

APHIDS AT DUNDREGGAN, SCOTLAND:

JULY 2015 SURVEY

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NOVEMBER 2015

INTRODUCTION

Trees for Life has an outstanding reputation for including the so-called 'neglected' invertebrate groups in their biodiversity surveys of the Dundreggan estate. One such neglected group is the aphids with over 600 species in Britain.

There are (at least) four important reasons why aphids really ought to be of conservation interest:

1. Many aphid species provide the main source of nutrition - honeydew - for ants. This is best documented for wood ants - which are recognised as a keystone species in the forest ecosystem.
2. Many more aphid species support a wide variety of insect and bird species, either as hosts of parasitoids, or as prey for predators. They are known to be the main source of food for young birds such as blue tits. Also many birds that normally eat seeds use aphids and caterpillars to feed growing young as these are high in protein, and often among the most readily available food sources early in the year.
3. Some species, no-one knows how many, may benefit their host plants by providing sugars (via their honeydew) to crucial root mycorrhizae.
4. The presence of uncommon species is a useful indicator of an ecosystem's biodiversity. Not all 'ancient' woodlands are the same - many only have common plants and insects - genuinely ancient woodlands are now extremely rare and fragmented.

Admittedly it is hard to get support for conserving what most people regarded as pests. Nevertheless, if we only conserve "cuddly, cute, or magnificent" species, whilst the rest become extinct, there won't be an ecosystem to support those cuddly species - or us.

The first survey of aphids together with their mutualists, predators and parasitoids was carried out by Baker (2012) and mainly focused on tree aphids. From 23 host plant species, of which 15 were trees and 8 herbaceous plants or shrubs, 38 aphid species were recorded. An additional 4 aphid species were recorded without host associations, giving a total of 42 aphid species. Tree dwelling aphids comprised 30 species, with the remainder feeding on herbaceous plants or shrubs. The most outstanding find was the aphid, *Cinara smolandiae* on juniper (*Juniperus communis*), which had never previously

been recorded in Britain. Other notable species were *Cinara nuda* on Scots pine (*Pinus sylvestris*), and *Rhopalosiphoninus calthae* on marsh marigold (*Caltha palustris*). From 7 tree-dwelling aphid species, 20 species of parasitoids were reared and from 2 herbaceous plant-dwelling aphid species, 3 species of parasitoids were reared. One of these parasitoids *Alloxysta vandenboschi* was new to Europe, whilst two parasitoids *Ephedrus helleni* and *Praon cavariellae* were new species to Britain.

A second aphid survey was carried out in July 2013 by the authors of this current report, with greater emphasis on aphids living on herbaceous plants or shrubs. That survey (Dransfield & Brightwell, 2013), recorded a further 20 aphid species new to Dundreggan, and 32 aphid species in total, from 24 host plant species of which 9 were trees and 15 herbaceous plants or shrubs. The most outstanding find was *Uroleucon pilosellae* on *Hieracium officinarum* (Mouse-ear hawkweed) (= *Pilosella officinarum*) which was the first observation of this aphid on its hostplant in Britain. Other notable species were *Dysaphis sorbi* on rowan (*Sorbus aucuparia*), *Myzocallis myricae* on bog myrtle (*Myrica gale*), *Uroleucon solidaginis* on goldenrod (*Solidago virgaurea*) and *Uroleucon campanulae* on harebell (*Campanula rotundifolia*). *Cinara smolandiae* was not found during this survey, nor by Alan Watson Featherstone during surveys prior to this nor subsequently.

The aims of the 2015 survey were:

- 1) Rediscover *Cinara smolandiae* and obtain more information on its distribution and habitat preference.
- 2) Focus on plants in bogs or other damp biotypes.
- 3) Focus on root aphids as revealed by the tenting activities of attending ants.
- 4) Identify members of the natural enemy / mutualist complex and provide insight into how the different members interact.
- 5) Highlight species complexes of conservation interest and make recommendations to ensure they are not unduly threatened by management practices on the estate.

METHODOLOGY

Sampling methods

The aim of the survey was to find new species of aphids and members of the predator / parasitoid / mutualist complex at Dundreggan. Sampling aphids along transects or within random quadrats tends to be both insensitive and ineffective for assessing species diversity. We instead used convenience / opportunistic sampling by hand to search the maximum number of suitable hosts. Efforts were concentrated upon herbs and shrubs rather than trees since the latter had been targeted previously.

Aphids are never distributed uniformly among their hosts. Search efforts must therefore be highly targeted, both in selecting areas to be searched and in selecting individual plants. Marginal habitats such as track-verges and rocky areas such as stream-bottoms are often the most profitable in that respect. Plants that appeared sickly, stunted, damaged, out-of-place or otherwise abnormal are given highest priority. Since searching large numbers of healthy plants is an inefficient use of resources, if an area was found to be unproductive search activity was curtailed and we moved to another area.

We did not use beating of vegetation to sample aphids nor did we use sweep nets. These methods have three major drawbacks when used to sample herbs and shrubs:

- a) It is very difficult to ensure that a sample is only taken from the particular plant species of interest. This then creates difficulties in identification of any aphids found.
- b) Aphid specimens are readily damaged by such methods.
- c) Colony structure cannot be observed, nor can the presence of parasitized aphid mummies.

We also did not use traps - specifically water traps, suction traps or Malaise traps. Traps can pick up some species which are not easily found on the host (e.g. moss aphids), but they are insensitive to species that produce few winged morphs, or are weak fliers. Perhaps more importantly, since their host-plant is unknown many species (especially in the genera *Aphis* and *Dysaphis*) cannot be identified to species level. Moreover observing an aphid in a trap does not mean that species occurs on a host-plant in the area being sampled. Some aphid species are transported considerable distances by air currents, but arrive in too poor a condition to establish a colony.

To improve search efficiency, by identifying species-rich search-areas, a list of 12 target host-plants was selected from the potential target species listed in Annex 2 & 3: *Betula nana*, *Betula pendula*, *Arctostaphylos uva-ursi*, *Alnus glutinosa*, *Eriophorum*, *Salix*, *Sorbus aucuparia*, *Carex*, *Populus tremula*, *Galium*, *Empetrum*, and *Vaccinium*. These host plants include rare species, species either characteristic or unique to that habitat, and species hosting aphid species not encountered in previous Dundreggan surveys. A number of common host species such as *Rosa*, not on the above 'target list' but also typical of the area were also targeted, but these were not used to prioritize search areas *a priori*.

Since many of the target host plants are widely distributed in Dundreggan, to improve search efficiency, species-rich areas were given priority. Each of the 275 'target note locations' listed in Appendix 3 of the Averis & Averis (2007) Dundreggan vegetation survey were weighted according to species present on our target host plant list. Areas with several of the most heavily-weighted target locations were tentatively identified as priority search areas - most of which were stream valleys. 1. Caochan na sgochrich 2. Red Burn next valley to west of it 3. Bhlaraidh stream 4. River Morrison valley.

Particular effort was invested in searching *Juniperus communis* for *Cinara smolandiae*. This species was first discovered in Britain at Dundreggan by Ed Baker in 2012. Dundreggan is so far the only location where this species has been found in UK and, despite repeated searches, it had not been observed at Dundreggan since its initial discovery. In Sweden *Cinara smolandiae* is

found in bark crevices or rust cankers 1-2 m above ground on stems of old (50-year plus) trees of *Juniperus communis*. Baker noted that unlike in Sweden, the specimens observed at Dundreggan fed on thin but lignified parts of terminal stems, with or without ant attendance. Hence previous searches by us in 2013 and others have concentrated on this particular niche. However, Baker himself comments that given the rostrum measurements of the Dundreggan specimens, it is very likely they also spend part of their lifecycle feeding on thicker stems. Hence this time we concentrated our search on older wood.

Whenever a colony of *Cinara smolandiae* was found, all neighbouring bushes of juniper were carefully searched. In addition the position and height of the colony was recorded, as was any evidence of past infection with juniper rust (*Gymnosporangium clavariiforme*). A small number of adult apterae were also collected from two of the colonies in an attempt to establish whether the Scottish specimens really are much smaller than the Swedish ones.

Identification

The same methods as reported in our previous survey were used for identification. When an aphid colony was found, the aphid and its host plant were tentatively identified to species (or genera), and their location recorded using a GPS. Additionally, the behaviour of any ants were recorded. The colony, its host plant, any ants or predators or parasitoids were photographed *in-situ*, then a live sample thereof was obtained. Under more controlled conditions the aphids were photographed to show taxonomic features of interest. If adults were present, a sample was transferred to alcohol (70% isopropyl alcohol) for later confirmation of identifications. If no adults were present, the immatures were reared to adult and then placed in alcohol.

The authors (RDD & RB) collected and identified most of the aphids primarily using the keys of Blackman & Eastop (1994, 2006). To confirm provisional identifications aphids were examined microscopically in alcohol, and key features measured.

We have also included reference to results of a previous survey by Edward Baker (EB). In that survey some aphid records were from collections by Alan Watson Featherstone (AWF) and specimens captured in Malaise traps set by Tony Hunter and Guy Knight from Liverpool Museum whilst studying the sawfly fauna at Dundreggan.

RESULTS

This survey recorded 14 aphid species new to Dundreggan, and 36 aphid species in total, from 25 host plant species of which 10 were trees and 15 herbaceous plants or shrubs (see Table 1). The most outstanding new aphid finds were *Ericaphis ericae* and *Aphis tormentillae*. Annex 1 at the end of this report gives a summary of field notes, GPS locations and identification details..

Table 1. CHECKLIST OF ALL APHIDS RECORDED AT DUNDREGGAN				
	2011/2012	2013	2015	Rarity
ADELGIDAE				
<i>Pineus pini</i> (Macquart)	Widespread on <i>Pinus</i>	-	Common on <i>Pinus</i> ; alates present	Common
<i>Adelges laricis</i> (Vallot)	-	Abundant on <i>Larix</i>	Common on <i>Larix</i>	Common
APHIDINAE				
<i>Acyrtosiphon boreale</i> Hille Ris Lambers			On <i>Potentilla palustris</i>	Uncommon
<i>Aphis armata</i> Hausmann	Few colonies	-	Few colonies	Common
<i>Aphis callunae</i> Theobald	Found on one <i>Calluna</i> plant but probably widespread	-		Rare under-recorded?
<i>Aphis cytisorum</i> Hartig	-	Locally common on <i>Cytisus</i>		Common
<i>Aphis fabae</i> ssp. <i>cirsiiacanthoidis</i> Scopoli	One location on <i>Cirsium</i>	Single <i>Cirsium</i> with colonising alate	Few colonies on <i>Cirsium</i>	Abundant
<i>Aphis farinosa</i> Gmelin			Several colonies on <i>Salix aurita</i>	Common
<i>Aphis hypochoeridis</i> (Börner)			Several colonies under ant tenting on	Uncommon

			<i>Hypochoeris</i>	
<i>Aphis tormentillae</i> Passerini			Widely distributed on <i>Potentilla erecta</i>	Rare under-recorded?
<i>Aphis ulicis</i> Walker	-	Locally common on <i>Ulex</i>		Common
<i>Aphis urticata</i> J. F. Gmelin	Found on <i>Urtica</i> in one location	-		Common
<i>Aulacorthum palustre</i> Hille Ris Lambers	Malaise trap (2011)	-		Uncommon
<i>Brachycaudus cardui</i> (Linnaeus)	-	Several colonies on <i>Senecio</i>	Colony on <i>Senecio</i>	Abundant
<i>Brachycaudus helichrysi</i> (Kaltenbach)			In mixed colony with <i>Hyperomyzus rhinanthi</i> in flower of <i>Rhinanthus minor</i>	Common
<i>Cavariella archangelicae</i> (Scopoli)	Malaise trap (2011)	-		Common
<i>Cavariella pastinacae</i> (Linnaeus)	-	Colony on <i>Heracleum</i>		Common
<i>Cavariella theobaldi</i> (Gillette & Bragg)	Common on <i>Salix aurita</i>	Common on <i>Salix</i> in nursery	Common on <i>Salix</i> in nursery	Common
<i>Chaetosiphon tetrarhodum</i> (Walker)			Present on <i>Rosa sheradii</i>	Common
<i>Corylobium avellanae</i> (Schränk)	On <i>Corylus</i> along Moriston River	-		Uncommon

<i>Cryptomyzus galeopsidis</i> (Kaltenbach)			On <i>Galeopsis tetrahit</i> in lodge garden	Common
<i>Dysaphis ranunculi</i> (Kaltenbach)			Gall on hawthorn	Uncommon
<i>Dysaphis sorbi</i> (Kaltenbach)	-	Occupied leaf nests found on two <i>Sorbus</i> trees	One colony on <i>Sorbus aucupariae</i>	Rare
<i>Ericaphis ericae</i> (Börner)			On <i>Erica tetralix</i> (cross-leaved heath)	Rare under-recorded?
<i>Hyperomyzus rhinanthi</i> (Schouteden)			Colonizing flowers of <i>Rhinanthus minor</i>	Uncommon
<i>Macrosiphoniella millefolii</i> (De Geer)	-	Widespread on <i>Achillea</i>		Common
<i>Macrosiphoniella tanacetaria</i> Kaltenbach	On <i>Tanacetum</i> in lodge garden	-	On <i>Tanacetum</i> in lodge garden	Common
<i>Macrosiphum euphorbiae</i> (Thomas)	-	Colonising alates on several plant species	Present on several plant species including <i>Galeopsis tetrahit</i>	Abundant
<i>Macrosiphum tinctum</i> (Walker)	-	Small colony on <i>Epilobium</i>		Uncommon
<i>Microlophium carnosum</i> (Buckton)	-	Found parasitized on <i>Urtica</i>		Common
<i>Myzaphis bucktoni</i> Jacob			Found on <i>Rosa caninum</i>	Uncommon

<i>Myzodium modestum</i> (Hottes)	Malaise trap (2011)	-		Uncommon
<i>Nasonovia compositellae</i> ssp <i>compositellae</i> Theobald			Colony found on <i>Hieracium pilosella</i>	Uncommon
<i>Nasonovia pilosellae</i> (Borner)			Several colonies found on <i>Hieracium pilosella</i>	Common
<i>Nasonovia ribisnigri</i> (Mosley)	Several colonies on <i>Hieracium (Pilosella) officinarum</i>	-		Common
<i>Pterocomma pilosum</i> Buckton			(Found prior to survey on <i>Salix aurita</i>)	Rare
<i>Pterocomma tremulae</i> Börner	On aspen trees growing close to <i>Formica lugubris</i> nests	On aspen trees growing close to <i>Formica lugubris</i> nests		Rare
<i>Rhopalosiphoninus calthae</i> (Koch)	On one plant of <i>Caltha</i> by Moriston River	-		Rare
<i>Rhopalosiphum oxyacanthae</i> (Schrank)	Found parasitized on Sorbus	-		Common
<i>Rhopalosiphum padi</i> (Linnaeus)	On <i>Prunus</i> (2011)	-		Common
<i>Sitobion fragariae</i> (Walker)			On flowering heads of <i>Juncus</i>	Common
<i>Uroleucon campanulae</i>	-	One colony on		Rare

(Kaltenbach)		<i>Campanula</i>		
<i>Uroleucon grossum</i> (Hille Ris Lambers)	-	Common on <i>Crepis</i> on waste ground		Common
<i>Uroleucon cirsii</i> (Linnaeus)	-	Several colonies on <i>Cirsium</i>		Common
<i>Uroleucon hypochoeridis</i> (Fabricius)	-	Common on <i>Leontodon autumnalis</i>	Present on <i>Hypochaeris radicata</i>	Common
<i>Uroleucon jaceae</i> (Linnaeus)	-	Several colonies on <i>Centaurea nigra</i>		Common
<i>Uroleucon leontodontis</i> (Hille Ris Lambers)	Several colonies on <i>Leontodon autumnalis</i>	-		Uncommon
<i>Uroleucon pilosellae</i> (Börner)	-	One colony on <i>Hieracium pilosella</i>		Very rare
<i>Uroleucon solidaginis</i> (Fabricius)	-	One colony on <i>Solidago</i>		Rare
<i>Wahlgreniella vaccinii</i> (Theobald)	Malaise trap	-		Uncommon
CALAPHIDINAE				
<i>Betulaphis quadrituberculata</i> Kaltenbach	Occasional on <i>Betula</i> across site	-	Occasional on <i>Betula</i> across site	Common
<i>Calaphis flava</i>	<i>Present</i> in small numbers on	<i>Present</i> in small numbers on		Common

