

# Plant Galls Survey of Big Wood, Hampstead Garden Suburb, London, NW11

On behalf of:

**Friends of Big Wood**



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## **0 SUMMARY**

- 0.1 A Plants Galls Survey and Plant Galls Walk was commissioned by the Friends of Big Wood of the Big Wood Nature Reserve, Hampstead Garden Suburb, London, NW11.
- 0.2 The survey was conducted on 28<sup>th</sup> August 2021 by ecologist Tommy Root BSc ACIEEM (Professional Ecologist, LNHS Plants Galls Recorder, BPGS Vice-Chair). The survey consisted of a survey of host plants looking for plant galls within the Big Wood Nature Reserve. A plant galls walk was conducted by Tommy Root, on 5<sup>th</sup> September 2021, as an introduction to the topic of plant galls for the Friends of Big Wood.
- 0.3 Plant galls are unnatural growths of plant-based tissue induced by invading organisms for which the invader gains benefit. Any size plant can be galled as can all plant parts. They come in a variety of shapes and colours, but most are small in size.
- 0.4 Cecidology, the study of plant galls, has been gaining in popularity. An increasing number of people are becoming interested in these intriguing plant-based growths induced by an invading organism. Plant gall surveys are now conducting regular throughout the country. In the 1980's, with the aim of promoting all aspects of plant gall study, the British Plant Gall Society was founded. Many natural history societies now have a plant galls recorder. Recording schemes recognize the legitimacy and value of plant gall surveys and welcome survey results.
- 0.5 The plant galls survey consisted of a visual inspection of host plants present in Big Wood looking for the sign of plant galls on plant parts known to be galled. For accuracy, a comprehensive identification book was used.
- 0.6 The survey resulted in the finding of twenty-one gall types induced by twenty species.
- 0.7 The major factor in terms of gall species found in such surveys is due to the host species present. Other relevant factors affecting survey results include: the time of year, variation in inducer life cycles, potential for inducer movement and connectivity of the site in relation to other bio-diverse sites.

## **1 INTRODUCTION**

### **1.1 Background**

- 1.1.1 Tommy Root was commissioned by Friends of Big Wood to undertake a Plants Galls Survey of the Big Wood Nature Reserve and a Plant Galls walk for the Friends of Big Wood
- 1.1.2 Plants galls are unnatural growths of plant-based tissue induced by invading organisms for which the invader gains benefit. The invader, by various methods depending on the inducer group, causes enlargement/proliferation of host cells to form a structure – the plant gall. The plant gall is then used, for all or part of the organism’s life cycle, as: a breeding site, for shelter or for food. Plant galls are caused by a variety of different organisms including insects, mites, fungal agents, nematodes, bacteria, viruses and a small number of more niche groups. Plant galls are generally (but not always) small and come in a variety of shapes, colours and textures. Examples of gall morphology include: spikey objects, spheres, woody growths, enlarged leaf rolls, unusual leaf conglomerations, distorted growths, enlarged buds, leaf pustules or induced hairs. Any size plant can be galled as can all plant parts. Plant gall inducers generally tap into the natural growth systems within the plant, i.e. plant galls occur where growth is going to occur. See Appendix 4 for a more complete introduction to the topic.
- 1.1.3 Plant galls are considered to be an extension of the inducing organism’s phenotype, as such all plant galls are named after the gall causer. In most cases, recognising the plant gall on the correct host species and it occurring on the usual plant part is enough to result in a successful identification.

## **2 METHODOLOGY**

### **2.1 The survey**

- 2.1.1 The plant galls survey consisted of a visual inspection of host plants present at Big Wood looking for the sign of plant galls on plant parts known to be galled.
- 2.1.2 Survey methodology not only includes looking for galls already known to affect particular host species but also looking at visual signs outside of the normal development of host species (unusual swellings, shapes, textures, discolourations etc).
- 2.1.3 All species correctly identified were recorded.

### **2.2 Study Limitations**

2.2.1 Limitation factors affecting a plant galls survey include: presence and number of host species, time of year relating to inducer life cycles, local abundance of inducers and connectivity of the site.

