

**The first Psyllid for Iceland: *Trioza anthrisci* Burckhardt, 1986,
and an update of the Icelandic Auchenorrhyncha fauna
(Insecta: Hemiptera)**

Roel van Klink¹

Summary: The Icelandic fauna of Auchenorrhyncha and Psylloidea was assessed at 14 locations in the south, west and north of the country in August 2013. In total, 1,556 individuals belonging to six species were recorded: *Javesella pellucida*, *Ribautiana ulmi*, *Edwardsiana rosae*, *Cicadula quadrinotata*, *Macrosteles laevis* and *Jassargus pseudocellaris*. *Edwardsiana rosae* and *R. ulmi* have only been found in Reykjavík, while the other species are all widespread and common on Iceland. Two further species known to occur on Iceland were not recorded: *Evacanthus interruptus* and *Philaenus spumarius*, which both have very restricted distributions. Additionally, with the finding of *Trioza anthrisci* Burckhardt (Hemiptera: Triozidae) the first psyllid species was recorded from Iceland. One female was found near the airport of the northern town of Akureyri. Some of this species' main host plants (*Angelica sylvestris* and the introduced *Anthriscus sylvestris*) are widespread in the coastal lowlands, but might not have been adequately sampled during earlier investigations. Because only one individual was found, and because of its proximity to an airport, the native status of the species for Iceland remains to be determined, but is not unlikely given its northern occurrence in Scandinavia.

Keywords: Psylloidea, Iceland, first record,

1. Introduction

Iceland is Europe's most isolated major landmass and is located just south of the polar circle. The Icelandic Auchenorrhyncha fauna is the poorest of all European countries, with only ten species reported in 150 years of recording (Endrestøl 2013a). A comprehensive history of the recording of Auchenorrhyncha on Iceland was presented by Endrestøl (2013a), and therefore only a short account is given here.

During the earliest investigations (Staudinger 1857; Lindroth 1931), only four species were found: *Javesella pellucida*, *Cicadula quadrinotata*, *Jassargus pseudocellaris* and *Macrosteles laevis*, the latter wrongly identified as *Macrosteles sexnotatus*, according to Ossiannilsson (1947). Later, several species were added by different authors: *Macrosteles sexnotatus* was placed back on the list by Nast (1972) based on the earlier misidentifications, *Ribautiana ulmi* was first mentioned by Ossiannilsson (1981), and *Philaenus spumarius* was added by Ólafsson (1991). Then a single specimen of *Toya propingua* was reported by Remane (2005), and *Evacanthus interruptus* was found for the first time in 2008 (Endrestøl 2013a). The latest addition to the Icelandic fauna was *Edwardsiana rosae*, found on *Rosa* spp. in the Reykjavík city centre in 2009 (Endrestøl 2013a). Of these ten species, only *M. sexnotatus* and *T. propingua* are not regarded as established (Endrestøl 2013a), and *P. spumarius*, *E. interruptus*, *R. ulmi*, and *E. rosae* are regarded as introduced species, due to their exclusively synanthropic occurrence.

¹ Corresponding author, e-mail: roel.klink@div.de

Regarding Psyllids, their practical absence until now is remarkable, although at least one unidentified species was mentioned in the checklist of Ólafsson (1991). In this paper I report the first Psyllid species recorded from Iceland, *Trioza anthrisci* Burckhardt, 1986, as well as new records for the Icelandic Auchenorrhyncha fauna.

2. Study area and Methods

Over a two-week period in August 2013, 14 locations in the southern, western and northern parts of Iceland were sampled for Auchenorrhyncha and Psylloidea (Fig. 1A). Methods used for catching were sweepnet, beating sheet and visual inspection of plants (Fig 2). All available plants, including trees and shrubs, which were mostly represented by *Betula* spp and *Salix* spp., were sampled extensively. All specimens are stored in the author's collection. Auchenorrhyncha were identified using Biedermann & Niedringhaus (2003) and Psyllids using Ossiannilsson (1992). All new records are presented here following the regions used by Endrestøl (2013a).