(Mordvilko)	<i>Betula</i> young growth	<i>Betula</i> young growth		
<i>Calaphis betulicola</i> (Kaltenbach)	-	Present in large numbers on nursery plants	Present in large numbers on nursery plants	Uncommon
<i>Clethrobius comes</i> Walker	Occasional across site	-		Rare
<i>Euceraphis punctipennis</i> (Zetterstedt)	Common and ubiquitous on <i>Betula</i>	Generally uncommon on <i>Betula</i>	Present on <i>Betula</i>	Common
<i>Myzocallis coryli</i> (Goetze)	By river on <i>Corylus</i>	Occasional on <i>Corylus</i>		Common
<i>Myzocallis myricae</i> (Kaltenbach)	-	A few colonies on growing tips of <i>Myrica</i>		Rare
<i>Phyllaphis fagi</i> (Linnaeus)	On <i>Fagus</i> in compound	-		Common
<i>Pterocallis alni</i> (De Geer)	Occasional across site	-		Common
<i>Symydobius oblongus</i> (von Heyden)	Frequent on <i>Betula</i> in the main area of <i>Formica</i> nests	On <i>Betula</i> by roadside	On <i>Betula</i> in the several areas	Common
<i>Tuberculatus annulatus</i> (Hartig)	Ubiquitous on <i>Quercus</i>	-	Ubiquitous on <i>Quercus</i>	Abundant
CHAITOPHORINAE				
<i>Chaitophorus tremulae</i> Koch	Present on <i>Populus tremula</i> across the estate	-	(Recorded by Alan Watson Featherstone on <i>Populus</i>)	Uncommon

	in small numbers		<i>tremula</i>)	
<i>Periphyllus acericola</i> (Walker)	In lodge garden on <i>Acer</i>	-	In lodge garden on <i>Acer</i>	Common
<i>Periphyllus lyropictus</i> (Kessler)	In lodge garden on <i>Acer</i>	-		Common
<i>Periphyllus testudinaceus</i> (Ferne)	In lodge garden on <i>Acer</i>	-	In lodge garden on <i>Acer</i>	Common
DREPANOSIPHINAE				
<i>Drepanosiphum platanoidis</i> (Schrank)	In lodge garden on <i>Acer</i>	-		Common
ERIOSOMATINAE				
<i>Eriosoma ulmi</i> (Linnaeus)	On <i>Ulmus</i> in lodge garden	On <i>Ulmus</i> in lodge garden		Uncommon
<i>Thecabius affinis</i> (Kaltenbach)	-	On a single group of <i>Ranunculus flammula</i>	Again present on <i>Ranunculus flammula</i>	Uncommon
LACHNINAE				

<i>Cinara juniperi</i> De Geer	Ubiquitous and abundant on <i>Juniperus</i>	Occasional on a few <i>Juniperus</i>	Common on <i>Juniperus</i>	Uncommon
<i>Cinara nuda</i> (Mordvilko)	On mature <i>Pinus</i> in one site	-		Rare
<i>Cinara pinea</i> (Mordvilko)	Present on young <i>Pinus</i>	Present on young <i>Pinus</i>	Present on young <i>Pinus</i>	Common
<i>Cinara pini</i> (Linnaeus)	Present on young and mature <i>Pinus</i>	Present on young and mature <i>Pinus</i>		Uncommon
<i>Cinara smolandiae</i> Danielsson & Carter	On <i>Juniperus</i> in one site	-	On <i>Juniperus</i> in three sites	Very rare
<i>Eulachnus brevipilosus</i> Börner	On young <i>Pinus</i>	On young <i>Pinus</i>		Uncommon
<i>Schizolachnus pineti</i> (Fabricius)	Small colonies on most <i>Pinus</i>	-	Small colonies on <i>Pinus</i>	Common
PEMPHIGINAE				
<i>Pachypappa tremulae</i> (Linnaeus)	Nests on most <i>Populus tremula</i> trees	-		Uncommon
THELAXINAE				
<i>Thelaxes dryophila</i> (Schrank)	Found on one mature <i>Quercus</i>	-		Uncommon

Bold in table above indicates new to Dundreggan in 2015 survey. In the section below species previously found in 2013 are dealt with in summary form to avoid repetition.

Aphids found at Dundreggan in 2015 (arranged by plant family)

RANUNCULACEAE

Ranunculus flammula (Lesser spearwort)

Thecabius affinis (Poplar-buttercup gall aphid)

Thecabius affinis was again found feeding on the stems and seedheads of *Ranunculus flammula*. In life the aphids are usually densely covered with shiny wax spicules (see below).



Plate: 1. *Thecabius affinis* on *Ranunculus flammula*.



Plate: 2. Photomicrograph of *Thecabius affinis* aptera.

Unusually for an aphid, *Thecabius affinis* has no siphunculi as shown above.

This species normally host alternates between *Populus* spp. (its primary host) and *Ranunculus* spp. (its secondary host). In 2015 it was found in almost exactly the same location as in July 2013, supporting the suggestion that *Thecabius affinis* is maintaining itself throughout the year on *Ranunculus* as an anholocyclic population.

ACERACEAE

Acer platanoides (Norway Maple)

Periphyllus testudinaceus

Previously recorded in 2012, this species was observed colonizing on the young shoots of Norway maple.

Acer pseudoplatanus (Sycamore)

Periphyllus acericola

Previously recorded in 2012, this species was observed colonizing the young shoots of sycamore.

ROSACEAE

Crataegus monogyna (Hawthorn)

Dysaphis ranunculi (hawthorn-buttercup aphid) [new species to Dundreggan]

Large numbers of old galls of a *Dysaphis* species were found on Hawthorn growing in the lodge garden. Only one of these galls (see below) still had live aphids in it.



Plate: 3. Gall of *Dysaphis ranunculi* on *Crataegus monogyna*.

Dysaphis ranunculi is the only *Dysaphis* species which produces pale yellowish leaf galls (as above) rather than deep red galls on hawthorn. The offspring of the fundatrices develop to the spring migrant alatae. The image below shows two fourth instar spring migrant alatae in the gall.



Plate: 4. *Dysaphis ranunculi* alatiform nymphs in gall on *Crataegus monogyna*.



Plate: 5. Photomicrograph of *Dysaphis ranunculi* alate nymph.

The species is closely related to other hawthorn-feeding host-alternating species. Identification here was problematic as no specimens survived through to the adult alate stage. The curled leaf galls were yellowish-green, without the sharp demarcation line between red of gall and green of leaf lamina found in *Dysaphis crataegi*. This strongly points to *Dysaphis ranunculi*. However, the immature alatae are light green with wax spots, whilst Blackman describes developing alatae of *Dysaphis ranunculi* as brownish to grey. Despite this we are still inclined to identify these as *Dysaphis ranunculi* given the clear evidence of the yellowish-green galls. One hyperparasitoid (*Syrphophagus*) emerged from a mummy in the gall.



Plate: 6. Hyperparasitoid (*Syrphophagus*?) from *Dysaphis ranunculi* on *Crataegus monogyna*

Potentilla erecta (Common tormentil)

Aphis tormentillae (tormentil aphid) [new species to Dundreggan]

Aphis tormentillae is a small species which lives on *Potentilla erecta* (common tormentil). It can be recognised by its short, stout siphunculi and dark colour. It is very dark blackish green but appears black, and is not wax covered.



Plate: 7. *Aphis tormentillae* aptera and nymphs on *Potentilla erecta*.

The dorsal abdominal sclerotic pattern in apterae is confined to bands across tergites 7 & 8 and other small or rudimentary sclerites. The ratio of the siphuncular to caudal length ranges from 0.64 to 1.00. It is most closely related to *Aphis comari* (a species we have yet to find) which lives on the shoots or leaves of *Potentilla palustris*.



Plate: 8. Photomicrograph of *Aphis tormentillae* aptera.

Aphis tormentillae lives scattered, usually in very small numbers, on the leaf bases and in the flowers of tormentil.



Plate: 9. *Aphis tormentillae* alate, aptera and nymphs on *Potentilla erecta*.



Plate: 10. *Aphis tormentillae* on flower of *Potentilla erecta*.

The species is only recorded from a few parts of Britain. Stroyan (1984) comments it is probably overlooked because of the small size both of its individuals and populations. We found it to be widely distributed at Dundreggan with specimens found at three widely separated locations.

***Rosa canina* agg (Dog rose)**

***Macrosiphum rosae* (Common rose aphid)**

The parasitoid was *Aphidius rosae* was reared from mummies *Macrosiphum rosae* on rose.



Plate: 11. *Aphidius rosae* reared from *Macrosiphum* sp on *Rosa canina*.

Several hyperparasitoids were also reared from mummies on rose. They included *Dendrocerus carpenteri*, two females of which are shown below.



Plates: 12a & b. Female *Dendrocerus carpenteri* reared from *Macrosiphum* sp on *Rosa canina*

Two other hyperparasitoids were reared from mummies of *Macrosiphum* aphids on wild rose – *Asaphes* sp. and *Syrphophagus* sp. Efforts are being made to identify these to species level.

***Myzaphis bucktoni* (Brown-lined rose aphid) [new species to Dundreggan]**

A new aphid species for Dundreggan, *Myzaphis bucktoni*, was present in moderate numbers on dog rose (*Rosa canina* agg.). Apteræ are pale yellow to pale green with brown dorsal markings consisting of a brown head, two large brown patches on the pronotum and paired brown stripes extending from the mesothorax to the base of the cauda converging between the siphunculi. Like the other *Myzaphis* species, it is a small aphid with body length varying from 1.0-1.9 mm.



Plate: 13. *Myzaphis bucktoni* aptera on mid-rib of *Rosa canina*.



Plate: 14. Photomicrograph of *Myzaphis bucktoni* apterae.

The alate has rather weak abdominal pigmentation which is usually divided intersegmentally in the midline, with large marginal sclerites on abdominal tergites 2-4.



Plate: 15. *Myzaphis bucktoni* alate on *Rosa canina*.

Myzaphis bucktoni mainly occurs on wild roses (*Rosa canina* & *Rosa tomentosa*). The apterae feed dispersed along the mid-ribs of upper sides of the leaves.



Plate: 16. *Myzaphis bucktoni* aptera on mid-rib of *Rosa canina*.

One unusual feature of the *Myzaphis bucktoni* at Dundreggan was the great variability in size of the adult apterae. All the aphids in the picture below are adults, yet even in the same colony they were found to vary in size by a factor of 1.5 times.



Plate: 17. Photomicrograph of *Myzaphis bucktoni* apterae showing size variation.

***Rosa sheradii* (Northern downy rose)**

***Chaetosiphon tetrarhodum* (Hairy rose aphid) [new species to Dundreggan]**

This is another new species for Dundreggan. *Chaetosiphon tetrarhodum* adult apterae are pale green to yellow-green or occasionally reddish. The head is rather smooth with few if any spicules. The antennae are short, only 0.6-0.8 times the body length. The dorsal cuticle is densely covered with flat warts giving it a wrinkled appearance.



Plate: 18. *Chaetosiphon tetrarhodum* on *Rosa sheradii*.

Each abdominal segment bear 5 pairs of capitate hairs, clearly visible in the picture below. The siphunculi are 1.1 to 2.5 times longer than the cauda. The body length of *Chaetosiphon tetrarhodum* is 0.7-2.1 mm with the smallest individuals in mid-summer.



Plate:19. Photomicrograph of *Chaetosiphon tetrarhodum* showing capitate hairs.

Chaetosiphon tetrarhodum is found on various species of roses especially the Japanese rose (*Rosa rugosa*). In spring they can be found on the shoot tips, young leaves and developing flower. Later in the year they can be found singly or in small groups on the undersides of mature leaves. Sexual forms occur in autumn. The distribution of *Chaetosiphon tetrarhodum* is

worldwide.

Jaskiewicz (2003) found that their numbers varied over time with peak numbers in June.

Chaetosiphon tetrarhodum comprised 0.8-15.3% of the total number of aphids on roses. Kmiec (2007) sampled four varieties of rose on 28 occasions over 3 years, and calculated a constancy index for each of seven species of aphids as the percentage of occasions when the species was present. For *Rosa rugosa* it was present in about 70% of samples, higher than any other species for this type of rose. Barjadze *et al.* (2010) reported the aphid parasitoid *Aphidius eglanteriae* attacking *Chaetosiphon tetrarhodum*, with a parasitism rate of 0-4%. Tomanovic *et al.* (2009) records *Ephedrus laevicolis* as a parasitoid of this species.



Plate: 20. *Chaetosiphon tetrarhodum* being attacked by *Aphidoletes* larva.

Despite the abundance of empty mummies of *Macrosiphum rosae*, there were no mummies of *Chaetosiphon* present on the rose bush. They were however being attacked by midge larvae, most likely *Aphidoletes*.

Sorbus aucuparia (Rowan, Mountain ash)

***Dysaphis sorbi* (Rowan aphid)**

This species was first found in Dundreggan in 2013 and is clearly fairly widespread wherever there are rowan trees. We only found one colony in 2015 which was still quite small. In life the apterae are reddish-brown to dark green.



Plate: 21. *Dysaphis sorbi* aptera and nymphs on *Sorbus aucuparia*.



Plate: 22. Photomicrograph of *Dysaphis sorbi* aptera.

The pale yellowish siphunculi are cylindrical and slender. *Dysaphis sorbi* is facultatively host alternating, with rowan (*Sorbus aucuparia*) as its primary host and bellflowers (*Campanula*) as its secondary host. Winged females are not produced till June and colonies may be found on rowan all year.

ASTERACEAE

Hieracium officinarum (Mouse-ear hawkweed) (= *Pilosella officinarum*)

Nasonovia compositellae ssp. *compositellae* [new species to Dundreggan]

The apterae have an extensive shining black dorsal abdominal shield. The body is dark green, often (as here) strongly tinged with orange-red.



Plate: 23. *Nasonovia compositellae* ssp *compositellae* aptera on *Hieracium pilosella*.



Plate: 24. Micrograph of *Nasonovia compositellae* ssp *compositellae* aptera.

The terminal process of the antenna is from 3.3 to 6.7 times longer than the base of antennal segment VI.

Nasonovia compositellae sensu stricto is found in the north and west of England and in Wales, Scotland and Ireland. Outside Britain it is only known from Norway and Iceland, so it is a true northern subspecies. Both Blackman and Heie indicate it may be found on any *Hieracium* species, but Blackman states that most British records so far come from another *Hieracium* species, *Hieracium exotericum*.



Plate: 25. *Nasonovia compositellae* ssp *compositellae* nymphs on *Hieracium pilosella*.



Plate: 26. *Nasonovia compositellae* ssp *compositellae* aptera on flower of *Hieracium pilosella*

The parasitoid *Aphidius hieraciorum* was reared from mummified *Nasonovia compositellae*, the first record for this species in Scotland



Plates: 27a & b. *Aphidius hieraciorum* reared from *Nasonovia compositellae*

***Nasonovia pilosellae* (Hawkweed aphid) [new species to Dundreggan]**

Nasonovia pilosellae are medium-sized yellowish-green rather shiny aphids, with a well-marked dorsal sclerotic pattern of pigmented paired intersegmental muscle plates.



Plate: 28. *Nasonovia pilosellae* aptera on *Hieracium pilosella*.

Their siphunculi are cylindrical and rather long, with little or no apical reticulation. The cauda of

Nasonovia pilosellae is elongate and rather blunt finger-shaped. The secondary rhinaria on the third antennal segment are spread out along one side of the segment. This distinguishes the species from *Nasonovia ribisnigri* which has the secondary rhinaria concentrated on the basal part of the segment. The first segment of the hind tarsus has two hairs. The ratio of the length of the terminal process of the last antennal segment to its base ranges from 5.7-8.0.



Plate: 29. Micrograph of *Nasonovia pilosellae* aptera.

The hawkweed aphid host alternates from currants (*Ribes* spp.) to a few related species of hawkweed, including the mouse-ear hawkweed (*Hieracium pilosella*). The species was parasitized by *Aphidius hieraciorum* and *Monoctonus crepidis*.



Plate: 30. Heavily parasitized colony of *Nasonovia pilosellae* on *Hieracium pilosella*.



Plates: 31a & b. *Aphidius hieraciorum* attacking *Nasonovia pilosellae* on *Hieracium pilosella*



Plate32 . *Monoctonus crepidis* reared from *Nasonovia pilosellae* on *Hieracium pilosella*

***Hypochoeris radicata* (Cat's ear)**

***Aphis hypochoeridis* (Cat's ear root aphid) [new species to Dundreggan]**

Apterae of *Aphis hypochoeridis* are bright yellow to pale greenish yellow. The abdominal dorsum is entirely pale (see first picture below) or with dusky bands across tergites 7-8 only. The siphunculi are dark.



Plate: 33. *Aphis hypochoeridis* on basal collar of *Hypochoeris radicata*.

They are 3.5-7.1 times their midlength diameters, and 0.9 to 1.6 times the length of the elongated pale or dusky finger-shaped cauda. The body length of *Aphis hypochoeridis* is 0.7-1.6 mm.



Plate: 34. *Aphis hypochoeridis* on basal collar of *Hypochoeris radicata*.