2.2.2 The survey was conducted in late August, as such some earlier occurring galls might not be present

## **2.3 Site Survey - Methodology**

### *Habitats and Surroundings*

2.3.1 The site was visited on the 28<sup>th</sup> August 2021 to survey for Plant Galls. The following information was noted:

Host plant, scientific name of gall inducer, common name (where applicable), description of gall (including plant part that the gall was found on), inducer group, generation of gall inducer (this applies to wasp galls on oak).

### *Equipment & accuracy*

2.3.2 Equipment available for use during the survey included; x10 hand lens, camera with macro facility (Olympus Tough TG-4), smart phone, identification keys, clipboard, paper + pencil, penknife and plastic resealable bags for collection of samples.

2.3.3 For accuracy, the comprehensive FSC keys British Plant Galls, written by Redfern & Shirley (2011), was used for reference and identification purposes. Also at hand was access to comprehensive websites concerned with identification (e.g. the excellent Dutch Bladmineerders website), British Plant Galls Facebook group and access to specific group experts within the British Plant Galls Society.

## **2.4 Further Site Visit**

### *Walk, Talk & Identification Session*

2.4.1 A plant galls walk for the Friends of Big Wood was conducted on the 4<sup>th</sup> September 2021.

2.4.2 The walk started and finishing at the Temple Fortune entrance. The walk introduced the topic of plant galls then used various found examples of galls on-site at selected places along a circular walk.

2.4.3 Some of the topics covered on the walk included: introduction to plant galls, diversity of gall inducers, gall types, insect herbivory, what to look for on specific host plants, tips on gall hunting and relevant information to record when surveying.

### 3 RESULTS

#### 3.1 Site Survey Results

Table 1 – Results of Plant Galls Survey

Host plant	Scientific name	Description/Common name	DAFOR Relative Abundance
<b>Arachnid – Acari: mites</b>			
Sycamore – <i>Acer pseudoplatanus</i>	<i>Aceria cephalonea</i>	Small red leaf pustules – on leaf upper side	O
Field maple – <i>Acer campestre</i>	<i>Aceria macrochela</i>	Larger pustules following leaf veins – on leaf upper side	O
Field maple – <i>Acer campestre</i>	<i>Aceria myriadeum</i>	Small red leaf pustules – on leaf upper side	O
Hornbeam – <i>Carpinus betulus</i>	<i>Aceria tenella</i>	Small mid-rid leaf pustules – pustule on upper, erinea (mite induced hairs) on underside	O
Wood avens – <i>Geum urbanum</i>	<i>Cecidophyes nudus</i>	Leaf swellings on upper side with erinea on underside	R
Wild service – <i>Sorbus torminalis</i>	<i>Eriophyes torminalis</i>	Small leaf pustules	R
<b>Insect - Hemiptera: Psylloidea (jumping plant louse)</b>			
Ash – <i>Fraxinus excelsior</i>	<i>Psyllopsis</i> group	Leaf roll with thickening – tinged purple	A
<b>Insect - Diptera: Cecidomyiidae (gall midge)</b>			
Bramble - <i>Rubus fruticosus</i> agg	<i>Dasineura plicatrix</i>	Twisted, buckled leaves + thickened veins	O
Yew - <i>Taxus baccata</i>	<i>Taxomyia taxi</i>	“Artichoke” gall – formed by clusters of leaves	O
<b>Insect - Hymenoptera: Cynipidae (gall wasp)</b>			
English oak – <i>Quercus robur</i>	<i>Andricus aries</i>	“Ramshorn gall” – a bud gall.	R
English oak – <i>Quercus robur</i>	<i>Andricus gemmeus</i> (agamic)	Raised cone-like bumps – a trunk gall (on areas of epicormic growth)	A
English oak – <i>Quercus robur</i>	<i>Andricus kollari</i> (agamic)	“Marble gall” - a bud gall	R
English oak – <i>Quercus robur</i>	<i>Andricus quercuscalicis</i> (agamic)	“Knopper gall” – an acorn gall.	A
English oak – <i>Quercus robur</i>	<i>Andricus quercuscorticis</i> (agamic)	Conical shaped galls often in clusters – a trunk gall (on areas of epicormic growth)	R
English oak – <i>Quercus robur</i>	<i>Neuroterus albipes</i> (sexual phase)	Spherical gall on edge leaf underside (an old example was found)	R
English oak – <i>Quercus robur</i>	<i>Neuroterus albipes</i> (agamic)	“Smooth Spangle galls” – on leaf underside	A
English oak – <i>Quercus robur</i>	<i>Neuroterus anthracinus</i> (agamic)	“Oyster” gall – small, oval gall on leaf underside	R
English oak – <i>Quercus robur</i>	<i>Neuroterus quercusbaccarum</i> (agamic)	“Common Spangle galls” – on leaf underside	A
English oak – <i>Quercus robur</i>	<i>Neuroterus numismalis</i> (agamic)	“Silk button galls” – on leaf underside	A
Dog rose – <i>Rosa canina</i> agg	<i>Diplolepis nervosa</i>	“Sputnik” gall – a spiky leaf gall	R
<b>Fungal - Uredinales: Phragmidiaceae</b>			
Dog rose – <i>Rosa canina</i> agg	<i>Phragmidium mucronatum</i>	Small rust fungus pustule type galls – on leaves	O