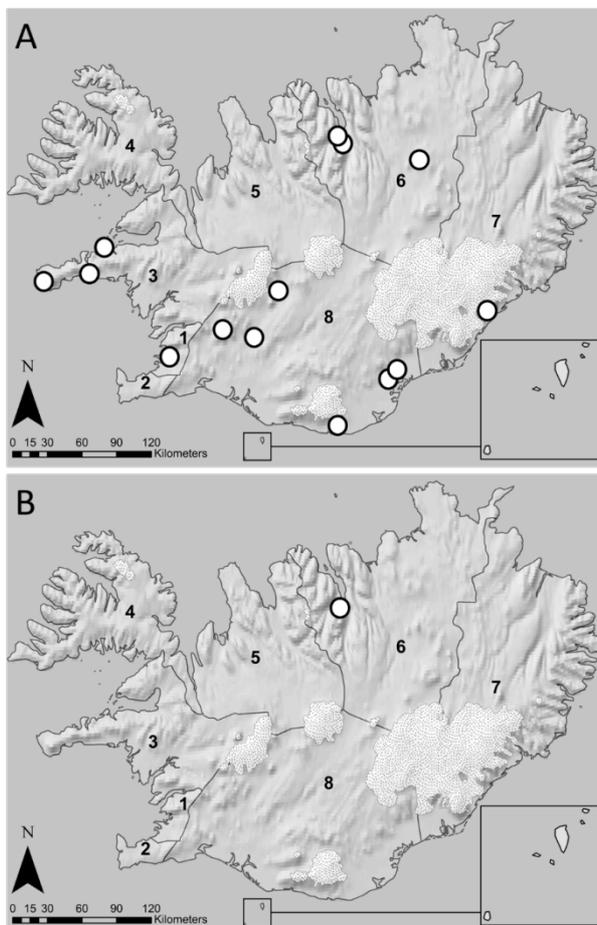


Fig. 1: (A) Locations on Iceland sampled for Auchenorrhyncha and Psylloidea between the 5th and 20th of August 2013; (B) locality of the first psyllid recorded for Iceland, *Trioza anthrisci* Burckhardt, near the town of Akureyri. Numbers correspond to the 8 regions of Iceland: 1 Höfuðborgarsvæði, 2 Suðurnes, 3 Vesturland, 4 Vestfirðir, 5 Norðurland vestra, 6 Norðurland eystra, 7 Austurland, 8 Suðurland. Map source: Natural Earth.



Fig. 2: The author sampling on mount Súlur, near the locality of *Trioza anthrisci*. In the background the town of Akureyri is visible. Photo: C. Rickert.

4. Results

A total of 1,556 individuals of Auchenorrhyncha were collected belonging to six species, and one psyllid individual was found. *Jassargus pseudocellaris* was the most abundant species, with 682 individuals, followed by *Macrosteles laevis* with 573 individuals.

4.1 Sternorrhyncha - Psylloidea

Trioziidae

Trioza anthrisci Burckhardt, 1986

Records: Norðurland eystra: Road verge close to the airport of Akureyri (65°40'36"N, 18°05'48"W), 15.viii.2013, 1♀ (Fig 1B).

Trioza anthrisci Burckhardt is the first Psyllid species reported for Iceland, although one unidentified Psyllid species was reported by Ólafsson (1991). The species feeds mainly on *Angelica sylvestris* which is native for Iceland, and the introduced *Anthriscus sylvestris*, but possibly also other Apiaceae (Burckhardt 1986). Both plant species are common and widespread in the coastal lowlands of Iceland (Kristinsson 2010).

Trioza anthrisci has been reported from many European countries: Sweden, Norway, Finland, Russia, Belarus, Ukraine, Poland, Germany, Czech republic, Slovakia, France, Switzerland, Austria, Slovenia, Italy, and Turkey (Ouvrard 2017). In Sweden and Finland *T. anthrisci* occurs up to 68° North (Ossiannilsson 1992), well above the most northern latitude of Iceland. The proximity of the airstrip of Akureyri to the locality of the first finding does raise the suspicion, however, that it concerns an anthropogenic introduction. More findings as well as the identification of the unidentified specimen listed by Ólafsson (1991) are required to find out whether this species is native or introduced.