The cat's-ear root aphid lives on the root collar, the underside of radical leaves and up the lower part of the stem of *Hypochoeris radicata* (cat's ear). *Aphis hypochoeridis* do not host alternate. They have a sexual stage in the life cycle with oviparae and males appearing in autumn. Their colonies were 'tented over' with soil particles by *Myrmica ruginodis* and/or *Lasius niger* ants (see below). *Aphis hypochoeridis* is widely distributed in Britain and throughout Europe.

***Uroleucon hypochoeridis* (Large cat's ear aphid)**

Several plants had colonies of the aphid *Uroleucon hypochoeridis* on the upper parts of the flower stem. In life *Uroleucon hypochoeridis* apterae are brown or reddish brown with black antennae and siphunculi. Their body length is 2.8 to 4.4 mm.



Plate: 35. *Uroleucon hypochoeridis* on flower stem of *Hypochoeris radicata*.



Plate: 36. Photomicrograph of *Uroleucon hypochoeridis* aptera.

Antesiphuncular sclerites are present. The cauda is light. Dorsal hairs all or mostly arise from dark sclerites. The fused last two segments of the rostrum are 0.84 to 1.08 times as long as the second tarsal segment.



Plate: 37. *Uroleucon hypochoeridis* colony on flower stem of *Hypochaeris radicata*.

One plant had a large number of mummies of an aphid with long black siphunculi, most likely *Uroleucon hypochoeridis*. The hyperparasitoid *Dendrocerus carpenteri* was reared from these mummies.



Plates: 38a & b. *Dendrocerus carpenteri* male (left) and female (right) reared from *Uroleucon* on *Hypochaeris radicata*.

Tanacetum vulgare (Tansy)

Macrosiphoniella tanaceti (Tansy aphid)

Macrosiphoniella tanacetaria apterae are large wax powdered green or pinkish-brown aphids. Their antennae are black including the base of the third segment (distinguishes from *artemisiae*). The legs, siphunculi and cauda are also black. There are no body hairs on dark scleroites.



Plate: 39. *Macrosiphoniella tanaceti* aptera on flower stem of *Tanacetum vulgare*.

The tansy aphid spends its entire lifecycle on tansy (*Tanacetum* spp.), chrysanthemum (*Chrysanthemum* spp.) and mayweed (*Matricaria* spp.) Colonies occur on upper parts of stem and between the flowers. Eggs are laid on the stem and withered leaves. *Macrosiphoniella tanacetaria* is common and widespread throughout Europe extending into North Africa, parts of Asia and the Americas.

ERICACEAE

***Erica tetralix* (Cross-leaved heath)**

***Ericaphis ericae* (Cross-leaved heath aphid) [new species to Dundreggan]**

Apterae are green or brownish green with the tips of the antennae and legs black. It is a small species with a body length of 1.1-1.7 mm. The fused last two segments of the rostrum are 1.3 to 1.5 times longer than the second hind tarsal segment.



Plate: 40. *Ericaphis ericae* aptera on stem of *Erica tetralix*.



Plate: 41. Photomicrograph of *Ericaphis ericae* aptera.

Ericaphis ericae lives without host alternation on *Erica* species, especially cross-leaved heath (*Erica tetralix*) feeding on flowers and shoot apices. Blackman (2010) notes that the species is often overlooked because of its small size and cryptic colouration.



Plate: 42. *Ericaphis ericae* aptera on flower of *Erica tetralix*

There is certainly very little published about this aphid, and it seldom appears in any of the lists of species recorded for various geographical areas. The find at Dundreggan is only the second time we have ever found this species – the first was in heathland in Ashdown Forest in East Sussex.

SCROPHULARIACEAE

***Digitalis purpurea* (Foxglove)**

***Aphis armata* (Foxglove aphid)**

The apterae of *Aphis armata* are black. Immatures often have discrete wax spots, but apterae rarely have such spots. The middle abdominal tergites in apterae are usually without dark sclerotic bands. The only reliable characteristic to differentiate the species from *Aphis fabae* is that the oviparae have hardly any swelling of the hind tibiae, whilst in *Aphis fabae* the oviparae have the hind tibiae strongly swollen. The body length of apterae is 2.2-2.9 mm.



Plate: 43. *Aphis armata* colony on *Digitalis purpurea*.



Plate: 44. Photomicrograph of *Aphis armata* aptera.

The foxglove aphid does not host alternate. It only feeds on foxglove (*Digitalis purpurea*). Sexual forms occur in autumn. The species has been found in several countries in Europe, but is probably under-recorded because of difficulties in identification. Other members of the *Aphis fabae* complex also feed on foxglove and can only be distinguished morphologically at the ovipara stage - which is not present for most of the year.

In Britain, large populations of *Aphis armata* can be found on *Digitalis purpurea* from mid May. They are usually, but not always, attended by ants, most commonly by *Lasius* or *Myrmica* species.

***Rhinanthus minor* (Yellow rattle)**

***Brachycaudus helichrysi* (Leaf-curling plum aphid) [new species to Dundreggan]**

On its primary host (*Prunus*), the adult aptera of *Brachycaudus helichrysi* (see first picture below) ranges from yellow to green to brown, often shiny with a slight wax dusting. On its secondary hosts *Brachycaudus helichrysi* can be yellow, green, or almost white or pinkish. Their antennae are shorter than the body with dusky tips. The dorsum of the abdomen is without a black shield. Their siphunculi are pale, tapered and short - 0.8-2.0 times the length of the cauda. The cauda is pale, short and blunt. The body length of *Brachycaudus helichrysi* apterae is 0.9 - 2.0 mm.



Plate: 45. Photomicrograph of *Brachycaudus helichrysi*

The leaf-curling plum aphid host alternates between various plum (*Prunus*) species (especially domestic plum and blackthorn) and numerous plant species including *Rhinanthus minor*. At Dundreggan it was found in a mixed species population inside flowers of yellow rattle with *Hyperomyzus rhinanthi* (see below). We have found mixed species populations of these two species in yellow rattle flowers in Sussex.

***Hyperomyzus rhinanthi* (Currant–yellow rattle aphid) [new species to Dundreggan]**

Examination of the flowers of yellow rattle produced several colonies of currant–yellow rattle aphid living inside the flowers (shown below on the leaves) The adult apterae are some shade of green with extensive shiny black sclerotisation including a large ovoid central; abdominal patch.

Antennae and legs are mainly black and siphunculi and cauda are black.



Plate: 46. *Hyperomyzus rhinanthi* aptera on *Rhinanthus minor*

Summer generations feed on the flower stems and flowers of yellow rattles (*Rhinanthus*) and eyebrights (*Euphrasia* spp.). On yellow rattle they feed mainly inside the flower on the inner side of the calyces, so they can only be found by opening the flowers (which is how we found these).



Plate: 47. *Hyperomyzus rhinanthi* aptera giving birth to nymph on *Rhinanthus minor*.



Plate: 48. Photomicrograph of *Hyperomyzus rhinanthi*.

Heie (2009) notes that this species is often seen on its secondary host *Rhinanthus*, but is much less often observed on its primary host *Ribes*. It is possibly confused with other species on *Ribes*.

LAMIACEAE

Galeopsis tetrahit (Common hemp nettle)

Cryptomyzus galeopsidis (Currant – hemp nettle aphid) [new species to Dundreggan]

Several small colonies of the currant–hemp nettle aphid were found on common hemp nettle growing in the planted wild flower area of the lodge garden. The apterae are pale greenish white, often with a darker green spinal stripe.



Plate: 49. *Cryptomyzus galeopsidis* aptera on *Galeopsis tetrahit*.

Dorsal hairs are long thick and capitate, arising from tuberculate bases. The siphunculi are not swollen and are 1.1-2.1 times the length of the cauda (see below). The body length is 1.3-2.6 mm.



Plate: 50. Photomicrograph of *Cryptomyzus galeopsidis* aptera.

The species host alternates from *Ribes nigrum* (blackcurrant) as primary host to *Galeopsis* (hemp nettles) as secondary host. On hemp nettle they live dispersed on the underside of the leaves.

BETULACEAE

Betula pendula (Silver birch), *Betula pubescens* (Downy birch)

Betulaphis quadrituberculata (small downy birch aphid)

A small colony of *Betulaphis quadrituberculata* was found on *Betula pendula* growing in the *Betula nana* compound. *Betulaphis quadrituberculata* apterae are pale yellowish green.



Plate: 51. *Betulaphis quadrituberculata* on *Betula pendula*.

All dorsal body hairs are long and capitate. The siphunculi are smooth. The body length of *Betulaphis quadrituberculata* apterae is 1.5-2.0 mm.



Plate: 52. Photomicrograph of *Betulaphis quadrituberculata* showing capitate hairs.

They are mainly found on the undersides of leaves of downy birch (*Betula pubescens*), but they also occur on silver birch (*Betula pendula*) and occasionally on grey alder (*Alnus incana*). *Betulaphis quadrituberculata* is widely distributed across Europe through Asia to China and has been introduced to North America.

***Symydobius oblongus* (Shiny birch aphid)**

As in previous surveys *Symydobius oblongus* was found on the twigs, young stems and branches of both *Betula pendula* and *Betula pubescens*. In life *Symydobius oblongus* is shiny dark brown with no wax. The antennae have two or three broad white bands and are a little shorter than the length of the body, with a terminal process that is shorter than the base of the last antennal segment.

As is usual, the colonies were vigorously attended by ants. Perhaps more interestingly two of the aphids in one colony were found to have trombidid mites parasitizing them (see below).



Plate: 53. Photomicrograph of *Lassenia* mite found on *Symydobius oblongus*

These mites have been identified as a species of the genus *Lassenia* (Tanaupodidae). This genus has six described species, three from North America, one from China and two from Europe. Efforts are being made to put a species name to the Dundreggan specimens. The aphid host record is new for the genus – the only other known host is a dipteran.

***Euceraphis punctipennis* (Downy birch aphid)**

A dead alate *Euceraphis punctipennis* was found resting on a leaf on a *Betula pubescens* tree north west of the lodge garden, and several nymphs were obtained by beating *Betula* foliage. In life *Euceraphis punctipennis* adults are pale green with a dark brown head and thorax. Mature

adults have extensive deposits of bluish white wax, most noticeably on the legs and antennae (see below).



Plate: 54. *Euceraphis punctipennis* on *Betula*.

This species were abundant at Dundreggan in June 2012, but much less common in July 2013. Few were seen in 2015 although birch was not intensively sampled.

***Calaphis betulicola* (Black-tipped dark-veined birch aphid)**

Calaphis betulicola was present again on young growth of *Betula nana* in the nursery and polytunnel.

SALICACEAE

***Salix aurita* (Eared willow), *Salix lapponum* (Downy willow)**

***Aphis farinosa* (Small willow aphid) [new species to Dundreggan]**

Aphis farinosa was first found at Dundreggan by Emma Bruce. A small colony was found on eared willow about 100m below the dam on the Bhlaraidh track at Dundreggan shortly before the 2015 aphid survey. We subsequently found it again in the same and other nearby sites during the survey.

Aphis farinosa is a rather small aphid with green apterae mottled to a greater or lesser extent with yellow-orange. The siphunculi are pale with a slightly dusky tip and the cauda is distinctly darker. The body length of *Aphis farinosa* apterae is normally within the range 1.6-2.5 mm.



Plate: 55. *Aphis farinosa* aptera & nymphs on *Salix aurita*.

The *Aphis farinosa* at Dundreggan appeared unusually small.

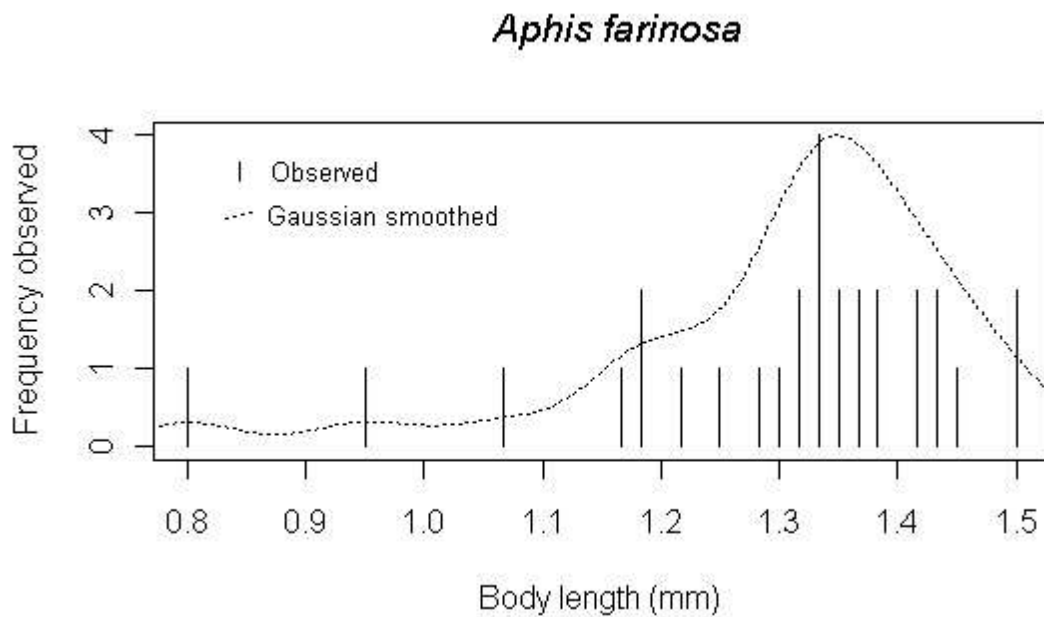


Figure: 1. Bar diagram & Gaussian smoothed size distribution of *Aphis farinosa*.

A sample of 29 Dundreggan apterae (in alcohol) turned out to have a mean body length of only 1.30 mm with a range of 0.8 – 1.5 mm. However, given these are somewhat left-skewed, their median length (1.33 mm) would be a more appropriate summary measure.

If we assume that when measured in alcohol their body lengths are 0.83 what we would expect from preserved mounts, their range 'ought' to be 0.96 - 1.8 mm, which is still markedly smaller than their normal size-range (1.6-2.5 mm). We cannot tell whether this is related to climatic factors or to the diet of *Salix aurita*.



Plate: 56. Photomicrograph of alate *Aphis farinosa*.

The alatae (see above) are dark green with more or less dusky siphunculi. The apterous males are reddish orange.



Plate: 57. *Aphis farinosa* apterae, nymphs & males on *Salix aurita*.

The small willow aphid is fairly common in dense colonies on the young shoots of willows (*Salix* spp.) especially willow (*Salix caprea*) in spring and early summer.



Plate: 58. *Aphis farinosa* alate, apterae, nymphs & males on *Salix aurita*.

Aphis farinosa is known to be associated with the gall midge *Rhabdophaga rigida* (Nakamura *et al.* 2006). Colonization rates by the aphid *Aphis farinosa* are significantly higher on galled shoots than on ungalled shoots, presumably because this aphid favours lateral shoots. Gall initiation on current-year shoots stimulated the development of lateral shoots, followed by a secondary leaf flush. Lateral shoots and upper leaves on galled shoots have a higher water and nitrogen content than other shoots. A related gall midge *Rhabdophaga rosaria* occurs at Dundreggan, so it would be interesting to see if the same relationship holds.

Aphis farinosa do not host alternate, and are attended by ants. They have a sexual stage in the life cycle with oviparae and males appearing much earlier (July onwards) than is the case with most species of aphids. The species occurs throughout northern temperate parts of the world and in South America.

***Cavariella theobaldi* (Willow - parsnip aphid)**

Large numbers of *Cavariella theobaldi* were again found on young saplings of *Salix lanata* and *Salix lapponum* growing in the nursery.



Plate: 59. *Cavariella theobaldi* aptera and nymphs on *Salix lanata* leaf.

Apterae on leaves and new growth of *Salix* spp. are yellowish green to green with rather dusky tapering siphunculi. Their body length is 1.6 to 2.0 mm.

PINACEAE

Larix decidua (European larch)

Adelges laricis group (Larch adelgid)

Larch adelgids were again found on the larch in a mixed larch/western hemlock hedge along the front of the Dundreggan lodge compound. Females live on larch producing one or more generations and vast quantities of wax wool and large globules of honeydew. The adelgid is usually completely covered by the wax wool.

Pinus sylvestris (Scots pine)

Cinara pinea (Large pine aphid)

The aphid *Cinara pinea* was again found on young *Pinus sylvestris* trees. In life apterae are shiny orange-brown (spring) to grey or dark brown finely spotted with black and dusted with wax (summer). *Cinara pinea* is a large species with a body length of 3.1 to 5.2 mm. The hairs on abdominal tergites arise from small, irregularly shaped scleroites (see below). *Cinara pinea* lives on new shoots of *Pinus sylvestris*, and sometimes other *Pinus* spp. including *Pinus nigra* in

dry areas.



Plate: 60. *Aphis farinosa* alate, apterae, nymphs & males on *Salix aurita*.