- 3.1.1 Twenty-one gall types induced by twenty species were found. Nine host plants were found with galls. Five groups were found to have induced galls: arachnid - mites, insect - Hemiptera, insect – Diptera, insect – Hymenoptera and fungi.
- 3.1.2 NOTE: Due to a cyclical pathogenic life cycle, gall wasps inducing galls on oaks are known to produce two very different galls. A sexual phase where male and female wasps hatch and emerge from induced galls (earlier in the year) and an agamic stage (asexual females only) later in the year. It is possible to find two very different types of galls induced by the same wasp species, often on different parts of the oak, at the same time of year. Some gall wasps utilize two different oak species for both parts of their life cycle - native oak species and *Quercus cerris*.

## 3.2 Description of Plant Galls Found

### *Mite induced Plant Galls*

- 3.2.1 *Aceria cephalonea* on Sycamore. These small red leaf pustules are found on leaf upper side. Can be a brighter shade of red with higher sunlight exposure. A fairly common species.
- 3.2.2 *Aceria macrochela* on Field maple. These large pustules following leaf veins on the upper side. The pustules are usually white but can sometimes be tinged red. A fairly common species.
- 3.2.3 *Aceria myriadeum* on Field maple. These small red leaf pustules are found on leaf upper side. Can be a brighter shade of red higher sunlight exposure. A fairly common species.
- 3.2.4 *Cecidophyes nudus* on Wood Avens. This gall consist of leaf bumps and crumpling on leaf upper, with erineae (mite induced hairs) on leaf underside. This gall tends to be more common in areas of disturbance. Only one plant was found to be galled at Big Wood, despite a larger number of available wood avens.
- 3.2.5 *Eriophyes torminalis* on Wild Service Tree. Small leaf pustules on leaf upper with opening on leaf lower side, can cause tinging of leaf colour. A fairly common plant gall when the host plant can be found.

### *Hemiteran induced Plant Galls*

- 3.2.6 *Psyllopsis group* on Ash. A leaf roll gall with much thickening of tissue induced by a jumping plant louse. The leaf roll is often tinged purple or cream coloured. The plant lice can be found within the gall, often accompanied by a filamentous white covering resembling wool. The gall is probably induced by the common *Psyllopsis fraxini*, however other *Psyllopsis* species (generally a lot more scarce) are known to induced similar galls – therefore expert verification of nymphs is required for certainty. A common gall easily found, although it is rarely very abundant on host species.

*Dipteran induced Plant Galls*

- 3.2.7 *Dasineura plicatrix* on Bramble agg. Twisted, buckled leaves with thickened veins. White larvae can be found within this gall in late spring/early summer. A common gall generally found in moderate numbers.
- 3.2.8 *Taxomyia taxi* on Yew. An “Artichoke” gall – formed by clusters of leaves at the tips of leaf branches. This midge has a two-year life cycle, as a result the gall can look a little different depending on the year. Smaller tighter galls in first year, slightly larger and opening out in the second year. Old galls can persist on the tree often turning brown. A fairly common species.