4.2 Auchenorrhyncha

Delphacidae

Javesella pellucida (Fabricius, 1794)

Records: **Suðurland:** 50 km NE of Sellfoss (64°14'01"N, 20°19'57"W), 5.viii.2013, 1 ♀; Þingvellir (64°15'32"N, 21°07'21"W), 7.viii.2013, 1 ♀; **Vesturland:** Snæfellsbær (64°48'24"N, 23°06'40"W), 16.viii.2013, 1 ♀.

Javesella pellucida was found at three locations, each time represented by one brachypterous ♀. Although this species is one of the most common Auchenorrhyncha species of mainland Europe, it seems to be relatively scarce on Iceland (see also Endrestøl 2013a).

Cicadellidae

Ribautiana ulmi (Linnaeus, 1758)

Records: **Höfuðborgarsvæði:** Reykjavík city centre (64°08,22"N, 21°55'08"W), 19.viii.2013, 6 ♂♂, 17 ♀♀; (64°08'37"N, 21°56'30"W), 20.viii.2013, 8 ♂♂, 3 ♀♀.

Ribautiana ulmi was found in high numbers in the city centre of Reykjavík. All of the investigated ornamental elm trees (*Ulmus* spp.) were heavily infested and suction damage was severe (Fig. 3). *Ribautiana ulmi* is widespread and common in Europe, occurring in Norway at least until just south of the polar circle (Endrestøl 2013b).



Fig. 3: Severe suction damage (whitish dots) on an elm leaf in the Reykjavík city centre. The holes in the leaf are consistent with the damage caused by the elm leaf beetle *Xanthogaleruca luteola*, but this species has not yet been reported from Iceland. Photo R. v. Klink.

***Edwardsiana rosae* (Linnaeus, 1758)**

Records: Höfuðborgarsvæði: Reykjavík city centre (64°08'22"N, 21°55'08"W), 20.viii.2013, 1 ♂, 1 ♀, on *Salix caprea*. *Salix* is not one of the known host plants, but *E. rosae* has a facultative host shift, where the second generation of each year has a broader host range than the first generation, which only feeds on *Rosa* spp. Still, also the second generation is known to be confined to Rosaceae species as host plant. Although the number of generations on Iceland is at present unknown, it can be assumed that the specimens on *Salix* were vagrant individuals, possibly looking for adequate oviposition sites. *Rosa* were not sampled extensively during this trip, and no additional specimens were found.

Edwardsiana rosae is common and widespread in Europe, including Scandinavia (Ossiannilsson 1981), as far north as the polar circle (Endrestøl 2013b).

***Macrosteles laevis* (Ribaut, 1927)**

Records: Suðurland: 50 km NE of Sellfoss (64°14'01"N, 20°19'57"W), 5.viii.2013, 6 ♂♂, 24 ♀♀; Hvitárvatn (64°32'10"N, 19°47'02"W), 6.viii.2013, 9 ♂♂, 1 ♀, 1 nymph; Þingvellir (64°15'32"N, 21°07'21"W), 7.viii.2013, 2 ♂♂, 4 ♀♀, 1 nymph; 8.7 km NE Kirkjubæjarklaustur (63°50'35"N, 17°57'03"W), 10.viii.2013, 2 ♂♂, 1 ♀; 4 km NE Kirkjubæjarklaustur (63°48'47"N, 18°00'45"W), 10.viii.2013, 93 ♂♂, 100 ♀♀, 9 nymphs; Vik (63°24'35"N, 19°02'53"W), 11.viii.2013, 39 ♂♂, 68 ♀♀, 1 nymph; **Norðurland eystra:** Mývatn (65°37'N, 16°55'W), 12.viii.2013, 4 ♀♀; Mt Sútur (65°39'11"N, 18°10'19"W), 16.viii.2013, 129 ♂♂, 28 ♀♀, 21 nymphs; **Vesturland:** Snæfellsbær (64°48'24"N, 23°06'40"W), 16.viii.2013, 10 ♂♂, 11 ♀♀; Snæfellsness (64°46'48"N, 23°53'57"W), 17.viii.2013, 7 ♂♂, 4 ♀♀; Mt Horn (64°56'16"N, 22°54'40"W), 18.viii.2013, 5 ♂♂.