CUPRESSACEAE

***Juniperus communis* (Juniper)**

***Cinara juniperi* (Juniper aphid)**

In 2015 *Cinara juniperi* was present in quite large numbers on juniper. Their apterae and alatae are pinkish brown with light wax dusting, not forming a pattern, and have dark legs. The wax dusting is fairly uniform (which distinguishes them from *Cinara mordvilko* where the posterior is wax free). Their body length is 2.1 to 3.4 mm.



Plate: 61. *Cinara juniperi* apterae & nymph on *Juniperus communis*.



Plate: 62. *Cinara juniperi* apterae *Juniperus communis*.

Their hind tibiae are uniformly dark brown. Antennal segment V is less than 0.9 times the length of segment VI. The hairs along the outer side of the hind tibia are at least 1.5 times (mostly 2 to 3 times) the diameter of the tibia in the middle (see below). The ratio of the length of the fused last two segments of the rostrum to the length of the second segment of the hind tarsus is 0.60 to 0.85 (see below).

According to Blackman & Eastop (1994), *Cinara juniperi* feeds on the needles on the undersides of young shoots of *Juniperus communis* and its varieties. Baker (2012) reported them feeding on the needles. In 2013 we found them feeding at the base of shoots, as reported by Jaskiewicz & Kot (2007). In 2015 we found them feeding on needles, at the base of shoots and among developing berries. The differing reported sites probably reflect a seasonal change in preferred feeding site through the year as young shoots and fruits mature.

***Cinara smolandiae* (Giant juniper aphid)**

Colonies of *Cinara smolandiae* were found on three *Juniperus communis* (juniper) bushes. This species was first discovered in Britain at Dundreggan in 2012. In Sweden apterae of *Cinara smolandiae* have been described as dusky brownish grey with dull bronze metallic highlights in sunlight. The siphuncular cones are shiny black.



Plate: 63. *Cinara smolandiae* aptera on bark of *Juniperus communis*.

In Scotland Baker described them as varying from light coffee to chestnut brown with only a light wax dusting on the head and thorax.



Plate: 64. *Cinara smolandiae* aptera and alatiform fourth instar on bark of *Juniperus communis*.

Cinara smolandiae is in the *Cinara* subgenus *Cupressobium*, which is characterized by the very short first hind tarsal segment, the unsclerotized rim of the primary rhinarium on the sixth antennal segment, and the relatively few (usually 3) subapical hairs on the antennal terminal process.



Plate: 65. Photomicrograph of dorsal view of *Cinara smolandiae* aptera.

Cinara smolandiae can be distinguished from most other *Cupressobium* by: (a) the presence in

apterae of secondary rhinaria on the third antennal segment; (b) the long rostrum, characteristic of *Cinara* species that feed on the woody tissue of their host plants.



Plate: 66. Photomicrograph of ventral view of *Cinara smolandiae* aptera showing long rostrum

Baker (2012) noted that the size of his *Cinara smolandiae* from Dundreggan was markedly less than that recorded for Sweden. Only two specimens were available to Baker, so we took a larger sample of adult apterae in an attempt to confirm this observation. The mean body length of these apterous *Cinara smolandiae* at Dundreggan (mean=3.14 mm, range:2.8-3.52 mm, n=19, **measured in alcohol**) was markedly less than that of apterae in Sweden (mean:= 3.85 mm, range: 3.33 – 4.25 mm, n=10, **measured as permanent mounts**).

Cinara smolandae

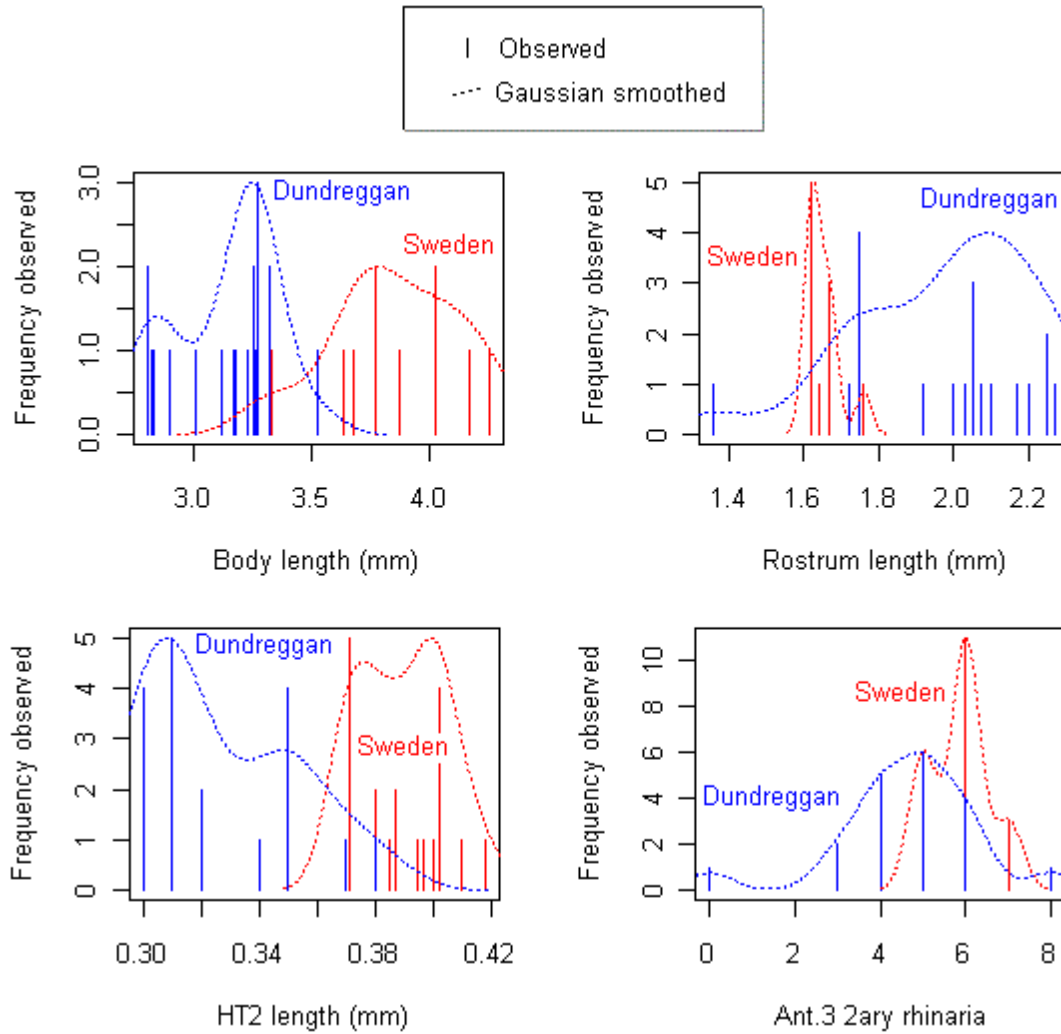


Figure 2. Bar diagrams and Gaussian smoothed size distributions of body size measurements of *Cinara smolandae* from Sweden and Dundreggan.

The differences in overall body length were mirrored in the length of the second hind tarsal segment (HT2). The length of HT2 at Dundreggan was 0.33 mm (0.30-0.38 mm) compared to 0.39 mm (0.37-0.42 mm) for Swedish specimens.

The mean number of secondary rhinaria on antennal segment III at Dundreggan was 4.63 (0-8) compared to 5.85 (5-7) for Sweden. Siphuncular cone diameter at Dundreggan was 0.34-0.58 mm (mean 0.5 mm) compared to a range in Sweden from 0.45-0.68mm. RIV+V length at Dundreggan was 0.33 mm (0.28-0.36 mm).

The measurements presented in Figure 2. (above) exclude those of four aphids which appeared to

have unusually short rostra.



Plate: 67a & b. *Cinara ?smolandiae* with apparently short rostra, in alcohol.

These four adults superficially resembled very large *Cinara juniperi*. However they had 4 or 5 secondary rhinaria on antennal segment 3, which *Cinara juniperi* lack, suggesting they are indeed *Cinara smolandiae*.



Plate: 68. Secondary rhinaria on third antennal segment of short-rostrum *Cinara*.

Specimens were sent to Roger Blackman (Natural History Museum, London) for further investigation.

Blackman has since confirmed that these specimens are indeed *Cinara smolandiae*. The rostra appeared short because they were retracted into the aphid head in those specimens. This may

have occurred because in a few cases a dab of alcohol was used during the collection process to facilitate their removal with least disruption to the surrounding colony. (We had at that time found just one infested bush.) Measurements made by Roger Blackman on permanent mounts are given below.

Table 2 – Comparison of Dundreggan and Swedish *Cinara smolandiae* permanent mounts

	Range of values (mm)		
	Scotland (2012) n=2	Scotland (2015) n=4	Sweden n=10
Body length (BL)	2.86–2.98	3.29-3.97	3.33–4.25
Total antennal length (ANT)	1.45–1.51	1.48-1.60	1.62–1.81
Antennal segment III	0.496–0.550	0.505-0.585	0.550–0.620
Antennal segment IV	0.183–0.194	0.200-0.240	0.232–0.286
Antennal segment V	0.294–0.302	0.277-0.232	0.300–0.355
Antennal segment VI (incl. PT)	0.238–0.286	0.252-0.308	0.300–0.340
Rostrum length	1.26–1.45	1.48-1.55	1.62–1.76
Rostral segments IV+V	0.298–0.302	0.304-0.338	0.300–0.340
Hind tarsus segment II	0.357–0.385	0.345-0.397	0.371–0.418
Hind femur	1.27–1.34	1.23-1.44	1.57–1.81
Hind tibia	1.94–2.08	1.83-2.15	2.21–2.53
No. of secondary rhinaria III:IV:V	2–4: 2–4: 1–2	3-4: 1-3: 1-2	3–8: 3–6: 2–4
	Ratios		
ANT/BL	0.51–0.52	0.40-0.45	0.42–0.50
Rostrum/BL	0.44–0.48	0.38-0.47	0.39–0.45
Rostral IV+V/Hind tarsus II	0.77–0.85	0.85-0.88	0.79–0.86

These measurements confirm the smaller size of the Scottish specimens compared to the Swedish ones, although not to the extent suggested by the earlier 2012 data nor by our measurements on specimens in alcohol. It appears that whole body length measurements on specimens in alcohol are consistently shorter than those made on permanent mounts, although fortunately other measurements (e.g. hind tarsus segment II) are very similar. The reason for this is straightforward enough: features that retain their shape when reduced to a flat slide preparation retain their dimensions pretty accurately; whereas aphid bodies, being akin to a bag, distend

somewhat when flattened.

On each of the infested juniper bushes, the main *Cinara smolandiae* colonies at Dundreggan (see pictures below) were on swollen parts of branches partially or wholly concealed by vegetation. The diameter of branches was usually 1-2 cm. They were moderately vertical and bare of needles and moss. On several occasions the aphids spread across two branches just above a fork.



Plate: 69a & b. *Cinara smolandiae* colony, apterae with few nymphs, on bark of *Juniperus communis*

It was noticeable that colonies seemed to have a deficit of young nymphs (I–II instars). This prompted us to search parts other than the swollen branches of the bushes which had colonies.

On one of the bushes we found small numbers of young nymphs (see picture below) quite separate from the rest of the colony near the base of the bush. Whilst this may reflect a greater mobility among adults than nymphs, there are other possible reasons: Wood ants (*Formica lugubris*) were regularly moving between the main colony and the base of the bush. We present evidence later in this report that one of the ways that the nymphs were getting separated from the rest of the colony was that ants were transporting the aphids.



Plate: 70. *Cinara smolandiae* young nymphs at tree base on bark of *Juniperus communis*.

JUNCACEAE

Juncus effusus (Common rush)

Sitobion fragariae (Blackberry-grass aphid) [new species to Dundreggan]

The aptera of *Sitobion fragariae* is spindle-shaped and a dirty yellowish green, with small brown intersegmental sclerites on the abdominal dorsum.



Plate: 71. *Macrosiphum fragariae* aptera on flowers of *Juncus effusus*.

Their antennae are about the same length as the body, with the basal segments paler than the rest. The siphunculi are about twice as long as the pale pointed cauda and are usually entirely black, although they may have paler bases on the primary host. The body length of *Sitobion fragariae* apterae is 1.6-3.0 mm long.



Plate: 72. *Macrosiphum fragariae* aptera on flowers of *Juncus effusus*.

The blackberry - grass aphid host alternates from blackberry (*Rubus fruticosus* agg.) and occasionally other Rosaceae to grasses (Poaceae) especially *Holcus* spp., rushes (Juncaceae) and some Sedges (*Carex* spp). *Sitobion fragariae* eggs hatch in spring and the young nymphs feed on the breaking buds.



Plate: 73. *Macrosiphum fragariae* nymphs on flowers of *Juncus effusus*.

Colonies build up and in summer alates migrate to cereals and grasses. A return migration takes place in autumn.

POLYPHAGOUS APHID SPECIES

***Macrosiphum euphorbiae* (Potato aphid)**

Apterae found on *Galeopsis tetrahit* (common hemp nettle) were reared through and shown to be *Macrosiphum euphorbiae*.

MUTUALIST ASSOCIATIONS

Baker (2012) listed five examples of ‘obligate’ myrmecophily for Dundreggan (*Formica lugubris* attending *Cinara juniperi*, *Cinara nuda*, *Cinara smolandiae*, *Pterocomma tremulae* and *Symydobius oblongus*) and two examples of facultative’ myrmecophily, (*Formica lugubris* attending *Cinara pinea* and *Lasius* sp. attending *Aphis armata*).

In 2013 we found two of the same associations, the first being *Formica lugubris* attending *Cinara juniperi* on *Juniperis communis* (juniper) and the second being *Formica lugubris* attending *Pterocomma tremulae* on *Populus tremula* (aspen). We also found *Formica lugubris* attending *Dysaphis sorbi* on *Sorbus aucupariae* rowan and *Formica lemani* and *Formica lugubris* attending *Cinara pini* on *Pinus sylvestris* (Scots pine). *Formica lemani* and *Lasius* sp. were found attending *Aphis cytisorum* on *Sarothamnus scoparius* (broom), *Aphis ulicis* on gorse and *Brachycaudus cardui* on *Cirsium arvense* (thistle)

In 2015 conditions were very different with the season several weeks behind what it had been in 2013. Unlike in 2013, there were still many *Cinara juniperi* on the juniper. These were attracting the attentions of *Formica lugubris* and were being actively ant tended. Ants were more comfortable tending aphids feeding on the lignified stems as noted by Baker (2012).



Plate: 74. *Formica lugubris* tending *Cinara juniperi* on lignified stems of *Juniperus communis*.



Plate: 75. *Formica lugubris* tending *Cinara juniperi* on needles of *Juniperus communis*.

There were still rather few *Symydobius* populations around.

All the *Cinara smolandiae* colonies were closely and enthusiastically tended by *Formica lugubris*.



Plate: 76. *Formica lugubris* tending *Cinara smolandiae* on bark of *Juniperus communis*.



Plates: 77a & b. *Formica lugubris* tending *Cinara smolandiae* on bark of *Juniperus communis*.
Aphids were antennated and honeydew collected from the anus of the aphids.



Plate: 78. *Formica lugubris* carrying *Cinara smolandiae* at base of *Juniperus communis*.

The *Cinara* species present on Scots pine *Cinara pinea*, was tended by *Myrmica ruginodis*.



Plate: 79. *Myrmica ruginodis* tending *Cinara pinea* on *Pinus sylvestris*.



Plate: 80. *Myrmica ruginodis* tending *Cinara pinea*.

The only colony of *Dysaphis sorbi* on *Sorbus aucuparia* (rowan) that we found was actively tended , but by *Formica lemani*, not *Formica lugubris*.



Plate: 81. *Formica lemani* attending *Dysaphis sorbi* on *Sorbus*.



Plate: 82. *Formica lemani* attending *Dysaphis sorbi* on *Sorbus*.

These colonies were vigorously attended by large numbers of *Formica lugubris*, and there were very few predators or parasitoids in evidence. Cherix (1980) also found that *Formica lugubris* fed on honeydew from *Dysaphis sorbi*, as well as from several other aphid species.

Aphis hypochoeridis was attended and tented over by ants. The tenting serves to provide some protection to the aphids from adverse climatic conditions and from predators. Such protection is,

however, by no means absolute since we have often found other species of root aphids which have been similarly tented (such as *Aphis lambersi* on wild carrot) to be heavily parasitized by *Aphidius* parasitoids.



Plate: 83. Ant tenting over colony of *Aphis hypochoeridis* on *Hypochaeris radicata*.

Two species of ants were found tending the aphids under the earth tenting, *Lasius niger* and *Myrmica ruginodis*, but there was no way to tell which of these species was responsible for the initial tenting.