*Wasp induced Plant galls*

- 3.2.9 *Andricus aries* on English oak. The “Ramshorn gall”. A bud gall than can be long and thin but can also to be shorter and rounder if inquilines (another wasp species making use of the gall space and consuming gall tissue) are present. A fairly common gall. This species has no known sexual phase, with only asexual females in the one gall type.
- 3.2.10 *Andricus gemmeus* (agamic) on English oak. Very small (5mm across) raised cone-like bumps – a trunk gall occurring on areas of epicormic growth. Can sometimes be found on branches. New to the UK in 2008, this gall has a sexual phase on branch buds of Turkey Oak, this phase has yet to be recorded in the UK. Very common at Big Wood.
- 3.2.11 *Andricus kollari* (agamic) on English oak. The oak “marble gall”, a very common species, especially on young oak saplings. A purposely introduced species, rich in tannins and once used to make ink. The ink was once used on old important documents, usually written on vellum. Sexual phase is on English oak buds.
- 3.2.12 *Andricus quercuscalicis* (agamic) on English oak. The knopper gall consists of a large covering occurring on acorns. Often sticky in texture and sometimes tinged red. Is very common on *Quercus robur*, less so on *Quercus petraea*. The knopper gall can contain up to ten wasp grubs. Sexual phase on *Quercus cerris* consisting of oval protrusions on catkins.

- 3.2.13 *Andricus quercuscorticis* (agamic) on English oak. A bark gall often found in clusters – noted as being locally common. Sexual phase is an uncommon bud gall on *Quercus robur*.
- 3.2.14 *Neuroterus albipes* (sexual phase) on English oak. Spherical gall on edge leaf underside. An old example was found – better examples earlier in the year. A fairly common gall.
- 3.2.15 *Neuroterus albipes* (agamic) on English oak. Common name: smooth spangle gall. Smooth, round and disk-like in shape. Often varying in colour: cream, pink, red or purple can occur. These leaf galls contain one wasp grub. The galls later fall off leaves onto the ground, where the grubs pupate, many are eaten by birds. A fairly common Species
- 3.2.16 *Neuroterus anthracinus* (agamic) on English oak. “Oyster” galls occur on leaf underside mid rib vein. They are small, oval galls rather variable in colour. Often cream coloured but can be spotted brown or with red/pink colouration. A fairly common gall. Sexual phase is a bud gall on *Quercus robur*.
- 3.2.17 *Neuroterus quercusbaccarum* (agamic) on English oak. Common “Spangle galls” occur on leaf underside, are round, disk-like and hairy. Brown and cream in colour, they are often red when younger. Gall contains one wasp grub. The galls later fall off leaves onto the ground, where the grubs pupate, many are eaten by birds. A very common gall. Sexual phase, known as “currant galls”, are round berry-like spheroids and occur mainly on *Quercus robur* catkins, the can also occur on leaves.
- 3.2.18 *Neuroterus numismalis* (agamic) on English oak. “Silk button galls” occur on leaf underside, are round with a central pit and are hairy. A very common gall. Gall contains one wasp grub. The galls later fall off leaves onto the ground, where the grubs pupate, many are eaten by birds. Sexual phase galls are leaf blisters on *Quercus robur* earlier in the season.
- 3.2.19 *Diplolepis nervosa* on Dog Rose agg. Common name “Sputnik gall”. This is a round, spiky gall – sometimes tinged with red. *Diplolepis nervosa* is known to produce a non-spiky round form as well, however caution has to be observed as a rarer *Diplolepis* species is known to produce round specimens as well. Expert verification of wasps is needed with round form ‘pea’ galls. Sputnik galls and pea galls were recorded at Big Wood. A fairly common species, however very rarely numerous.

#### *Fungal induced Plant Galls*

- 3.2.20 *Phragmidium mucronatum* on Dog Rose agg. Small rust fungus gall on leaves – a common species.

## 4 DISCUSSION

### 4.1 Analysis of findings

#### *Noted findings*

- 4.1.1 *Taxomyia taxi* on Yew. Can be fairly common but I have looked in vain at some sites. The lack of interference with the yew trees present allowed their two-year life cycle to be completed.
- 4.1.2 *Andricus gemmeus* (agamic) on English oak. Is becoming more common – was found in abundance at Big Wood.
- 4.1.3 *Andricus quercuscorticis* (agamic) on English oak – can be locally common but not a gall I find regularly.
- 4.1.4 *Neuroterus albipes* both phases found. At the time of the survey, the remains of asexual phase wasp galls are harder to come by – both phases being present was good.
- 4.1.5 *Eriophyes torminalis* on Wild Service Tree. Although commonly found on wild service, due to the scarcity of the host, finding this gall is always a pleasure.
- 4.1.6 *Diplolepis nervosa* on Dog Rose agg. Although a fairly common species, I have looked at dog roses in good potential sites and have not found this gall.

