**Wood ants**

*Formica and Coptoformica spp.*

Wood ants are large and distinctive ants. They play an important role in woodland ecosystems and, particularly when colonies become vast, they can act as a keystone species providing conditions on which many other organisms depend[[1]](#footnote-1). Three species are considered in this document: *Formica aquilonia* and *Formica lugubris* are ‘true wood ants’, belonging to the genus Formica *sensu stricta*. *Formica exsecta* belongs to the subgenus Coptoformica. All species build mound-like nests in forests and are threatened by habitat loss.

*Formica exsecta* is included on the UK Red List of threatened species, where it is classified as Category 1, Endangered. It is also a UKBAP species. Scottish populations of *Formica aquilonia* and *Formica lugubris* are currently believed to be stable but remain vulnerable to inappropriate forest management. All three species are included on the Scottish Biodiversity List.

Description

Wood ants are large ants with a reddish thorax, dark head and abdomen[[2]](#footnote-2).

* ***Formica aquilonia* (Scottish wood ant)**

This species has a fringe of hairs at the rear of the head which does not extend down to the compound eyes. Viewed from the side, it does not appear hairy. It builds very large mound nests, about two metres in diameter and up to 1.5 m high. These nests are rarely isolated and are often linked by long trails to neighbouring mounds, effectively forming one huge colony.

* ***Formica lugrubis* (Northern wood ant)**

In *F. lugubris* the fringe of hairs at the rear of the head extends down to the compound eyes. There are also long hairs on the thorax and when viewed from the side, the top of the thorax looks very hairy. They build large mound nests about two metres in diameter and one metre high. Some nests exist in isolation, but large groups of interconnecting nests often occur, and may contain many hundreds of queens.

* ***Formica exsecta* (Narrow-headed ant)**

The distinctive feature of this ant is the notch in the top of the head and the narrow appearance of the head. It is smaller in size compared to the other wood ants, with workers around seven millimetres long. Their nests are dome-shaped mounds, smaller in size than the other two species, about 30 cm in diameter.

Distribution

Wood ants are associated with woodland, and in Scotland are found in Scot’s pine and birch woodland as well as non-native conifer plantations.

* ***Formica aquilonia* (Scottish wood ant)**

This ant is found from the Alps to Siberia and from northern Italy to Arctic Norway. However, within the UK it is only found in Scotland and Armagh. In Scotland the species is recorded from around the Firth of Clyde, through the Central and Western Highlands, Tayside and the Grampians, as far north as Ross and East Sutherland. Skye and Arran are the only Scottish islands with records.

* ***Formica lugrubis* (Northern wood ant)**

The Northern wood ant is found across the northern Palaearctic and in cooler mountainous regions of central and southern Europe and Asia. The UK distribution extends from the Highlands of Scotland through upland areas of northern England as far south as mid Wales. It prefers open sunny glades, rides and woodland edges, colonising young woodland but moving to the edges once the canopy closes. It spreads more readily into new plantation areas than other British wood ants, and can tolerate more exposed conditions, sometimes occurring on broken, rocky ground in the uplands with only a sparse tree or shrub layer[[3]](#footnote-3).

* ***Formica exsecta* (Narrow-headed ant)**

The Narrow-headed ant has a wide but patchy distribution in Europe and is found from southern Spain reaching as far east as Mongolia and northern China, and as far north as Arctic Scandinavia. In the UK, the core population (over 80%) of this ant occurs within the forest complex of Abernethy-Glenmore-Rothiemurchus in Speyside. Outlying populations exist at Braemar, Carrbridge and Black Wood of Rannoch. In England, the ant is now only found at one heathland site in Devon. Nests are usually within open clearings (such as power line rides) always away from canopy cover and often built around a grass tussock (e.g. purple moor-grass), or other supportive structure.

Ecology

* **The nest**

The nest is predominantly beneath ground and comprises of a series of tunnels and chambers. On the surface there is a dome shaped mound made of a soil core covered with a thatch of materials such as pine needles, small twigs, moss and dried grass. The thatch absorbs solar energy causing the temperature of the nest to be higher than that of the surroundings. This is important for the development of the brood and also keeps the workers warm enough to remain active on cooler days. The thatch also keeps the nest dry and provides protection from predators.

* **Lifecycle**

Wood ants are social insects and live in colonies. The queen is responsible for laying eggs. Males are produced in spring; their sole purpose is to mate with the queen. The remainder (and majority) of the colony are worker ants. These are females that do not reproduce, and each has a specific job such as keeping the nest repaired, foraging for food or tending to the queen and her brood. Eggs hatch into helpless larvae that are completely reliant on liquid food provided by the workers. They moult several times, eventually pupating to undergo complete metamorphosis and emerging as adults.

In the spring winged queens and males are produced and may take to the air in large numbers to mate. However, these nuptial flights don’t always occur and in Scotland both *F. lugubris* and *F. aquilonia* sexual forms are rarely seen outside the nest mound. One mating provides enough sperm for the queen's lifetime. A nest may contain many queens and a newly mated queen may stay in the nest where she was raised or establish a new colony nearby with some loyal workers. Often the daughter colony is very closely connected to the mother nest by trails both above ground and underground. If, for any reason, the 'daughter' nest fails to flourish, or is attacked; they can retreat back to the safety of the mother nest.