Plates: 84a & b. *Myrmica ruginodis* & *Lasius niger* found attending *Aphis hypochoeridis* under tenting.

Aphis farinosa was also tended (very loosely) by both *Lasius niger* and *Myrmica ruginodis*.



Plate: 85 *Lasius niger* attending *Aphis farinosa* on *Salix aurita*.

Aphis armata was loosely tended by *Lasius niger*



Plate: 86. *Lasius niger* attending *Aphis armata* on *Digitalis purpurea*.

A notable feature of ant behaviour in 2013 was the high incidence of nectar raiding of flowers by different species of ants. This was only observed once in 2015: *Lasius* ants were raiding flowers of *Sedum acre* for nectar (see below).



Plate: 87. Nectar raiding by *Lasius* ant on *Sedum acre*.

Table 3 – Ant-Aphid associations at Dundreggan

APHID	ANT	STRENGTH OF ASSOCIATION	Comments
<i>Aphis armata</i>	<i>Lasius niger.</i>	++	Loosely attended
<i>Aphis fabae cirsiacanthoidis</i>	<i>Formica lugubris</i>	+	
<i>Aphis farinosa</i>	<i>Lasius niger</i> <i>Myrmica ruginodis</i>	+ +	Very loosely attended
<i>Aphis hypochoeridis</i>	<i>Lasius niger</i> <i>Myrmica ruginodis.</i>	+++	Ants cover aphid colony with soil particles ('tenting') but leave when disturbed
<i>Brachycaudus cardui</i>	<i>Formica lugubris</i> <i>Lasius sp.</i>	++ , +++	
<i>Cinara juniperi</i>	<i>Formica lugubris</i>	++ , +++	closely attended in 2013; less so in 2012 and 2015
<i>Cinara nuda</i>	<i>Formica lugubris</i>	+++	
<i>Cinara pinea</i>	<i>Formica lugubris</i> <i>Myrmica ruginodis</i>	++	
<i>Cinara pini</i>	<i>Formica lugubris</i> <i>Formica lemani</i>	+++	closely attended and strongly defended
<i>Cinara smolandiae</i>	<i>Formica lugubris</i>	+++	Closely attended and strongly defended; ants move nymphs around the colony
<i>Dysaphis sorbi</i>	<i>Formica lugubris</i> <i>Formica lemani</i>	+++	Large colonies; also 'attended' by <i>Vespula</i>
<i>Pterocomma pilosum</i>	<i>Lasius niger</i>	++	Recorded by AWF
<i>Pterocomma tremulae</i>	<i>Formica lugubris</i>	+++	closely attended but weakly defended
<i>Symydobius oblongus</i>	<i>Formica lugubris</i> <i>Lasius sp.</i>	+++	closely attended and strongly defended

DISCUSSION

Ecology of *Cinara smolandiae*

One of our main aims in the survey was to rediscover *Cinara smolandiae* and in this we were successful. Our, all too brief, inspection of their colonies revealed some fascinating aspects of their ecology.

We found *Cinara smolandiae* on three bushes of *Juniperus communis* after searching an estimated 60-80 bushes. On all three colonised bushes, some of the branches were swollen. This swelling apparently results from old infections with juniper rust (*Gymnosporangium clavariiforme*) which is quite common at Dundreggan. The presence of the aphids appeared to be strongly associated with swelling of the branches both between and within bushes. We did not however find enough colonies to test this statistically. Danielsson & Carter (1993) only noted the *Gymnosporangium* cankers as **one** of the microhabitats where the aphids are found – other sites were under loose bark and in cavities. We also found aphids under loose bark, but much the largest colonies were on the swollen branches

If there is a causal association, there are several possible explanations. (a) The aphids could be facilitating fungal transmission or growth. (b) *Gymnosporangium* cankers may provide aphids a nutritional advantage – either because the aphids' rostra penetrate the wood more easily or (more plausibly) the swellings are associated with a higher soluble nitrogen levels. (c) Alternatively these aphids can conceal themselves more easily from predator where the bark is rough or contorted. It was notable that all the colonies were partially or wholly concealed by other juniper branches. The most likely vertebrate predator of *Cinara smolandiae* at Dundreggan is the treecreeper *Certhia familiaris*.

All *Cinara smolandiae* were vigorously attended by *Formica lugubris* which aggressively defended the colony. In Sweden Danielsson & Carter (1992) found they were assiduously attended by worker ants of *Formica polyctena*, *Formica rufa* and *Camponotus* sp. During this study we obtained direct observational evidence of *Formica lugubris* moving *Cinara smolandiae* around the bush. In the example photographed it was most probably a defensive move given that colonies were disturbed by photography.

But there is considerable evidence in the literature of ants moving aphids around a colony and to other locations. Goidanich (1958) recorded *Lasius fuliginosus* transporting young fundatrices of *Stomaphis quercus* from their overwintering egg site at the base of the tree to suitable feeding sites in the upper canopy of oak trees. Collins & Leather (2002) also recorded *Lasius niger* moving nymphal *Pterocomma salicis*, although they did not think that direct ant-borne dispersal was the only dispersal route. They felt that local 'wandering dispersal' also contributed to it, although this was considered a costly strategy since it exposed aphids to the actions of natural enemies. Such transport may be related to nutritional factors or to predatory pressures.

Transport by ants may partly explain why the colonies high up on the bush appeared to be mainly adults with a deficit of young aphids, whilst there were young aphids near the base of tree with no adults nearby. - But such a distribution was unlikely to have arisen solely by ant transport. Danielsson & Carter (1992) refer to small tight colonies each consisting of 6-8 adult apterae which appeared to be mobile. If adults were more mobile than the nymphs, and they tend to move quite often, it would explain

why the colonies tend to be all of one age group. Such mobility is also a good way to reduce competition between nymphs and adults.

We would certainly recommend that Trees for Life attempts to recruit a postgraduate student to further study the *Cinara* aphids on Juniper.

Aphid species of conservation interest

Most of the 14 new aphid species to Dundreggan were on herbaceous plants and shrubs, reflecting the orientation of the survey. Many were on plant species characteristic of bogs or other damp biotypes.

The Moriston river valley had rather few species present, although *Acyrtosiphon borealis* on *Potentilla palustris* was a worthwhile find. The aphid *Aphis farinosa* was present on *Salix aurita*, interestingly as very undersized individuals. Whether this is characteristic of populations on this species of *Salix*, or whether it is related to climatic factors in the high moorland habitat is unclear. Searching sedges and rushes for aphids proved very hard work and largely unproductive. We did find *Sitobion fragariae* on the flowering heads of *Juncus effusus*, but the various species present on *Carex* species eluded us, despite many hours of searching.

We did find one of the rare species associated with the Ericaceae – *Ericaphis ericae* on *Erica tetralix*. Although it probably occurs throughout Britain, there are very few records of it probably, as Blackman (2010) points out, because of its small size and cryptic coloration. Future studies should again target two further *Ericaphis* species in Britain – *Ericaphis latifrons* which is mainly found on *Empetrum nigrum* and *Ericaphis wakibae* on *Fragaria vesca*. The latter aphid is a North American species only known from one Welsh and two English localities.

We have listed *Aphis tormentillae* as rare in Table 1 given its ‘little recorded’ designation in Stroyan (1984). We have never found this species before, yet we found it on three occasions during this survey. We have listed three species as ‘uncommon’ – *Aphis hypochoeridis*, *Dysaphis ranunculi* and *Hyperomyzus rhinanthi*. We have found all these before, but they are seldom recorded because they live concealed from sight.

Aphid species diversity

Over the various aphid surveys, we and the other aphid surveyors have found a total of 77 aphid species at Dundreggan. These comprise 2 very rare species, 12 rare species, 21 uncommon species, 38 common species and 4 abundant species (see Table 1). In short that gives 35 out of 77 species of conservation interest (very rare, rare, uncommon) together with a few more common species that are especially involved in interactions with ants such as *Cinara pinea*, *Symydobius oblongus* and *Brachycaudus cardui*.

Below we have extended the cumulative aphid species curve to include the results for this survey.

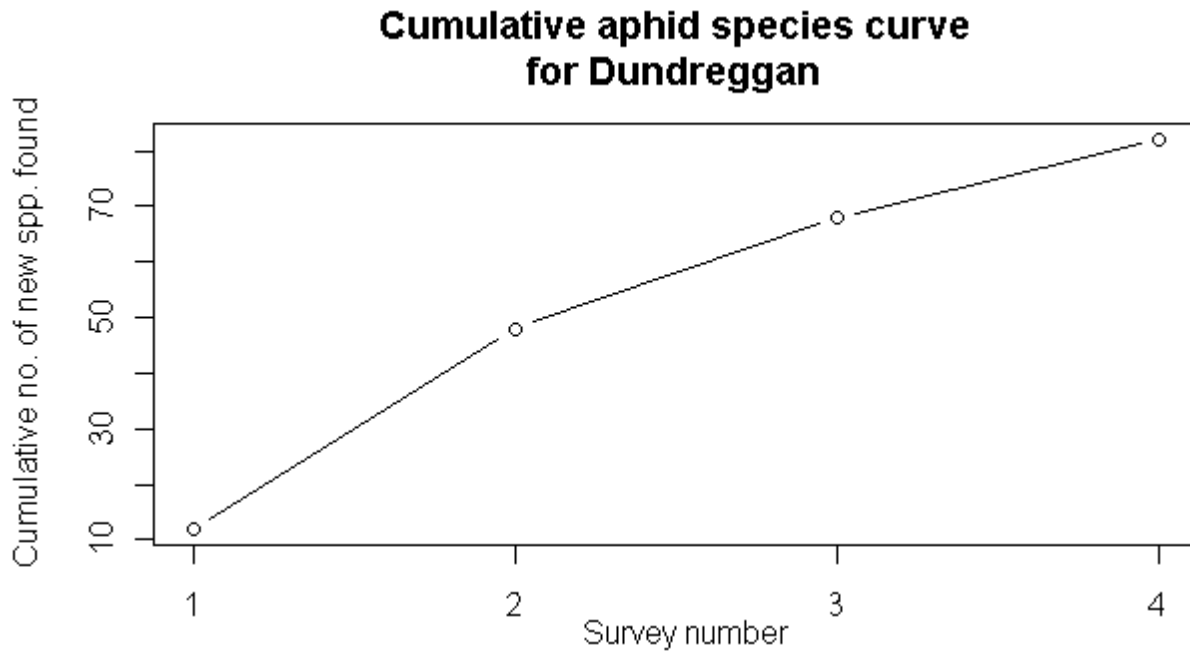


Figure. 3. Cumulative number of species found in (1) Malaise traps 2011, (2) Baker's 2012 survey, (3) Our first (2013) survey, this (2015) survey.

As expected the curve is levelling off as more of the species present are detected. Estimating the total number of species present from a curve of this type is fraught with difficulty (for details see Dransfield & Brightwell, 2013), but at present it would appear to be levelling off at around a hundred species. This is almost certainly artificially low because efforts have been restricted to areas relatively easy to access, and interpreting this curve assumes all aphid species are equally easy to find – which is patently untrue. Moreover, most of the remaining species will probably fall in the species of conservation interest categories, which will result in an unusually high proportion of such species for the Dundreggan site.

ACKNOWLEDGEMENTS

We thank Edward Baker for initially recommending us to Alan Watson Featherstone (Trees for Life), and for identifying the hymenopterous hyperparasites we found. We are delighted to have rediscovered the new aphid to Britain, *Cinara smolandiae*, which Ed first discovered in 2012.

We are indebted to Roger Blackman for identifying and measuring specimens of *Cinara smolandiae*.

We thank Cal Welbourn, acarologist with the Florida Department of Agriculture and Consumer Services, for identifying the mites found on *Symydobius* aphids.

We also wish to thank Phil Attewell, Herts. county recorder for ants, for identifying the ants.

We are very grateful to Alan Watson Featherstone for inviting us to do another survey and for providing accommodation, transport and guidance.

We especially thank all the Dundreggan Estate staff and Volunteers who went out of our way to make us feel welcome, and assist us in our travails.

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ANNEX 1

Summary of aphid samples taken during 2015 survey

N	Date	Time	Location	Plant	Aphid + characteristics	Ants	Part of plant	Notes
1	11/7	08.40	Lodge nursery	<i>Betula pubescens</i> (Downy birch)	<i>Calaphis</i> immatures	none	tips of branches	
2	11/7	08.40	Lodge nursery	<i>Betula nana</i> (Dwarf birch)	<i>Calaphis</i> immatures	none	tips of branches	
3	11/7	08.55	Lodge nursery	<i>Salix lanata</i> (Woolly willow)	<i>Cavariella</i>	none	young leaves	
4	11/7	09.15	Lodge nursery	<i>Salix lanata</i> (Woolly willow)	<i>Cavariella</i> being heavily predated by midge (<i>Aphidoletes</i>) larvae	none	young leaves	
5	11/7	11.28	Caochan na sgochrich, alt 160m	<i>Juniperus communis</i>	<i>Cinara juniperi</i>	Attended by <i>Formica lugubris</i>	Young stems and needles	#1002
6	11/7	11.52	Caochan na sgochrich, alt 160m	<i>Juniperus communis</i>	<i>Cinara juniperi</i>	Attended by <i>Formica lugubris</i>	Young stems and needles	#1002
7	11/7	11.56	Caochan na sgochrich, alt 160m	<i>Juniperus communis</i>	<i>Cinara juniperi</i>	Attended by <i>Formica lugubris</i>	Young stems and needles	#1002
8	11/7	12.03	Caochan na sgochrich, alt 160m	<i>Juniperus communis</i>	<i>Cinara juniperi</i>	Attended by <i>Formica lugubris</i>	Young stems and needles	#1002
9	11/7	12.15	Caochan na sgochrich, alt 160m	<i>Juniperus communis</i>	<i>Cinara juniperi</i>	Attended by <i>Formica lugubris</i>	Young stems and needles	#1002
10	11/7	12.30	Caochan na sgochrich, alt 160m	<i>Betula pendula</i>	<i>Symydobius oblongus</i>	Attended by <i>Formica lugubris</i>	Thin lignified stems	#1003
11	11/7	12.45	Caochan na sgochrich, alt 160m, 32360, 14702	<i>Juniperus communis</i>	<i>Cinara smolandiae</i>	Closely attended by <i>Formica lugubris</i>	Old wood	#1004
12	11/7	13.05	Caochan na sgochrich,	<i>Betula pendula</i>	<i>Betulaphis quadrituberculata</i>		Leaf underside	#1005
13	11/7	13.10	Caochan na sgochrich,	<i>Betula pendula</i>	<i>Euceraphis punctipennis alate</i> - dead		Leaf underside	
14	11/7	15.28	Nursery	<i>Galeopsis</i>	<i>Macrosiphum</i>		Up	#1006

			compound, wildflower planting	<i>tetrahit</i> (common hemp nettle)	<i>euphorbiae</i> & <i>Cryptomyzus</i> (immatures)		flowering stem & leaf undersides	
15	11/7	15.40	Nursery compound, wildflower planting	<i>Galeopsis tetrahit</i> (common hemp nettle)	<i>Macrosiphum</i> & <i>Cryptomyzus</i> (immatures)		Up flowering stem & leaf undersides	#1006
16	11/7	15.42	Nursery compound, wildflower planting	<i>Galeopsis tetrahit</i> (common hemp nettle)	<i>Macrosiphum</i> & <i>Cryptomyzus</i> (immatures)		Up flowering stem & leaf undersides	#1006
17	11/7	16.00	Nursery compound, wildflower planting	<i>Rhinanthus minor</i> (yellow rattle)	<i>Hyperomyzus rhinanthi</i> & <i>Brachycaudus helichrysi</i>		Both living inside flower	#1007
18	11/7	16.13	W track down to A338	<i>Potentilla erecta</i>	<i>Aphis tormentillae</i>		At leaf junctions and on flowers	#1000 #1034 (from culture)
19	11/7	17.10	On verge to A338	<i>Hieracium pilosella</i>	<i>Nasonovia pilosellae</i>		Up flower stem	#1033
20	11/7/		By stream 100m below dam	<i>Salix aurita</i>	<i>Aphis farinosa</i>		Young shoots	#1009 Collected by Jill
21	2/7		By stream 100m below dam	<i>Salix aurita</i>	<i>Aphis farinosa</i>		Young shoots	#1001 Collected by Alan
22	11/7/		By stream 100m below dam	<i>Salix aurita</i>	<i>Aphis farinosa</i>	Loosely attended by <i>Myrmica ruginodis</i>	Young shoots	#1013 specimens very undersized
23	12/7	11.45	By stream 100m below dam	<i>Potentilla erecta</i>	<i>Aphis tormentillae</i>		At leaf junctions and on flowers	#1014
24	12/7	12.10	Dwarf birch enclosure	<i>Betula pendula</i>	<i>Calaphis</i>		Underside of terminal leaf	#1015
25	12/7	15.40	Bhlaraidh stream bottom 312m alt, 36009, 17879	<i>Pinus sylvestris</i> (saplings)	<i>Cinara pinea</i>	Attended by <i>Myrmica ruginodis</i>	Young shoots	#1010
26	12/7	15.50	Bhlaraidh stream bottom 312m alt, 36009, 17879	<i>Sorbus aucuparia</i> (Rowan)	<i>Dysaphis sorbi</i>	Attended by <i>Formica lemani</i>	In leaf gall	