#### *Species found & numbers - factors*

- 4.1.7 Twenty-one galls reflects a number of factors. Although the major factor in all plant gall surveys is the host species present, other factors can be influential.
- 4.1.8 A number of common insect galls were not present at Big Wood. This could be down to the enclosed nature of the site making movement for insects difficult.
- 4.1.9 Oak trees - *Quercus robur* is the single UK species with the most galls. The trees present at big wood were tall and crowded. A proportion were hard to survey as many of the features were hard to reach. All trees were of a similar age – mature but not veteran.
- 4.1.10 Willows – an absence at Big Wood. *Salix* is the single largest genus for gall potential. More galls, induced by a mixed variety of inducer groups, can be found on *Salix* than on any other genus.
- 4.1.11 Low herbaceous species. Some interesting herbaceous species were present, however a fairly low number of species known to house plant galls was present.

- 4.1.12 Natural cycles in abundance - 2021 seems to have been a bad year for a number of bud galls on *Quercus robur* and some common species were not present at Big Wood, however they have been hard to come by elsewhere too. The three leaf spangle gall species (common spangle, smooth spangle & silk button galls) are doing very well this year, a healthy crop of these three species was present at Big Wood.

## 4.2 Increase potential

### *Time of year and Targeting*

- 4.2.1 An early season plant galls survey (around May/June) would result in the potential of finding more sexual phase gall on *Quercus robur*.
- 4.2.2 Targeting host species relating to plant gall potential could help. Considering the time of year in relation to potentially viable species. A table of hosts present with abundance of occurrence (results taken from Friends of Big Wood website), relative to gall potential is included within the appendix.

## 5 RECOMMENDATIONS

### 5.1 Introductions & Site Management

#### *Introductions*

- 5.1.1 Big Wood is a fine woodland oasis in an urban environment. The following suggestions need not be followed but are recommendations that could be considered.
- 5.1.2 A list of suitable native tree and shrubs are included within the appendix. The species chosen are all noted for a number of gall hosts. With a more diverse woodland, the potential for more species (not just galls) is higher.
- 5.1.3 Native English Mistletoe *Viscum album* is included within the table. Mistletoe is fairly scarce in London Borough of Barnet and is scarce in neighbouring Brent, Harrow and Camden. Mistletoe was successfully introduced into LB Camden. Mistletoe is known to induce swellings within host species and is thus considered a plant galling agent. Common host species hawthorn is abundant at Big Wood. Native English mistletoe is available through [www.englishmistletoeshop.co.uk](http://www.englishmistletoeshop.co.uk).

#### *Site Management*

- 5.1.4 Introduction of glades could result in a greater diversity of especially herbaceous species

## 6 CONCLUSION

- 6.1 The fact that Big Wood exists and is managed for wildlife is excellent for the local area. The potential for plant galls within London, NW11 is a lot greater thanks to the presence of Big Wood.
- 6.2 There is scope for finding more galls with an earlier season plant galls survey – around June.
- 6.3 Some good finds were evident, targeting specific hosts could prove beneficial.

## 7 REFERENCES

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## 8 ACKNOWLEDGEMENTS

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## 9 APPENDICES

### 9.1 Appendix 1: Photographs

Photograph 1 – Mite induced *Aceria cephalonea* on sycamore. 28<sup>th</sup> August 2021



Photograph by Tommy Root 2021

Photograph 2 – Mite induced *Aceria macrochela* on field maple. 28<sup>th</sup> August 2021



Photograph by Tommy Root 2021

**Photograph 3 – Mite induced *Aceria myriadeum* on field maple. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 4 – Mite induced *Aceria tenella* on hornbeam. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 5 – Mite induced *Eriophyes torminalis* on wild service. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 6 – Hemiptera (Jumping plant louse) induced *Psyllopsis* group on ash. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 7 – Diptera (gall midge) induced *Dasineura plicatrix* on bramble. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 8 – Diptera (gall midge) induced *Taxomyia taxi* on yew. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 9 – Hymenoptera (gall wasp) induced *Andricus aries* on oak. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 10 – Hymenoptera (gall wasp) induced *Andricus gemmeus* (agamic) on oak. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 11 – Hymenoptera (gall wasp) induced *Andricus kollari* (agamic) - oak marble gall found on ground. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 12 – Hymenoptera (gall wasp) induced *Andricus quercuscorticis* (agamic) on oak. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 13 – Hymenoptera (gall wasp) induced *Neuroterus albipes* (sexual phase) on oak. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 14 – Hymenoptera (gall wasp) induced *Neuroterus albipes* (top right) & *Neuroterus quercusbaccarum* (lower) – both galls agamic. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 15 – Hymenoptera (gall wasp) induced *Neuroterus anthracinus* (agamic) on oak. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 16 – Hymenoptera (gall wasp) induced *Neuroterus numismalis* (agamic) on oak. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 17 – Hymenoptera (gall wasp) induced *Diplolepis nervosa* on dog rose. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

