</td><td>744, 745, 746, 741, 531, 742, 743</td></tr>
<tr><td>744, 741, 531, 742, 743</td><td>527</td></tr>
<tr><td>Cinara (Cinara) brauni</td><td>555, 674, 670, 675, 671, 673,</td><td>C. (C.) brauni</td></tr>
</table>

<table>
<tr><td rowspan="2">n=8</td><td rowspan="11">536, 555, 670, 671, 672, 673, 674, 675
C. (*C.*) *hyperophila*
553, 686, 687, 689, 690, 684, 524, 682, 683, 685
C. (*C.*) *neubergi*
604, 606, 610, 613, 669, 693, 694, 695, 691, 692
C. (*C.*) *pilosa*
612, 715, 716, 717, 522, 611, 718
C. (*C.*) *pinea*
720, 722, 723, 725, 608, 719, 721, 724
C. (*C.*) *piniphila*
736, 605, 530, 551, 737, 738, 739, 603, 607, 609, 734, 735, 740
C. (*C.*) *nuda*
525, 701, 700, 699, 696, 698, 702
C. (*C.*) *pini*
733, 529, 568, 730, 732, 728, 731, 727, 726, 729</td><td>672</td><td rowspan="9">536, 555, 670, 671, 672, 673, 674, 675
C. (*C.*) *hyperophila*
553, 686, 687, 689, 690, 684, 524, 682, 683, 685
C. (*C.*) *neubergi*
604, 606, 610, 613, 669, 693, 694, 695, 691, 692
C. (*C.*) *pilosa*
612, 715, 716, 717, 522, 611, 718
C. (*C.*) *pinea*
720, 722, 723, 725, 608, 719, 721, 724
C. (*C.*) *piniphila*
736, 605, 530, 551, 737, 738, 739, 603, 607, 609, 734, 735, 740</td></tr>
<tr><td>536</td></tr>
<tr><td>*Cinara* (*Cinara*) *hyperophila*
n=10</td><td>524, 682, 685, 683, 684, 553, 687, 690, 689, 686</td></tr>
<tr><td>*Cinara* (*Cinara*) *neubergi*
n=10</td><td>669, 610, 613, 604, 606, 694, 693, 695, 691, 692</td></tr>
<tr><td rowspan="2">*Cinara* (*Cinara*) *pilosa* n=7</td><td>717, 612, 716, 715</td></tr>
<tr><td>611, 718, 522</td></tr>
<tr><td rowspan="2">*Cinara* (*Cinara*) *pinea*
n=8</td><td>*Cinara* (*C.*) *pinea*
720, 723, 725, 722
C. (*C.*) *piniphila*
736</td></tr>
<tr><td>*Cinara* (*C.*) *pinea*
608, 719, 721, 724
C. (*C.*) *piniphila*
530, 551, 603, 607, 609, 734, 735,737, 738, 739, 740</td></tr>
<tr><td>*Cinara* (*Cinara*) *piniphila*
n=13</td><td>605</td></tr>
<tr><td>*Cinara* (*Cinara*) *nuda*
n=7</td><td>525, 701, 700, 699, 696, 698, 702</td><td>525, 696, 698, 701, 702, 699, 700</td></tr>
<tr><td>*Cinara* (*Cinara*) *pini*
n=10</td><td>733, 529, 568, 730, 732, 728, 731, 727, 726, 729</td><td>529, 568, 733, 726, 727, 728, 729, 730, 731, 732</td></tr>
<tr><td rowspan="2">*Cinara* (*Schizolachnus*) *obscura*
n=5</td><td>769</td><td rowspan="2">569, 775, 759, 761, 769</td><td rowspan="3">*C.* (*S.*) *obscurus*
769, 569, 759, 761, 775
C. (*S.*) *pineti*
570, 762, 763, 764, 765, 766, 767, 768</td></tr>
<tr><td>569, 775, 759, 761</td></tr>
<tr><td>*Cinara* (*Schizolachnus*) *pineti*
n=8</td><td>768, 570, 763, 766, 767, 764, 762, 765</td><td>768, 570, 763, 766, 767, 764, 762, 765</td></tr>
<tr><td>*Eulachnus agilis*
n=5</td><td rowspan="2">*Eulachnus agilis*
539, 545, 565, 534, 770
Eulachnus rileyi
776, 774, 760, 777</td><td>539, 545, 565, 534, 770</td><td>534, 565, 770, 539, 545</td></tr>
<tr><td>*Eulachnus rileyi*
n=4</td><td>776, 774, 760, 777</td><td>760, 774, 776, 777</td></tr>
<tr><td>*Eulachnus brevipilosus* n=5</td><td>552, 546, 772, 773, 547</td><td>552, 546, 772, 773, 547</td><td>552, 546, 547, 772, 773</td></tr>
<tr><td>*Eulachnus nigricola*
n=1</td><td>537</td><td>537</td><td>537</td></tr>
</table>

Fig. S1. Detailed Neighbour-joining (NJ) tree showing relationships among partial sequences of mitochondrial cytochrome oxidase subunit I (COI) in samples of 26 species of aphids of the tribe Eulachnini collected in Lithuania. Red – Pinus, yellow – Abies, green – Larix, blue – Picea, purple – Cupressaceae. DNA isolate ID, host plant and microhabitat for each sample is shown, see Table S1 for details.

Fig. S2. Detailed Neighbour-joining (NJ) tree showing relationships among partial sequences of nuclear elongation factor 1 alpha (EF-1α) in samples of 26 species of aphids of the tribe Eulachnini collected in Lithuania. Red – Pinus, yellow – Abies, green – Larix, blue – Picea, purple – Cupressaceae. DNA isolate ID, host plant and microhabitat for each sample is shown, see Table S1 for details.

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