27	12/7	16.10	Bhlaraidh stream bottom	<i>Hieracium pilosella</i>	<i>Nasonovia compositellae</i>		Flower stem	#1008
28	12/7	16.50	Bhlaraidh stream bottom	<i>Salix aurita</i>	<i>Aphis farinosa</i>	Attended by <i>Myrmica ruginodis</i> & <i>Lasius niger</i>	Young shoots	#1012
29	13/7	09.55	Caochan na sgochrich, 160m alt 32360, 14702	<i>Juniperus communis</i>	<i>Cinara smolandiae</i> All neighbouring bushes searched for <i>C. smolandiae</i> . Only <i>Cinara juniperi</i> present.	Closely attended by <i>Formica lugubris</i>	On branches of bush; Colonies 1.2m up. Bush 2m high, 2m diam; in clearing; nearest visible wood ants nest approx 4m	#1016 Same bush as N11. 3 branches (b1-3) with colonies, moderately vertical, bare of needles & moss; all noticeably swollen: b1) 2 branches collectively 2cm across, just above fork, b2) 2cm diameter, just above fork b3) 1.25 cm dia., just above fork
30	13/7	12.15	Caochan na sgochrich	<i>Rosa sheradii</i>	<i>Chaetosiphon tetrarhodum</i>		On young hip	#1036
31	13/7	14.55	Boar pen track 153m asl 32941, 14762	<i>Hypochaeris radicata</i>	<i>Uroleucon hypocheiridis</i>		Up flower stem	#1035
32	13/7	15.20	Boar pen track 153m asl 32941, 14762	<i>Hypochaeris radicata</i>	<i>Aphis hypochoeridis</i>	Attended by <i>Lasius niger</i> and <i>Myrmica ruginodis</i>	On basal collar under earth tenting	#1031
33	13/7	15.30	Boar pen track 10m N waymarker	<i>Rosa ?caninum</i>	<i>Macrosiphum rosae</i> empty? mummies			#1036
34	13/7	15.42	Boar pen track 32992, 14808	<i>Hieracium pilosella</i>	<i>Nasonovia pilosellae</i>		Up flower stem	#1037
35	13/7	16.00	Boar pen track	<i>Potentilla erecta</i>	<i>Aphis tormentillae</i>		At leaf junctions and on flowers	#1018
36	13/7	16.30	Boar pen track 180 m asl 32804, 14892	<i>Juniperus communis</i>	<i>Cinara smolandiae</i> Colony B	Closely attended by <i>Formica lugubris</i>	On bark of stems	#1017
37	14/7	10.00	121m asl 33250, 14640 east gate to Dundreggan lodge	<i>Rosa caninum</i> (wild rose),	<i>Myzaphis bucktoni</i> +mummies of <i>Macrosiphum</i>		mostly singularly, on top of leaves, on vein	#1021
38	14/7	10.27	117m ASL,	<i>Potentilla</i>	<i>Acyrtosiphon boreale</i>		On	#1020

			33162, 14540 By oxbow lake near R. Morrison	<i>palustris</i> (Marsh cinquefoil)-			leaves, stem and flowers	
39	14/7	13.00	Caochan na sgochrich	<i>Digitalis purpurea</i> (foxglove)	<i>Aphis armata</i>		On flower spike	#1022
40	14/7	13.22	Caochan na sgochrich	<i>Erica tetralix</i> (Crossleaved heath)	<i>Ericaphis ericae</i>		Amongst flowers	#1023
41	14/7	14.56	Boarpen track	<i>Hypochoeris radicata</i> (Cats ear)	<i>Uroleucon hypochoeridis</i> alate + nymphs			
42	14/7	15.06	Boarpen track 157m ASL 32938 14784	<i>Hypochoeris radicata</i> (Cats ear)	<i>Aphis hypochoeridis</i>	Earth tenting by <i>Lasius niger</i> and/or <i>Myrmica ruginodis</i>		#1030
43	14/7	15.30	Boarpen track 157m ASL 32922, 14840	<i>Hypochoeris radicata</i> (Cats ear)	<i>Uroleucon hypochoeridis</i> apterae + nymphs		On flower head	#1029
44	14/7	15.32	Boarpen track 157m ASL 32839, 14783	<i>Ranunculus flammula</i>	<i>Thecabius affinis</i>		On leaf	
45	14/7	16.00	Boarpen track on other side of gully 182 m ASL, 32707, 14867	<i>Juniperus communis</i>	<i>Cinara smolandiae</i> Colony C	Closely attended by <i>Formica lugubris</i>	On bark of stems	#1024 #1025
46	14/7	17.30	Boarpen track 162m ASL 33017, 14829	<i>Hieracium pilosella</i>	<i>Nasonovia pilosella</i> + many mummies			#1028
47	14/7	17.45	Boarpen track	<i>Hypochoeris radicata</i> (Cats ear)	<i>Uroleucon hypochoeridis</i> apterae + nymphs		on flower heads	#1026
48	14/7	18.00	Nursery compound, wildflower planting	<i>Galeopsis tetrahit</i> (common hemp nettle)	<i>Cryptomyzus galeopsidis</i>		Up flowerin g stem & leaf undersides	#1019
49	15/7	14.02	Between red burn and Caochan na sgochrich by small pool on hillside 151 ASL, 32336, 14653.	<i>Juncus</i>	<i>Sitobion fragariae</i>		On flower heads	#1032
50	16/7	12.09	moorland at top of boar pen track	<i>Potentilla erecta</i> (Common	<i>Aphis tormentillae</i>		At leaf junctions and on	#1038

			25615, 01313	tormentil)			flowers	
51	16/7	16.30	Lodge garden @109m 32693, 14624	<i>Crataegus monogyna</i> (hawthorn)	Dysaphis ranunculi		In pale yellow leaf gall	#1039
52	16/7	17.05	Lodge garden	Tanacetum vulgaris	Macrosiphoniella tanaceti		On flower heads	#1040

ANNEX 2: Target shrub and herb species

ARCTOSTAPHYLOS UVA-URSI (Bearberry)- woody shrub with leathery, conspicuously veined, untoothed leaves, not having downturned edges like Cowberry; white flowers, green to red berries

ARCTOSTAPHYLOS ALPINUS/ (Alpine bearberry) – as above but leaves clearly toothed

Aphis uvaursi: Apteræ are dark brownish green or black; BL 1.3-1.9 mm. On *Arctostaphylos uva-ursi*, forming dense colonies on shoot apices of prostrate mats, tented over by ants. In Scotland, Norway, Sweden, Germany and Poland

Aphis vaccinii: Apteræ are shining greenish black with a fine wax bloom; BL 1.3-2.0 mm. Alatae have secondary rhinaria distributed III 8-17, IV 0-4. On stems of *Vaccinium* spp. and *Andromeda* spp., ant-attended.

Rhopalosiphoninus staphyleae : Migrate to plants to form colonies on roots

Wahlgreniella nervata;

Wahlgreniella ossiannilssonii: Apteræ are shining pale yellow, dark green, reddish brown or greenish black, with siphunculi dark in middle and at tips; BL 1.5-2.3 mm. On undersides of leaves and shoots of *Arctostaphylos uva-ursi*. Boreo-alpine in distribution (northern Europe, Alps and Pyrenees).

Wahlgreniella vaccinii. Apteræ are shining greenish yellow or yellowish green, and have antennae ringed with black; BL 1.6-2.3 mm. On the undersides of leaves of *Vaccinium* spp. in Europe and North America, where it is also recorded from *Arctostaphylos uva-ursi*.

Previously at Dundreggan: *Wahlgreniella vaccinii* in Malaise traps

CALLUNA VULGARIS – (Heather)

Ericaphis ericae: Apteræ are green or brownish green, with tips of antennae and legs black; BL 1.1-1.7 mm. Alatae have a dark dorsal abdominal patch with clear windows. On *Erica* spp., especially *E. tetralix*, feeding on flowers and in shoot apices, where it is often overlooked because of small size and cryptic colouration. It is also recorded from *Calluna vulgaris* and *Daboecia cantabrica*. In northern and western Europe

Ericaphis latifrons. – see aphids on *Empetrum*

Previously at Dundreggan: *Aphis callunae*

CALTHA PALUSTRIS (Marsh Marigold)–

Aphis nasturtii; Rhopalosiphum nymphæae

Previously at Dundreggan: *Rhopalosiphoninus calthæ*

CAMPANULA ROTUNDIFOLIA (Common harebell)

Dysaphis brevisrostris Apteræ are pale brown, with brown siphunculi; BL 1.2-1.6 mm. Alatae have secondary rhinaria distributed III 30-40, IV 8-12, V 4-6. On *Campanula* spp. and *Jasione montana*, usually in moist situations such as rocky or shingly banks of streams. In Europe (only known from UK, Germany and Slovakia).

Rhopalosiphoninus staphyleae: Migrate to plants to form colonies on roots

Previously at Dundreggan *Dysaphis sorbi* (on *Sorbus*); *Uroleucon campanulæ*.

CAREX ECHINATA (Star Sedge) – spikes about 3-4, unstalked, fruits have star appearance

CAREX NIGRA (Common sedge) – female spikes strikingly black

CAREX PANICEA (Carnation grass)

CAREX PILULIFERA (Pill sedge)

CAREX REMOTA (Remote Sedge): all bright pale green, about 4-7 well spaced out unstalked spikes

CAREX ROSTRATA (Bottle sedge) spikes look like a narrow bottle brush

CAREX VESICARIA (Bladder sedge)

Allaphis cyperi; narrowly elliptical body. Apteræ are yellowish green, covered with bluish white wax, with dark appendages, and extensive greyish dorsal sclerotisation leaving a pale spinal stripe; BL 2.3-3.1 mm. and dorsal abdomen with broad dark bars, usually separated between tergites. On leaves of *Carex* spp., often on river banks. Widely distributed in Europe

Allaphis ossiannilssoni: Apteræ are very elongate, pale greyish yellow to greyish brown with darker marginal sclerites, and a dark grey eighth abdominal tergite, secreting bluish wax wool especially at sides and end of abdomen; BL c.1.7-1.9 mm. On *Carex* spp., widely distributed in Europe, **but not so far in UK**

Allaphis producta: Apteræ are very elongate, yellowish white to pale greyish brown, secreting bluish white wax, especially at end of abdomen; BL 1.8-2.5 mm. Alatae have d broad black cross bars that are fused into a solid patch on abdominal tergites 3-6. On leaves of *Carex* spp. in North America, Europe, and across Asia to east Siberia

Allaphis verrucosa; Apteræ are yellow or pale greenish yellow, with antennae distally black and legs mainly pale; BL 2.4-2.8 mm. Alatae have 9- dorsal abdomen with broad dark bars partially separated between tergites. On *Carex* spp. in Europe

Anoecia pskovica (roots);

Atheroides serrulatus; Apteræ are yellow or yellowish brown; BL 1.7-2.4 mm. On leaves of various grasses. Also recorded quite frequently from Cyperaceae (*Carex*, *Juncus*), although this needs confirmation because the specimens may have been collected by sweeping or beating mixed vegetation.

Ceruraphis eriophori – see aphids on Eriophorum;

Forda formicaria (roots, ants nests)

Iziphya bufo; squat-bodied, distinctively marked sedge-feeding aphids, leaping from host when disturbed. Alatae have banded wing veins Apteræ are yellowish or greenish yellow with variable blackish grey markings, but sometimes with dorsum almost completely black; BL 1.4-2.1 mm. Alatae have a dark central dorsal abdominal patch and broadly banded wing veins. On various *Carex* spp., especially *C. arenaria*, and also on *Cyperus* often found in drier situations, but also sometimes in bogs

Iziphya ingegardae; Apteræ have the dorsum strongly arched and are yellowish with dark dorsal markings, including an irregular dark band forming an arc between the siphunculi, fused at least partially in midline; BL 1.8-2.2 mm. On *Carex canescens* and *C. leporina* in bogs in northern Europe **but not so far in UK**

Iziphya memorialis; Apteræ are probably yellowish with dark dorsal markings; BL 1.6-1.9 mm. On *Carex* spp. (*praecox*, *stellulata*, possibly *montana*) in both wet and dry habitats in Europe **but not so far in UK**

Rhopalosiphum oxyacanthae (on roots); Rhopalosiphum padi; Rhopalosiphum rufiabdominale (roots) – common polyphagous spp.;

Saltusaphis scirpus: Apteræ are long-bodied, greyish yellow to greenish yellow, with dark

markings tending to form longitudinal bands, the dorsum being powdered with a very thin layer of greyish white wax; BL 2.3-2.5 mm. Alatae have broad dark dorsal abdominal cross bars and dark-bordered wing veins with spots at their apices, and antennae with 10-21 rhinaria on III. On various Cyperaceae (*Carex*, *Cyperus*, *Scirpus*). In Europe **but not so far in UK**.

Schizaphis caricis: Apteræ are shiny blackish brown to blackish green; BL 1.3-2.4 mm. On *Carex* and *Scirpus*, living in small compact colonies on basal parts of leaves, and often in ant "shelters". In Europe,

Schizaphis pilipes: Colour of apteræ in life is unknown, probably dark brownish; BL 1.6-2.4 mm. Alatae On *Carex acuta* and possibly other *Carex* spp. in Europe

Schizaphis scirpi Apteræ are shiny dark bronze-brown to reddish brown or blackish; BL 1.5-2.8 mm. In ant-attended colonies at leaf-bases of *Typha* and *Sparganium*, also on Cyperaceae (*Carex*, *Eriophorum*, *Scirpus*) and sometimes on Araceae (*Colocasia*), Juncaceae (*Juncus*) or Iridaceae. Throughout Europe

Schizaphis wahlgreni: Colour of apteræ in life is unknown, probably pale, with black antennae (except at base) and siphunculi, and a pale cauda; BL c.2.1 mm. On *Carex vesicaria* in Sweden, Poland, Czech Republic and Hungary **but not so far in UK**

Sipha glyceriae: Apteræ are dull pale green to mid-green, sometimes reddish, often with a paler spinal stripe; BL 1.5-2.4 mm. On many species of Graminae, especially in wetlands.

Sipha maydis; Apteræ are shining dark brown to almost black on dorsal surface; BL 1.0-2.1 mm. Alatae have a solid black dorsal abdominal patch. On numerous species of Poaceae, in more than 30 genera. It feeds on upper sides of leaf blades near bases, sometimes on stems or inflorescences, often attended by ants. In Europe

Sitobion avenae*; *Sitobion fragariae – common polyphagous spp.

Subsaltusaphis flava: Apteræ are dull yellow, with dark intersegmental muscle sclerites (no longitudinal dark stripes), and antennae black except at bases; BL 1.8-2.1 mm.. On *Carex nigra* in Europe

Subsaltusaphis ornata Apteræ are yellow to ochreous yellow with two very distinct pleural longitudinal dark lines, clearly defining a pale spinal band; BL c. 2.7-2.8 mm. On various *Carex* spp., with a record also from *Scirpus sylvaticus*. In Europe,

Subsaltusaphis paniceae: Apteræ are pale yellow, with dark intersegmental muscle sclerites and variably developed longitudinal dark markings similar to those of *S. picta* (q.v.), and with antennae banded on segments III-V, VI being wholly dark; BL 1.3-2.3 mm. On *Carex* spp. in wet meadows in Europe

Subsaltusaphis picta. Apteræ are whitish yellow, with dark transverse intersegmental muscle sclerites, and somewhat less dark and variably developed longitudinal dark markings, the most heavily marked specimens having dark marginal and pleural stripes and a shorter spinal stripe; antennae black beyond basal half of segment III. BL 2.4-3.0 mm.. On *Carex* spp. growing at the edge of water, and sometimes also on *Scirpus* in the same situation. Widely distributed in Europe

Subsaltusaphis pallida: Apteræ are pale yellow, with dark intersegmental muscle sclerites; BL c.2.2-2.7 mm. Alatae are unknown. On *Carex* spp. (*gracilis*, *stellulata*) on river banks, and there is also a record from *Juncus*. In Europe,

Subsaltusaphis rossneri: Apteræ are ochreous yellow, usually with dusky pleural longitudinal stripes on head and thorax, and paired segmental patches plus a faint spinal stripe on abdomen; BL c.2.3-2.5 mm.. On *Carex* spp. (*elata*, *nigra*, *rostrata*, *?vesicaria*) in Europe.