***Cicadula quadrinotata* (Fabricius, 1794)**

Records: Vesturland: Snæfellsbær (64°48'24"N, 23°06'40"W), 16.viii.2013, 75 ♂♂, 52 ♀♀, 35 nymphs; Mt Horn (64°56'16"N, 22°54'40"W), 18.viii.2013, 3 ♂♂; **Suðurland:** Þingvellir (64°15'32"N, 21°07'21"W), 7.viii.2013, 1 ♂, 50 km NE of Sellfoss (64°14'01"N, 20°19'57"W), 5.viii.2013, 1 ♂, 2 ♀♀; 4 km NE Kirkjubæjarklaustur (63°48'47"N, 18°00'45"W), 10.viii.2013, 40 ♂♂, 25 ♀♀, 3 nymphs; **Norðurland eystra:** Mývatn (65°37'N, 16°55'W), 12.viii.2013, 4 ♂♂, 1 nymph, Akureyri (65°40'36"N, 18°05'48"W), 15.viii.2013, 2 ♂♂, 5 ♀♀, 6 nymphs.

***Jassargus pseudocellaris* (Flor, 1861)**

Records: Suðurland: 50 km NE of Sellfoss (64°14'01"N, 20°19'57"W), 5.viii.2013, 4 ♂♂, 81 ♀♀; Þingvellir (64°15'32"N, 21°07'21"W), 7.viii.2013, 22 ♂♂, 28 ♀♀; 8.7 km NE Kirkjubæjarklaustur (63°50'35"N, 17°57'03"W), 10.viii.2013, 23 ♂♂, 16 ♀♀, 1 nymph; 4km NE Kirkjubæjarklaustur (63°48'47"N, 18°00'45"W), 10.viii.2013, 4 ♂♂, 3 ♀♀; Vik (63°24'35"N, 19°02'53"W), 11.viii.2013, 16 ♂♂, 23 ♀♀, 2 nymphs; **Austurland:** Jökulsárlón (64°00'31"N, 16°52'49"W), 9.viii.2013, 9 ♂♂, 9 ♀♀, 4 juv; **Norðurland eystra:** Mývatn (65°37'N, 16°55'), 12.viii.2013, 71 ♂♂, 73 ♀♀, 5 nymphs; Akureyri (65°40'36"N, 18°05'48"), 15.viii.2013, 64 ♂♂, 45 ♀♀, 1 juv; Mt Sútur (65°39'11"N, 18°10'19"W), 16.viii.2013, 9 ♂♂, 4 ♀♀, 57 juv.

Macrosteles laevis, *C. quadrinotata* and *J. pseudocellaris* are among the most common and widespread Auchenorrhyncha species in Europe (Jach & Hoch 2017). *Macrosteles laevis* and *C. quadrinotata* occur up to the northernmost parts of Scandinavia (Ossiannilsson 1983), while *J. pseudocellaris* is less widespread, occurring up to central Sweden (Ossiannilsson 1981).

5. Discussion

With *T. anthrisci* the Icelandic entomofauna has gained a new superfamily of insects, although its native status remains to be confirmed. The absence of psyllids so far has been notable and noticed (Koponen 1980), but no explanation has so far been proposed. As for the Auchenorrhyncha, several new localities were found for some species, but for none of the eight regions of Iceland new species were recorded. This can probably be attributed to an observer bias concentrated near the most important tourist attractions, such as Reykjavík (Höfuðborgarsvæði), the Geysir and the waterfalls of Gullfoss (Suðurland), lake Mývatn (Norðurland eystra; Fig 4), and the glacier lake Jökulsárlón (Austurland). By contrast, the regions Vestfirðir and Norðurland vestra in northwestern Iceland have been poorly sampled (see maps in Endrestøl 2013a), and were also not sampled during the present investigation (Fig 1A). Nevertheless, only two more species can be expected to occur in these regions: *J. pellucida* and *J. pseudocellaris*.