**Photograph 18 – Fungal (rust fungus) induced *Phragmidium mucronatum* on Dog rose agg. 28<sup>th</sup> August 2021**



Photograph by Tommy Root 2021

## 9.2 Appendix 2: Plant Gall Potential at Big Wood

**Table 2 – Big Wood host abundance relative to gall potential. Host & abundance information obtained via Big Wood Botanical Report (LB Barnett, 2016).**

Potential Host Species	Host Abundance	Potential Plant Galls
<i>Hedera helix</i> Ivy, Common	A	One uncommon gall species, found in Autumn
<i>Corylus avellana</i> Hazel	F	Seven potential galls, only one listed as common
<i>Epilobium montanum</i> Willowherb, Broad-leaved	F	Four possible galls
<i>Fraxinus excelsior</i> Ash	F	Three common dipteran galls, one common mite gall, one common hemipteran
<i>Geum urbanum</i> Wood Avens	F	Two species possible
<i>Hyacinthoides x massartiana</i> Bluebell, hybrid (Span. x native)	F	Out of season
<i>Ligustrum ovalifolium</i> Garden Privet	F	Galls only occur sometimes
<i>Malus sylvestris</i> Crab Apple	F	Seven potential galls, two listed as common
<i>Prunus avium</i> Wild Cherry	F	Three species, one out of season
<i>Quercus robur</i> Pedunculate Oak	F	Huge species potential however tree height limitations made searching difficult
<i>Rubus fruticosus</i> agg. Bramble, native microspecies	F	Six galls possible, three common species
<i>Acer campestre</i> Maple, Field	O	Ten potential galls, Three common species
<i>Acer pseudoplatanus</i> Sycamore	O	Six potential galls - two common species, one found
<i>Aesculus hippocastanum</i> Horse-chestnut	O	Low number of inducers
<i>Anthriscus sylvestris</i> Cow Parsley	O	Low number of inducers
<i>Calystegia silvatica</i> Bindweed, Large	O	Low number of inducers
<i>Cardamine flexuosa</i> Wavy Bitter-cress	O	Low number of inducers
<i>Carex pendula</i> Sedge, Pendulous	O	Low number of inducers
<i>Carpinus betulus</i> Hornbeam	O	Four possible galls
<i>Chamerion angustifolium</i> Willowherb, Rosebay	O	Low number of inducers
<i>Circaea lutetiana</i> Enchanter's-nightshade	O	Low number of inducers
<i>Crataegus laevigata</i> Hawthorn, Midland	O	Eighteen species possible, six out of season, three potentially common
<i>Crataegus monogyna</i> Hawthorn, Common	O	Eighteen species possible, six out of season, three potentially common
<i>Crataegus x media</i> Hawthorn, hybrid (Mid.x Com.)	O	Eighteen species possible, six out of season, three potentially common
<i>Dryopteris filix-mas</i> Male-fern	O	Low number of inducers
<i>Epilobium hirsutum</i> Willowherb, Great	O	Low number of inducers
<i>Epilobium parviflorum</i> Willowherb, Hoary	O	Low number of inducers
<i>Galium aparine</i> Cleavers	O	Five possible, one common
<i>Geranium robertianum</i> Herb-Robert	O	Low number of inducers
<i>Hyacinthoides non-scripta</i> Bluebell	O	Out of season
<i>Polygonum aviculare</i> Knotgrass	O	Low number of inducers