Thripsaphis caricis: Apteræ are dark greyish brown, clothed with bluish grey wax powder; BL 2.5-2.8 mm. Alatae have dorsal abdomen with broad dark bars separated between tergites. On

Carex spp. (*rostrata*, *vesicaria*) in northern and central Europe

Vesiculaphis theobaldi:- Apteræ are variable in colour, yellowish green, pale to mid-green or brownish green to almost black; BL 1.7-2.1 mm. . On undersides of leaves of *Carex* spp., visited by ants, mainly in shady and humid situations. Also recorded from *Eriophorum vaginatum* and *Scirpus maritimus* Widely distributed in Europe

Previously at Dundreggan: none

EMPETRUM NIGRUM (Crowberry) – 6 separate pink petals/sepals; leaf margins rolled under to almost meet below; **berries black 4-10mm**

Ericaphis latifrons;- Apteræ are yellow-green, with tips of antennae and legs black; BL 1.3-1.9 mm. Alatae have broad dark cross-bands more-or-less fused into a patch. On various Ericaceae, most usually *Empetrum nigrum* but also recorded from *Calluna vulgaris*, *Erica umbellatum* and *Vaccinium uliginosum*. In northern and western Europe

Wahlgreniella nervata* ssp. *arbuti.

ERICA CINEREA (Bell Heather) – leaves 5-7 mm long in whorls of 3, with margins downturned to almost meet underneath. Common on drier parts of moors

Ericaphis latifrons:- Apteræ are yellow-green, with tips of antennae and legs black; BL 1.3-1.9 mm. Alatae have broad dark cross-bands more-or-less fused into a patch. On various Ericaceae, most usually *Empetrum nigrum* but also recorded from *Calluna vulgaris*, *Erica umbellatum* and *Vaccinium uliginosum*. In northern and western Europe

ERICA TETRALIX (Cross-leaved heath) – leaves all 2mm or more long in whorls of 4, with margins downturned to almost meet underneath. Flowers almost closed with tiny mouth

Ericaphis ericae:- Apteræ are green or brownish green, with tips of antennae and legs black; BL 1.1-1.7 mm. Alatae have a dark dorsal abdominal patch with clear windows. On *Erica* spp., especially *E. tetralix*, feeding on flowers and in shoot apices, where it is often overlooked because of small size and cryptic colouration. It is also recorded from *Calluna vulgaris* and *Daboecia cantabrica*. In northern and western Europe,

ERIOPHORUM ANGUSTIFOLIUM (Common cottongrass)/

ERIOPHORUM VAGINATUM (Hare's tail cottongrass)

***Anoecia pskovica* (roots)**:- Apteræ are greyish white; BL 2.4-2.7 mm. On roots and subterranean runners of Cyperaceae (*Carex*, *Eriophorum*). In Europe (UK, Denmark, Sweden, Germany, northern Russia) and Central Asia (

Cavariella aquatica : Apteræ in spring colonies on *Salix* spp. they migrate to found summer colonies on plants growing in water or marshy situations. Unusually for this genus, a wide variety of secondary hosts, inc *Eriophorum*. Apteræ on secondary hosts are pale yellowish green, wax-dusted underneath; BL 1.3-2.6 mm.

Ceruraphis eriophori:- Apteræ (including fundatrices) blackish; BL (fundatrices on *Viburnum*) 2.5-3.0 mm, BL (apteræ on Cyperaceae) 2.0-2.8 mm. Curling leaves of *Viburnum* spp. in spring, migrating from second generation to Cyperaceae (*Carex*, *Cyperus*, *Eriophorum*, *Luzula*, *Typha*). Apteræ on secondary hosts have a tuft of wax at end of abdomen. In Europe, northern India

***Colopha compressa* (roots)**:- Galls are formed on the upper surfaces of leaves of *Ulmus* spp., usually *U. laevis*, often near the mid-rib; they are laterally compressed, pouch- or short cockscomb-shaped, yellowish, often tinged with red Alatae (BL 1.4-1.8 mm) - emerge in July

from an opening on the underside of the leaf and found colonies on roots of *Carex* and *Eriophorum*, sometimes in ants' nests. Apteræ on secondary hosts are dark yellowish, secreting flocculent wax; BL 0.9-1.5 mm.

***Metopolophium dirhodum*;**

***Paraschizaphis scirpi ssp. eriophori*;**

***Vesiculaphis theobaldi*.** Apteræ are variable in colour, yellowish green, pale to mid-green or brownish green to almost black; BL 1.7-2.1 mm. . On undersides of leaves of *Carex* spp., visited by ants, mainly in shady and humid situations. Widely distributed in Europe

***EUPHRASIA FRIGIDA* (Eyebright) –**

***EUPHRASIA OFFICINALIS* (Eyebright)**

Hyperomyzus rhinanthi*;** apteræ yellowish green with extensive shiny black sclerotization; In flowers & on flower stems. Also on ***RHINANTHUS MINOR (Yellow Rattle)

Hyperomyzus thorsteinni : apteræ shining bright yellow green; lives on young growth and flowers which become slightly curved & stunted. Alates not described. RARE. Also

***Hyperomyzus zirnitsi*;** ***Myzus cerasi*;** ***Nasonovia ribisnigri*.**

***GALIUM PALUSTRE* –(Marsh bedstraw** – not forming mats, leaves in whorls of 4-6, flowers white, anthers dark red when young

***GALIUM SAXATILE* (Heath Bedstraw) -)**.- matt-forming herb, leaves in whorls of 6-8, flowers white, anthers yellow when young

***Aphis galliscabri*:** Apteræ are greenish black, heavily wax-powdered, BL 1.4-2.2 mm. On upper parts of *Galium* spp., causing shortening of stems so that leaves and flowers of young shoots become close-set;

***Myzus cerasi*:** migrating to secondary hosts in Rubiaceae (*Asperula*, *Galium*) and others. Apteræ on secondary hosts are shining dark brown to yellowish brown or olive green, with black siphunculi and brown cauda;

***Myzus langei*:** are somewhat flattened, dull yellowish to pale green, the abdomen tinged anteriorly with rosy red; BL 1.3-1.9 mm. Alatae have a large dark dorsal abdominal patch. Immatures are bright rosy red. On *Galium* spp., stunting and deforming new growth so that the foliage becomes bunched like a “witches’ broom” Colonies are visited by ants. In north-west, northern and central Europe

***HIERACIUM PILOSELLA* (= *PILOSELLA OFFICINARUM*) (Mouse-ear hawkweed)**

***Aphis gossypii*:** Apteræ vary in colour from dark blackish green or green mottled with dark green (larger specimens in favourable conditions) to very pale whitish yellow. Very polyphagous.

***Aphis pilosellae*:** Apteræ are pale green to dark green, mottled, with black siphunculi and cauda; BL 0.9-1.7 mm. On *Hieracium* spp., mostly of the *Pilosella* group, colonising undersides of basal leaves and subterranean runners. Ant-attended. In Europe, eastward to Russia and Ukraine

***Hyperomyzus hieracii*:** Apteræ shining brownish black with black antennae, siphunculi & cauda. BL 1.7-2.0 mm. Alates have dark abdominal cross bands. In summer colonise upper parts of stems and flowers. In Europe

Nasonovia compositellae ssp. nigra Apteræ are shining black dorsally; BL 1.6-2.5 mm. On *Hieracium* spp. in Europe, feeding (*ssp. nigra*) in spring on the upper sides of the leaves which fold upwards to enclose the colonies, later feeding on stems and inflorescences.

***Nasonovia pilosellae*:** Apteræ are shining green to black; BL 1.2-2.5 mm. On *Hieracium* spp.

living in spring inside upwardly rolled leaves, later moving onto stems and flowers. Throughout most of Europe

Pemphigus busarius: They found colonies mainly on roots of Compositae. Apteræ on roots of secondary hosts are yellowish white with a tuft of white wax on the posterior part of the abdomen;

Pleotrichiphorus deviatus: Apteræ are dull whitish; BL 1.8-2.4 mm. On undersides of leaves of *Hieracium* spp. in continental Europe

Trama troglodytes: Apteræ are white, yellowish white, or grey (older adults); BL 2.5-3.9 mm. They occur in ant-attended colonies on the roots of numerous Compositae. In Europe

Uroleucon cichorii: Apteræ are shining metallic brown with black antennae, legs and siphunculi, and pale yellow cauda; BL 2.7-4.7 mm. On upper parts of stems of *Cichorium* and related genera of Cichorieae (*Crepis*, *Hieracium*, *Lactuca*, *Lampsana*, *Leontodon*, etc.). In Europe

Uroleucon obscurum: Apteræ are reddish brown to bronze with black siphunculi and yellow cauda; BL 2.2-3.7 mm. On upper parts of stems of *Hieracium* spp. in Europe, south to Spain and eastward to Russia, and

Uroleucon pseudobscurum: Apteræ are very dark bronze, with black siphunculi and pale yellow cauda; BL 2.5-3.2 mm. In large colonies on stems of *Hieracium* spp. in Italy, Slovakia, Byelorussia but not yet in UK.

Previously at Dundreggan: *Nasonovia ribisnigri*, *Uroleucon pilosellae*

LAPSANA COMMUNIS (Nipplewort)

Hyperomyzus lampsanae: Apteræ are ivory white (light green?); BL 2.3-3.0 mm Alates have a dark trapezoid central abdominal patch. Lives on undersides on radical (and stem) leaves.-

LEONTODON AUTUMNALIS

Uroleucon leontodontis

Previously at Dundreggan: *Nasonovia ribisnigri*, *Uroleucon hieracii*, *Uroleucon leontodontis*?

PICRIS ECHIODES (Bristly ox-tongue)

PICRIS HIERACOIDES (Hawkweed oxtongue)

Hyperomyzus picridis: Shining pale yellow green to dark green with dark intersegmental markings; dusky siphunculi & cauda; BL 2.0-2.8 mm

Uroleucon picridis: Apteræ are dark shiny reddish brown to black, with black antennae & siphunculi, legs brown black except basal halves of femora are yellow, cauda yellow, BL 2.6-3.7 mm./

POLYTRICHUM spp (Haircap mosses) & SPHAGNUM

Decorosiphon corynothrix Apteræ are brownish green to brownish yellow; BL 1.4-1.9 mm. On basal parts of *Polytrichum* spp. growing in damp, shady situations. Also recorded from *Catharinaea* (=Atrichum) *undulata*. Europe

Melaphis rhois (Fitch) Forming closed, sac-like red and white galls (fig. 129) on leaflets of *Rhus* spp. (*glabra*, *typhina*) in North America. Emigrant alatae (BL 1.4-1.7 mm) emerge in late August-October and fly to mosses. Apteræ on mosses are pale with darker antennae and legs; BL 0.8-1.2 mm; a detailed redescription of them was provided by Pike *et al.* (2012).

Anholocyclic populations also occur all-year-round on mosses, and have been introduced into Europe

Muscaphis musci;: Apteræ are greyish yellow, pale brown, or shiny dark olive-green, with reddish brown siphunculi; BL 0.5-1.0 mm. Alatae are larger (BL 1.1-1.5 mm),. On mosses in the genera Europe

Myzodium modestum; Apteræ are reddish brown to dark brown or olive, sometimes greenish posteriorly, dorsum shiny, antennae and legs brown, siphunculi blackish; BL 1.2-1.9 mm. Alatae have secondary rhinaria distributed III 21-45, IV 7-13, V 0-4, and a large dark dorsal abdominal patch. On various mosses, e.g. *Catharinaea* and *Polytrichum* (Polytrichaceae); *Pohlia* (Bryaceae); and *Rhacomitrium* (Grimmiaceae). It is also the only aphid recorded from *Sphagnum* (Sphagnaceae). It is not attended by ants

Previously at Dundreggan: none

VACCINIUM MYRTILLUS (Bilberry)

VACCINIUM VITIS-IDAEA (Cowberry)

Acyrtosiphon brachysiphon: Apteræ are waxy green in life, 1.8-2.8 mm, with siphunculi hardly longer than cauda, their apices slanted outwards. This aphid has a boreoalpine distribution on *Vaccinium* spp. but not so far in UK.

Aphis vaccinii: see aphids on *Arctostaphylos*

Aulacorthum flavum; Apteræ are shining yellow or greenish yellow, with yellowish brown spots at bases of siphunculi; BL 1.5-2.1 mm. On leaves and shoot apices of *Vaccinium* spp., especially *V. uliginosum*. In northern and central Europe., not so far in UK

Aulacorthum rufum: : apteræ are green or dirty reddish brown, slightly wax powdered laterally and ventrally, BL 2.0-2.7 mm lives all year round on young shoots and undersides of leaves of *Vaccinium* usually bilberry

Pachypappa myrtilli: Apteræ secreting wax; BL 1.2-1.4 mm. Described from roots of *Vaccinium myrtillus* in Germany

Wahlgreniella vaccinii. see aphids on *Arctostaphylos*

Previously at Dundreggan: *Wahlgreniella vaccinii* in Malaise traps

ANNEX 3: Target tree species

ALNUS GLUTINOSA – (Alder)

Glyphina betulae - see under *Betula pendula*

Glyphina jacutensi: Apteræ are brown; BL 1.7-2.0 mm. Immatures are pale brown.

Monoecious holocyclic, in colonies on young growth of *Alnus* spp., ant-attended. In central and northern Europe. **but not yet in UK**. The life cycle is reported to be like that of *G. betulae*.

Pterocallis maculata: Apteræ are yellowish green or green with a variably developed pattern of rather diffuse dark green dorsal cross-bands, black apices to antennal segments, a black spot near apex of hind femur, and black tarsi; BL 1.4-2.1 mm. Alatae have greenish abdomen with dark green markings. On undersides of leaves of *Alnus* spp., especially *A. glutinosa*, usually along main veins, almost always attended by ants. Widely distributed in Europe.

Stomaphis quercus.- see under *Betula pendula*

Previously at Dundreggan: *Pterocallis alni*

BETULA NANA – (Dwarf Birch)

Betulaphis pelei: Apteræ are yellow with dark tarsi and tips of antennae, BL 1.4-1.7 mm.

Alatae sometimes have a dark dorsal abdominal patch. Feed scattered on underside of leaves.

On *Betula nana* with a boreo-alpine distribution in North Europe, Iceland and Greenland, **but not yet in UK**

Calaphis arctica: Apteræ of BL about 1.9-2.1 mm, green, with dusky dorsal hairs and spots. Probably feeds on young shoots like other *Calaphis* spp. .Originally described from *Betula nana* in Greenland, and since recorded from Finland, alpine Germany and Czech Republic, **but not yet in UK**

Euceraphis borealis: mainly N America

Symydobius nanae: Brown to dark brown, with dark appendages except for two pale rings on distal halves of antennae; BL probably 2-3 mm. In small aggregations on young branches of *Betula nana*; only known from apterous viviparæ, oviparæ and males collected in September in Czech Republic. **Not yet in UK**

Previously at Dundreggan: none

BETULA PENDULA (Silver Birch)

Betulaphis brevopilosa: Apteræ are pale to grass-green aphids, BL 1.5-2.0 mm, with the tips of the antennae and the tarsi dark. Alatae almost always have a dark dorsal abdominal patch.

Aptera with spinal and pleural hairs, or at least those on abdominal tergites 1-4, inconspicuous, much shorter than posterior marginal hairs and those on abdominal tergite 8. Frequently confused with *B. quadrituberculata* which has all dorsal body hairs long and capitate. It seems to feed mostly on *Betula pendula*, usually on the upper surfaces of the leaves, in north and central Europe (**but not yet in UK**). Examine all specimens of *Betulaphis* carefully!

Callipterinella calliptera: Apteræ yellowish green to green, usually with dark transverse bands on all tergites; BL 1.5-2.5 mm. Alatae have dorsal markings less well developed. In ant-attended groups on undersides of leaves of *Betula* spp., often inside leaves sewn up by lepidopterous larvae; on *B. pendula*, less commonly *B. pubescens*, in Europe:

Callipterinella minutissima: Apteræ are very small, stout, oval -bodied, green to yellowish green with a dark transverse bar on abdominal tergite 8 only; BL 0.9-1.4 mm. On *Betula* spp.

(*pendula*, *pubescens*) in Europe. The size and shape of the apterae enable them to feed inside bud scales and developing leaves when the buds burst in spring, and in the female catkins in summer.

Callipterinella tuberculata; Apteræ are yellowish with a brown head and dark brown dorsal abdominal markings comprising especially a dark quadratic patch on ABD; BL 1.7-2.2 mm.

Alatae have irregular small sclerites on posterior abdominal tergites, but no transverse bands.