Four species previously reported from Iceland were not found during this trip: *Toya propinqua*, *Philaenus spumarius*, *Evacanthus interruptus*, and *Macrosteles sexnotatus*. *P. spumarius* and *E. interruptus* both have a very restricted distribution on Iceland (Endrestøl 2013a). *P. spumarius* has been found at three locations in the southwestern corner of Iceland, but may be spreading, and *E. interruptus* is only known from one locality in southern Iceland. Neither of these locations were sampled during this trip. *Toya propinqua* has been recorded only once, and should be considered a vagrant species (Remane 2005; Endrestøl 2013a), since in Europe it is confined to the south with northernmost records in southern Poland and southwestern Germany (Nast 1976; Nickel 2003). Old records of *M. sexnotatus* are probably all based on misidentifications (Óssiannilsson 1947), therefore the species should be removed from the species list of Iceland (Ólafsson 1991; Endrestøl 2013a), but was still included in the catalogue of Söderman (2009).

The poorly developed insect fauna of Iceland has been discussed on several occasions (most recently by Endrestøl 2013a), and has even been called a ‘problem’ (Lindroth 1931). Dispersal limitation, climatic adversity as well as human land use have been implicated, but no explanation has been offered.

Especially the absence of any Auchenorrhyncha or psyllid species living on the ubiquitous willow (*Salix* spp) shrubs and birch (*Betula pubescens*) trees is noteworthy, as was already stated by Koponen (1980). On mainland Europe, these are some of the most widely used plant genera by Auchenorrhyncha (Nickel 2003) and psyllids (Hodkinson & White 1979), with most, if not all, species having excellent flight capabilities. When Iceland was first settled in the ninth century, it was densely forested by birch, covering some 25-40 % of the land surface. However, deforestation for (fire)wood and pasture land caused a decline in forest extent, and it is estimated that in the mid 20th century, only 0.5-1 % of the land surface was covered by trees (Eysteinnsson 2017). It is possible that the tree-associated psyllids and Auchenorrhyncha that may have once occurred on Iceland were lost during this extensive deforestation phase, and have not (re-)colonized the island since. Since in Norway at least 93 species of Auchenorrhyncha occur at more northern locations than Iceland (Endrestøl 2013a), it is likely that experimental (re-)introduction would lead to successful establishment for many species.



Fig. 4: Sampling location at lake Mývatn in north-eastern Iceland. Photo C. Rickert.

6. Conclusions

The Auchenorrhyncha fauna of Iceland remains poor, but through repeated investigations by different authors the species list has grown steadily over the last decades. Although Iceland is Europe's most isolated landmass, the successful establishment of several species, probably following anthropogenic introductions, shows that dispersal limitation rather than climatic adversity is the most important cause of the low number of species. It is therefore likely that the species list of Iceland will continue to grow.

7. Zusammenfassung

Die erste Blattflohart für Island: *Trioza anthrisci* Burckhardt, 1986 und eine Fortschreibung der isländischen Zikadenfauna (Insecta: Hemiptera). – Die Zikaden- und Blattflohfauna von Island wurde im August 2013 an 14 Stellen im Süden, Westen und Norden des Landes aufgenommen. Insgesamt wurden 1.556 Individuen von folgenden sechs Zikadenarten erfasst: *Javesella pellucida*, *Ribautiana ulmi*, *Edwardsiana rosae*, *Cicadula quadrinotata*, *Macrosteles laevis* und *Jassargus pseudocellaris*. *E. rosae* and *R. ulmi* wurden nur in Reykjavík nachgewiesen, während die anderen Arten weit verbreitet in Island vorkamen. Zwei weitere für Island nachgewiesene Arten konnten nicht gefunden werden: *Evacanthus interruptus* und *Philaenus spumarius*, beide mit sehr eingeschränkter Verbreitung. Zudem konnte mit dem Fund von *Trioza anthrisci* Burckhardt (Hemiptera: Triozidae) die erste Psylliden-Art für Island nachgewiesen werden. Ein Weibchen wurde in der Nähe des Flughafens nördlich der Stadt Akureyri gefunden. Einige ihrer Nahrungspflanzenarten (*Angelica sylvestris* und der eingeführte *Anthriscus sylvestris*) sind in Küstenniederungen weit verbreitet, wurden aber bei früheren Untersuchungen möglicherweise nicht adäquat besammelt. Da nur ein Einzelexemplar gefunden wurde und wegen der Nähe zu einem Flughafen ist unsicher, ob die Art autochthon oder eingeschleppt. Wegen ihrer nördlichen Verbreitung in Skandinavien ist letzteres jedoch nicht unwahrscheinlich.