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<i>Prunus cerasifera</i> var. <i>cerasifera</i> Cherry Plum	O	Low number of inducers
<i>Prunus spinosa</i> Blackthorn	O	Eight potential, four out of season
<i>Ranunculus repens</i> Creeping Buttercup	O	Low number of inducers
<i>Rosa arvensis</i> Field-rose	O	Low number of inducers
<i>Rosa canina</i> agg. Dog Rose	O	Two locally common, two rare, three common (two found)
<i>Rubus idaeus</i> Raspberry	O	Low number of inducers
<i>Rumex obtusifolius</i> Dock, Broad-leaved	O	Low number of inducers
<i>Rumex sanguineus</i> Dock, Wood	O	Low number of inducers
<i>Sambucus nigra</i> Elder	O	Low number of inducers
<i>Scrophularia nodosa</i> Common Figwort	O	Low number of inducers
<i>Sorbus torminalis</i> Wild Service	O	Low number of inducers
<i>Taxus baccata</i> Yew	O	Low number of inducers
<i>Acer platanoides</i> Maple, Norway	R	Rare host presence, one UK gall not present in North London
<i>Cirsium vulgare</i> Spear Thistle	R	Rare host presence, low number of inducers
<i>Fagus sylvatica</i> Beech	R	Rare host presence
<i>Fragaria vesca</i> Wild Strawberry	R	Rare host presence, low number of inducers
<i>Linaria purpurea</i> Purple Toadflax	R	Rare host presence, low number of inducers
<i>Lonicera periclymenum</i> Honeysuckle	R	Rare host presence, low number of inducers
<i>Narcissus</i> agg. Cultivated Daffodil	R	Rare host presence, low number of inducers, out of season
<i>Persicaria maculosa</i> Redshank	R	Rare host presence
<i>Polystichum setiferum</i> Soft Shield Fern	R	Rare host presence, low number of inducers
<i>Prunus domestica</i> Wild Plum	R	Rare host presence
<i>Ribes rubrum</i> Red Currant	R	Rare host presence, low number of inducers
<i>Senecio jacobaea</i> Common Ragwort	R	Rare host presence
<i>Silene dioica</i> Red Champion	R	Rare host presence, low number of inducers

### 9.3 Appendix 3: Recommended plant species

**Table 3 - Selected UK native trees and shrubs.**

<b>Common Name</b>	<b>Scientific Name</b>
Alder	<i>Alnus glutinosa</i>
Aspen	<i>Populus tremuloides</i>
Buckthorn	<i>Rhamnus cathartica</i>
Beech	<i>Fagus sylvatica</i>
Sallow	<i>Salix caprea</i>
Juniper	<i>Juniperus communis</i>
Mistletoe, English	<i>Viscum album</i>
Poplar, Black	<i>Populus nigra</i>
Silver Birch	<i>Betula pendula</i>
Lime, Small-leaved	<i>Tilia cordata</i>
Lime, Large-leaved	<i>Tilia platyphyllos</i>
Spindle	<i>Euonymus europaeus</i>
Willow, White	<i>Salix alba</i>
Willow, Goat	<i>Salix caprea</i>
Sallow	<i>Salix cinerea</i>

## 9.4 Appendix 4: Introduction to Plant Galls

### **Introducing Plant Galls**

Plants, invertebrates and other associated organisms have co-evolved over millions of years, resulting in a diversity of interactions, some essential to ecosystems, some bizarre, some wondrous. Herbivory is a major factor in this coevolution with plants trying not to get eaten and invertebrates trying to overcome various plant defences (poisoning, reduced palatability etc). Plant galls represent one of the more sophisticated forms of herbivory, in which plant cellular mechanisms are fooled into producing food and security for the herbivore. The plant/herbivore interaction reaches particular heights of complexity within plant galls, involving multi trophic levels of association, complex life cycles and some of the most intriguing plant-based structures in nature. Plant interactions with fungal & bacterial organisms are also fascinating.

### **What is a plant gall?**

A plant gall is an abnormal growth of plant-based tissue produced under the influence of an invading organism. The invading organism (the gall inducer) is able to redirect plant resources - resulting in cell enlargement/ proliferation, leading to abnormal growths (the galls). Galls are structured purely for the benefit of the invading organism and acts as a plant sink - diverting nutrients and structural materials (for gall formation) purely for the benefit of the invader. Gall formation is a form of parasitism. Most galls are neither detrimental nor beneficial to the host plant, in most instances the plant can cope with the physical demands of the gall, however there are examples of detrimental and positive galls. Gall morphology is unique to each interaction, thus if plant species is known and gall morphology is recognized, determining gall species is possible. All sizes of plants can be galled as can all plant parts. Galls come in a variety of shapes, colours, textures and sizes - the majority are not large. Galls are always named after the gall former.