Apparently specific to *Betula pendula* in Europe,

Glyphina betulæ: Apteræ are dark green to almost black with a pale spinal stripe; BL 1.2-2.0 mm. Immature stages are green. Monoecious holocyclic, in colonies on young shoots of *Betula* spp., especially *B. pendula*, and occasionally on *Alnus* spp. Ant-attended. The life cycle is abbreviated; oviparae appear in July, and apterous males in August. Throughout Europe,

Hamamelistes betulinus: Apteræ in blister-like pseudogalls on birch are greenish or dark brown to black, BL about 1.5 mm, secreting white wax. They have short, 3- or 4-segmented antennae, and lack siphuncular pores in European populations. *H. betulinus* is anholocyclic on *Betula* spp., mainly on *B. pendula*, in Europe and northern Asia, east to Mongolia. It feeds on the undersides of the leaves causing pale yellowish blisters to develop on the upper surfaces and overwinters as aleyrodiform/ coccidiform first instar larvae on the twigs.

Hormaphis betulæ: Small, flattened, subcircular yellowish green or yellowish brown aphids with a fringe of radiating wax filaments, dispersed on undersides of birch leaves, not causing any leaf deformation. *H. betulæ* is anholocyclic on *Betula* spp. in northern and central Europe, and in Siberia

Monaphis antennata: All adult viviparae are alate, robust, ventrally flattened, green, with very long thick black antennae and an elongate dark pterostigma in the forewing; BL 3.3-4.3 mm. They live solitarily on *Betula* spp. in Europe, Immatures are cryptic, and usually press themselves close along the mid-ribs on the upper sides of leaves. They migrate to the undersides of the leaves for the final moult, and the adults produce their offspring at an unusually rapid rate. Monoecious holocyclic. **Rare!**

Stomaphis quercus: Apteræ are elliptical to elongate oval, shining dark brown; BL 5.5-7.0mm. In bark crevices on trunk of *Quercus* spp, *Betula pendula* and occasionally *Alnus glutinosa*. Throughout Europe, and west Siberia. Sexual morphs occur in October-November. Usually attended by the ant *Lasius fuliginosus* **Rare!**

Previously at Dundreggan: *Betulaphis quadrituberculata*, *Calaphis betulicola*; *Calaphis flava*; *Euceraphis betulæ*;

BETULA PUBESCENS (Downy Birch) –

For *Callipterinella calliptera*, *Callipterinella minutissima* *Callipterinella tuberculata*, *Glyphina betulæ* – see *Betula pendula*

Glyphina pseudoschrankiana Apteræ are black with variable white markings; BL 1.5-1.8 mm. Immature stages are brown. Monoecious holocyclic, in colonies on young shoots, often on young trees, of *Betula pubescens* and related downy birches, attended by ants. In north-west Europe and Japan

For *Hamamelistes betulinus*, *Monaphis antennata*, *Stomaphis quercus* – see *Betula pendula*

Previously at Dundreggan: *Betulaphis quadrituberculata*, *Calaphis betulicola*; *Calaphis flava*; *Clethrobius comes*, *Euceraphis punctipennis*

JUNIPERUS COMMUNIS (Juniper)

Cinara mordvilkoii; Apteræ have a light coffee-brown wax-dusted head and thorax, and darker

shining bronze abdomen; BL 2.7-3.3 mm. On young growth and branches of *Juniperus communis* in Czechoslovakia, Latvia, Poland and Italy, . **but not yet in UK.** Found by Durak (2014) in Poland to prefer shaded humid habitats. Move to branches close to ground or roots covered with soil in summer. **May form mixed colonies with *C. juniperi*.**

Gootiella tremulae Found colonies on roots of *Juniperus* spp. Apterous exules are globular, grey, covered in white wax; BL 0.9-1.5 mm. Recorded from roots of *J. communis* in Britain (Carter & Danielsson 1993. Anholocyclic overwintering on juniper roots is probably common. UK, Denmark, Scandinavia and Poland

Previously at Dundreggan:

***Cinara juniperi*:** *Cinara juniperi* apterae are rather more rounded in profile than most species. They are pinkish-brown **with fairly uniform wax dusting** not forming a pattern, which distinguishes *Cinara juniperi* from *Cinara mordvilko* where the posterior is wax free. They feed on the needles and young shoots of juniper early in the season (see first picture), but later in the year they move to the base of shoots and young branches (see second picture). *Cinara juniperi* feeds on *Juniperus communis* (common juniper) and its varieties. **May form mixed colonies with *C. modvilko* so check all colonies.**

***Cinara smolandiae*:** Apteræ in Sweden have been described as dusky brownish grey with dull bronze metallic highlights in sunlight. The siphuncular cones are shiny black. In Scotland apterae are somewhat smaller and vary from light coffee to chestnut brown with only a light wax dusting on the head and thorax. The body length of *Cinara smolandiae* is 2.9-4.4 mm. In Sweden colonies were always ant attended, but in Scotland only one of the two colonies found was attended. In Scotland *Cinara smolandiae* was parasitized by the aphidiine *Pauesia laricis*, a generalist primary parasitoid of *Cinara* spp., but not recorded previously targeting aphids from the subgenus *Cupressobium*. The aphid mummies were blue-black in colour.

POPULUS TREMULA (Aspen)

***Chaitophorus leucomelas*:** Wingless females of *Chaitophorus leucomelas* are elongate oval in shape and vary from green to yellow. They usually have two dark stripes along the sides which may be divided segmentally. The stripes tend to merge on the fifth abdominal tergite as can be seen in the first picture below. They have dark siphunculi. The body length ranges from 1.2 to 2.4 mm. Alates have dark brown dorsal abdominal cross-bands and separate marginal sclerites visible in the second image below. The host plant of *Chaitophorus leucomelas* in Europe is mainly black poplar (*Populus nigra* and related species

***Chaitophorus longisetosus*:** Apteræ elongate oval, blackish-brown including siphunculi, with antennae and legs also mainly dark; BL 1.4-1.9 mm. Alatae have not been found. In small colonies mainly on older trees of *Populus alba*, on undersides of leaves, especially those spun together by other insects. Oviparae, which are larger (BL 1.8-2.5 mm), occur in the colonies in October, but males are unrecorded. In east **Europe but not yet in UK**

***Chaitophorus nassonovi*:** Apteræ brownish-red to brown, oval; BL 1.5-2.8 mm. Alatae have dark dorsal abdominal cross-bands and marginal sclerites. In ant-attended colonies on bark of young and older twigs or leaf petioles of *Populus nigra* and its varieties and hybrids, in eastern and central Europe **but not yet in UK;**

***Chaitophorus populati*:** Adult apterae are oval, shiny dark green to black. There is sometimes a paler stripe along the midline of the thorax and the front of the abdomen. The body length is 1.5-2.9 mm. Alates are dark green to black with broad brown dorsal abdominal cross-bands and marginal plates. The wing veins are brown-shadowed. The poplar shoot aphid lives on the young

shoots and terminal leaf petioles of various Poplar (*Populus* spp.) especially of the Aspen (*Populus tremula*) and White Poplar (*Populus alba*). It is usually attended by ants.. It is found throughout the Palaearctic region.

Gootiella tremula: Forming large pale green to yellowish bag-like galls from single leaves of *Populus tremula*, often situated rather high up in old trees and therefore hard to find. The gall is formed from a longitudinally folded leaf which is paler than the normal leaves and becomes much enlarged with a thickened petiole. Emigrant alatae are greyish green, clothed with wax, BL 3.2-4.0 mm, which leave galls in early July to found colonies on roots of *Juniperus* spp. Apterous exules are globular, grey, covered in white wax; BL 0.9-1.5 mm.;

Pachypappa populi: Forming large pale green, yellowish to slightly reddish blister-like galls(open to the underside, on leaves of *Populus tremula* in Europe.. The fundatrix is bluish grey-black, with sparse or no wax; BL 5.1-6.3 mm. Alatae, with olive green abdomen and BL c. 3.5 mm, migrate in early July in Europe, to found large colonies in flocculent wax on roots of *Picea abies*.

Pachypappella lactea: The gall is formed on *Populus tremula* by folding down of the leaf lamina to form a cone, which becomes bright orange. Fundatrices are greyish brown with white wax; BL 4.6-5.2 mm. All second generation are alate, with dark greyish brown abdomen, BL 2.5-3.5 mm, migrating in June-July to colonise roots of *Picea abies* (Danielsson 1990).

Phloeomyzus passerinii; Apteræ are green, covered with dirty white wax wool; BL 1.2-2.2 mm. On bark and in crevices on trunks of *Populus* spp., heaviest infestations occurring on 6 to 8-year-old trees. In Europe, north Africa (Egypt, Morocco), south-west, central and east Asia

Pterocomma populeum: Apteræ are yellowish grey or brownish, with paired dark patches at least on posterior abdominal tergites, intersegmental cross-bands of greyish white wax, and pale siphunculi; BL 2.7-4.3 mm. Alatae have broad dark dorsal abdominal cross-bands. On branches or two-year-old twigs, or in bark crevices, of many *Populus* spp., but especially common on *P. nigra* and its varieties. Widespread in Europe

Stomaphis longirostris. Apteræ are whitish powdered with greyish-white wax; BL 6.0-6.5 mm. On trunks of *Populus* spp. (*nigra*, *tremula*) and *Salix* spp. (*alba*, *viminalis*). There is also a record of a population on *Acer campestre*. In continental Europe (France, Netherlands, Germany, Italy, Spain), Turkey and western Siberia **but not yet in UK**.

Previously at Dundreggan: *Pterocomma tremulae*, *Pachypappa tremulae* and *Chaitophorus tremulae*

***SALIX* spp.**

***SALIX AURITA* (Eared Willow)**: shrub to 2.5m; dist. from *S. cinerea* by its reddish petioles and young twigs + persistent kidney shaped stipules along shoots

***SALIX CAPREA* (Goat Willow)** – leaves less than twice as long as broad; grey with dense covering of short hairs below; hybridises with grey willow

***SALIX CINEREA* (Grey Willow)**- leaves have rust coloured hairs on veins below, most leaves 2-4 times as long as broad; hybridises with eared willow

***SALIX REPENS* (Creeping Willow)** – creeping shrub; leaves < 5x as long as broad, densely silky beneath with appressed hairs, silky both sides when young

***SALIX HERBACEA* (dwarf willow)** – creeping shrub, willow buds enclosed in single scale, leaves hardly longer than broad, shiny with rounded teeth

***SALIX PENTANDRA* (Bay Willow)**: leaves dark green & glossy above, paler on underside, hairless 2.5-4 times as long as broad

***SALIX PHYLICIFOLIA* (Tea leaved willow)** – shrub, leaves rigid, bright shiny green and

hairless above, grey and waxy beneath.

Aphis farinosa; Apteræ 1.6-2.5 mm, dull pale to mid green with cauda distinctly darker than the long pale siphunculi, in dense colonies on young shoots of *Salix* spp. in spring and early summer, attended by ants. Monoecious, with green oviparae and orange males appearing from July onwards,

Cavariella aegopodii*; *intermedia konoii*; *Cavariella pastinacae: common host alternating aphids

Chaitophorus capreae; The apteræ are white to yellowish-white. The body is not markedly narrow. The cauda has a distinctly knobbed apex. The body length is 0.8-1.9 mm. Neither the apteræ nor the alates have any distinct dark dorsal abdominal markings. Mostly on broad-leaved *Salix* spp. Aphids are usually scattered on the undersides of leaves and are not attended by ants.

Widespread in Europe, and eastward to Central Asia.

Chaitophorus niger: Apteræ are blackish-brown with mainly pale antennae and legs, a thin pale ring around the base of each siphunculus, and a pale cauda; BL 1.0-2.4 mm. Alatae have brown dorsal abdominal cross-bands. Living separately or in small colonies on leaves of various *Salix* spp., only rarely visited by ants

Chaitophorus ramicola: Apteræ are broadly oval, mainly very dull greyish olive to black with a more-or-less distinct paler spinal stripe, and dark antennae and legs; BL 1.4-2.6 mm. Alatae have narrow dorsal abdominal cross-bands. In ant-attended colonies on bark of twigs of mainly broad-leaved *Salix* spp., in north, central and eastern Europe, Iran and Kazakhstan **but not yet in UK.**

Chaitophorus salicti: Adult apteræ in spring are black with a pale spinal stripe in spring, but in summer are light yellowish-green with reddish-brown or greyish-black dorsal markings (see picture below). The body length is 1.3-1.8 mm. The siphunculi are sometimes surrounded by a membranous ring, at other times fused solidly into the dorsal carapace. The alates are dark, with broad dorsal abdominal cross-bands. The aphids live along the veins on the underside of leaves of various broad-leaved *Salix*. They are usually ant-attended.

Chaitophorus truncatus; apteræ are elongate oval in shape. In spring they are pale green with three darker green interrupted longitudinal stripes. In early summer and autumn some are solidly blackish on the dorsum. Their antennae are half the length of the body, and the terminal process is 2.2-3.2 times as long as the base of the last antennal segment. The siphunculi are pale, as are the legs and antennae. The body length of *Chaitophorus truncatus* is 1.2-2.4 mm. The green willow leaf aphid lives in small colonies on leavers of various narrow leaved willows including *Salix purpurea*, *Salix amygdalina*, *Salix alba* and *Salix triandra*.. *Chaitophorus truncatus* does not host alternate, and is not ant attended. It is distributed throughout Europe

Chaitophorus vitellinae: Apteræ are broadly oval, yellowish-green with two broad darker green to greenish-brown pleural longitudinal stripes, and pale antennae and legs; BL 1.3-2.3 mm. Alatae have dark dorsal abdominal cross-bands. On bark of young twigs and leaf petioles of narrow-leaved *Salix* spp., especially *S. alba*, attended by ants

Plocamaphis amerinae: Apteræ are yellowish, greenish or brownish, wax-covered in life, with dark head, antennae and legs; BL 3.0-4.5 mm. On young growth of *Salix* spp. (*alba*, *purpurea*, *viminialis*), often in large colonies and sometimes causing damage in osier plantations. In north-west and north Europe, eastwards to west Siberia

Plocamaphis flocculosa; Apteræ are grey or yellowish grey, densely covered with wax powder; BL 3.1-5.0 mm. Head, legs and antennae are darker, and siphunculi are orange. On trunk and branches of *Salix* spp. in Europe (*caprea*, *cinerea*, *nigricans*, *repens*).

Pterocomma jacksoni: Apteræ vary in colour from pinkish or reddish brown to brown-black, with a greenish tinge, sometimes have fine lines of wax as in *italica* and *salicis*, and orange-yellow siphunculi; BL 2.2-4.3 mm. Alatae are without dorsal abdominal cross-bands. On branches or stems of *Salix* spp. (*aurita*, *caprea*, *cinerea*, *repens*), forming dense ant-attended colonies either above or below ground level. Widely distributed in Europe (see Heie 1986), but uncommon.

Pterocomma konoi*; *Pterocomma pilosum: Apteræ are greenish, greyish or brownish, with yellow siphunculi; BL 3.0-4.0 mm. In dense ant-attended colonies along stems and branches of many *Salix* spp

Pterocomma rufipe: Apteræ are variably pigmented, grey or dull reddish brown to dark brown with spots of powdery wax and yellowish siphunculi; BL 2.9-4.6 mm. Alatae have variably developed dorsal abdominal cross-bands. On twigs and young branches of numerous *Salix* spp, attended by ants

Pterocomma salicis: Apteræ and alatae are greenish black to black, marked dorsally with greyish white wax powder including a spinal stripe and lateral spots, and bright orange siphunculi; BL 2.7-4.5mm. Forming dense colonies on two-year-old twigs and wands of *Salix* spp, attended by ants. Widely distributed in Europe and Asia

Previously at Dundreggan: *Cavariella theobaldi*, *archangelicae*, *pastinacae*

***SORBUS AUCUPARIA* (Rowan)**

Aphis pomi: Apteræ are bright apple-green with black siphunculi and dark cauda; BL 1.3-2.2 mm. In dense colonies on young growth of several genera of woody Rosaceae ***Eriosoma***

sorbiradicis: Apteræ yellowish white, with sparse wax; BL 0.7-1.4 mm. They live singly or in small colonies on rootlets of *Sorbus aucuparia*). Recorded from Scotland (Stroyan 1991) and elsewhere

Muscaphis escherichi: Apteræ (fundatrices) are plump-bodied, matt dark brown to purplish black with rather shiny black siphunculi; BL 2.7-4.4 mm. They are found in spring in curled leaflets of *Sorbus* spp., usually with one fundatrix and its progeny in each). The second generation are almost all alatae (BL 1.7-2.7 mm), and leave *Sorbus* from late June to early August to mosses (*Plagiothecium*)

Ovatus insitus.: Apteræ are greenish white, rather shiny; BL 0.9-1.9 mm. In spring on undersides of young leaves of *Crataegus* spp. or *Mespilus germanica*, sometimes on *Cydonia*, *Pyrus* or *Sorbus*. Heteroecious holocyclic, migrating for the summer to *Lycopus*. In Europe and south-west Asia

Previously at Dundreggan: *Dysaphis sorbi*; *Rhopalosiphum oxyacanthae*