Acknowledgements

I thank Igor Malenovský for confirming the identity of *T. anthrisci*, Anders Endrestøl for providing the map of Iceland, and Corinna Rickert, and family van Klink for their patience.

8. References

- Biederman R., Niedringhaus R. (2003): Die Zikaden Deutschlands. W.A.B.V. Fründ, Scheeßel.
- Burckhardt D. (1986): Taxonomy and host plant relationships of the *Trioza apicalis* Förster complex (Hemiptera, Homoptera: Triozidae). *Insect Systematics & Evolution* 16: 415–432.
- Endrestøl A. (2013a): Contribution to the Icelandic fauna of Auchenorrhyncha (Hemiptera , Fulgoromorpha & Cicadomorpha). *Norwegian Journal of Entomology* 60: 95–107.
- Endrestøl A. (2013b): Et bidrag til Trænas insektfauna. *Insekt-Nytt* 38: 19–30.
- Eysteinnsson T. (2017): Forestry in a treeless land. Egilsstaðir, Iceland.
- Hodkinson I., White I. (1979): Homoptera Psylloidea. Handbooks for the Identification of British Insects vol II. 5a. Royal Entomological Society of London, London (Great Britain).
- Jach M., Hoch H. (2017): Fauna Europaea: Hemiptera, Cicadellidae. Fauna Europaea version 2017.06.
- Koponen S. (1980): Herbivorous insects of the birch in Iceland. *Annales Universitatis Turkuensis Series A II Biologica-Geographica-Geologica* 63: 7-12.
- Kristinnsson H. (2010): Flowering plants and ferns of Iceland. Mál og Menning, Reykjavík.
- Lindroth C.H. (1931): Die Insektenfauna Islands und ihre problem. *Zoologiska bidrag från Uppsala*. 13: 105–589.
- Nast J. (1972): Palaearctic Auchenorrhyncha (Homoptera). An annotated check list. Polish Scientific Publications, Warszawa.
- Nast J. (1976): Piewiki - Auchenorrhyncha (Cicadodea). Katalog Fauni Polski 25. Muzeum i Instytut Zoologii Polskiej Akademii Nauk, Warszawa.
- Nickel H. (2003): The leafhoppers and Planthoppers of Germany (Hemiptera: Auchenorrhyncha). Pensoft publishers, Sophia-Moscow.
- Ólafsson E. (1991): Íslenskt skordýratal. *Fjölrit Náttúrufræðistofnunar* 17.
- Ossiannilsson F. (1947): Om C.H. Lindroths isländska stritar. *Entomologisk Tidskrift* 68: 127–128.
- Ossiannilsson F. (1983): The Auchenorrhyncha (Homoptera) of Fennoscandia and Denmark. Part 3 The family Cicadellidae: Deltocephalinae. *Scandinavian Science Press Ltd., Copenhagen*.
- Ossiannilsson F. (1981): The Auchenorrhyncha (Homoptera) of Fennoscandia and Denmark Part 2: The Families Cicadidae, Cercopidae, Membracidae, and Cicadellidae (excl. Deltocephalinae). *Scandinavian Sciences Press Ltd., Klampenborg*.
- Ossiannilsson F. (1992): The Psylloidea (Homoptera) of Fennoscandia and Denmark. Brill, Leiden, New York, Köln.
- Ouvrard D. (2017): Psyl'list - The World Psylloidea Database.
- Remane R. (2005): Zur Zikadenfauna Islands, einer nur geologisch „alten“ Vulkaninsel: Analyse eines 2001 von Dr. M. v. Tschirnhaus gesammelten Materials (Insecta Rhyncota Auchenorrhyncha). *Marburger entomologische Publikationen* 3:111–123.
- Söderman G., Gillerfors G., Endrestøl A. (2009): An annotated catalogue of the Auchenorrhyncha of Northern Europe (Insecta, Hemiptera: Fulgoromorpha et Cicadomorpha). *Cicadina* 10:33–69.
- Staudinger O. (1857): Reise nach Island zu entomologischen Zwecken unternommen. *Entomologische Zeitung* 18:209–289.

Address of the author

Roel van Klink: GutsMuthsstraße 39, 04177 Leipzig, Germany.