Methods of gall inducement varying between different galling groups. Two common examples being: in reaction to saliva from feeding (mites, many insects) and in reaction to liquids accompanying egg laying (wasp).

### **Gall Formers**

Animals (non-insect): mites, nematode worms, one rotifer species, a small number of copepod species.

Insects- six galling orders: *Thysanoptera* (thrips), *Hemiptera* (aphids), *Coleoptera* (weevil and longhorn beetle species), *Lepidoptera* (some micro moths prior to leaf mining, small number of clearwing species), *Diptera* (gall flies, gall midges, tephritid flies), *Hymenoptera* (cynipid wasps & galling sawfly).

Non Animal: fungi, other plants (mistletoe, dodder), bacteria, phytoplasma, viruses.

### **Evolution of plant galls**

Plant galling evolution has occurred several times over, with the oldest fossil galls (tree fern galls) dating back 300 MYA; formed by an undetermined arthropod. In insects, galling is thought to have arisen by accident: probably as a result of plant reactions to insect ovipositing (egg laying). Insect diversity occurred thanks to the adaptive radiation of the Angiosperms (flowering plants) some 100 MYA and with this insect induced plant galls diversified too.

### **Tips for Surveying**

Learn your plants. Look for feature inconsistent within the natural development of that species. Look at areas of the plant where growth is going to occur. Look out for unusual swellings, discolourations, enlarged tissue, thickening, pustules and rusts. Remember that any plant has the potential to be galled from microscopic algae to large trees and anything in between. Gall species found can vary due to the time of year. Galls can be found all year – though some times of the year are better than others.

Have a good identification book – vital.

Sometimes you will need to be aware of additional information rather than just the appearance of the gall. Some differing species can look alike, you might need to use other criteria to separate out species:

- Is the gall hard or soft? (some wasp galls on oak)
- Texture: Is the inside of the gall accompanied by a sticky or waxy residue? (some aphid induced leaf roll galls)
- Leaf roll galls: is the roll up or down, is just the effected or the whole leaf
- Mite galls: are the pustules accompanied by erineae (mite induced hairs) on the other side of the leaf?
- Colour of adult insects or colour of larvae
- Time of year – if a gall only occurs May/June you might not find it in October

Additional items that can be useful: a digital camera with macro setting, hand lens, smart phone, re-sealable bags.

### **Recording – Relevant Information**

Date, Site Information (include a grid reference if you can).

Host plant species, inducer scientific name, common name/description, inducer group, generation (if applicable).

### **Gall identification book recommendations**

A fold out Field Studies Guide to British galls (Redfern & Shirley - 2005) is cheap and available via FSC website.

Chinery (2011). This is an excellent beginner's identification book with full colour photographs. It is published by Wild Guides.

Redfern & Shirley (2011). This is considered the definitive comprehensive guide. An early 2002 edition (less comprehensive) may still be available second hand.

A 2011 New Naturalist Series book on Plant Galls is available. Written by the excellent Margaret Redfern, it covers all areas from human use of galls, galls in history, natural history, different gall types and many other areas. Highly recommended.

### **Useful Websites**

An excellent site for information on gall species: [\*\*www.bladmineerders.nl\*\*](http://www.bladmineerders.nl)

The Hainault Forest website has many fine plant gall photos:  
[\*\*www.hainaultforest.co.uk\*\*](http://www.hainaultforest.co.uk)

Further information on all aspects of Cecidology (the study of plant galls) can be found on the website of the British Plant Galls Society. A number of pages with plant gall photographs are present on the website: [\*\*www.britishplantgallsociety.org\*\*](http://www.britishplantgallsociety.org)

A British Plant Galls Facebook group is in operation. British Plant Galls Society can be followed on Twitter.

### **Books For Identification:**

Redfern. M, Shirley (2011) *British Plant Galls*. Field studies Council, Shrewsbury.

Chinery. M (2011) *Britain's Plant Galls*. Wild guides.

### **For further information on galls:**

Redfern. M (2011). *Plant Galls*. Collins: New Naturalist Series.