* **Foraging**

The ants’ main food is sugary honeydew produced by aphids[[4]](#footnote-4). Worker ants “milk” the aphids of their honeydew, and in return protect the aphids from predators, sometimes even moving them to better feeding grounds. The developing brood require protein for growth, and a variety of insects including caterpillars, beetles, and other ant species are also taken.

Threats

The main threats to wood ants are the loss, degradation or fragmentation of their habitat.

* **Habitat loss**

Large-scale clear felling can affect populations through both direct nest destruction and removal of food sources (notably aphid bearing trees).

* **Habitat degradation**

Wood ants are unable to persist under dense closed canopy forest, so practices that maintain open areas within forests (e.g. thinning and ride management) are necessary, in particular for *F. aquilonia* and *F. lugubris* which like woodland edge habitats.  *Formica exsecta* prefers more open sites with just a few scattered trees and lack of grazing leading to succession to thicket-stage forests are a particular threat to this species. *Formica* *exsecta* can also suffer in marginal habitats through competition from the more shade-tolerant wood ants *F. aquilonia* and *F. lugubris.*

* **Habitat fragmentation**

Fragmentation of woodland habitats in Scotland is a serious concern, acting as a barrier to dispersal and colonisation of new areas. This may result in inbreeding, as no queens are arriving from more distantly related populations.

Management

The long-term objective for wood ants in Scotland is to secure viable, self-sustaining populations across their current range and also to expand existing populations into new areas.

Their habitat requirements (i.e. maintaining heterogeneity in woodland structure) should be incorporated into relevant development policies, plans and proposals and occupied habitats should be appropriately managed.

Further research and survey is required for all species to better understand their current status, population trends and ecological requirements.

Public awareness and appreciation of these ants and their role in woodland biodiversity should be enhanced through publications and events.

Current work

**The UK Wood Ants National Steering Group (NSG)** was established in the early 2000s to advise and drive the biodiversity action plans (BAP) for *F. exsecta* and then *F. aquilonia* and *F. lugubris.* The ongoing purpose of the group is to bridge gaps between science, policy and practice in order to secure the future of wood ants in the UK. All wood-dwelling ants, associated species and their habitats are considered.

**Forestry Commission Scotland** is the lead Partner for *F. aquilonia*, and with the **Scottish Wildlife Trust** and**Scottish Natural Heritage** manage the Action Plan Steering group for wood ants. **Forest Research** has been supporting this work by collating wood ant records and making them available.

Wider context

Wood ants are an important component of woodland ecosystems and failure to protect them is likely to have wider implications for forest biodiversity[[5]](#footnote-5). For example, Wood ants:

* Help tree growth through their relationship with tree canopy aphids and through removal of insects that can cause pest outbreaks (e.g. caterpillars of moths such as the pine looper, *Bupalus piniaria*).
* Influence soil communities through excavation of their nests and by providing nutrients for new plant growth when a nest is abandoned.
* Influencing the distribution, abundance and community structure of many species of invertebrates both above and below-ground. For example, the shining guest ant (*Formicoxenus nitidulus*) is a UKBAP species found only inside the nests of wood ants where it excavates its own nests inside deadwood.
* Provide food for a wide range of animals.
* Distribute the seeds of plants, including the endangered small cow-wheat (*Melampyrum sylvaticum*).

Provide birds with a method of removing parasites – some birds are known to visit wood ant nests to be sprayed by formic acid which repels lice and mites.

Quick facts

* A healthy forest has around 500 wood ants for every square metre.
* The life expectancy of a worker wood ant is only 60 days, males only a few weeks, but queens can live 15 years or more.
* Queen ants sleep for up to 9 hours a day, whilst workers have to make do with power naps.
* Workers will move the brood up and down the nest in order to provide them with the optimal temperatures for growth, sometimes bringing them onto the surface of the nest for an extra boost of warmth from the sun.
* In autumn, the nest can generate enough heat to melt a light dusting of snow.
* Pine resin has antibacterial properties, so by incorporating this into their nests, wood ants are protected from bacteria and fungi that could otherwise harm them.
* Wood ants use sight and smell to navigate. They have remarkable memories, and after hibernating for 6 months they will still remember routes to foraging grounds.
* Ants eggs mixed with onion juice were once used as a treatment for deafness in Scotland.
* Old Scots names for ants are: 'pish-minnie' or 'pish-mither', 'enmet', 'eemocks', 'immicks', or 'emmerteen'.
* In the early 1980s, the potential of wood ants as biological control agents for tree pests was explored by the Italian Forestry Ministry. Lorry loads of wood ants were moved between forests in an effort to increase timber yields. Results were inconclusive.
* The worm, *Dendrodrilus rubidus*, is found more readily in the nest of *Formica aquilonia* than in the surrounding soil, as conditions within the nest are very worm friendly, with an abundant food supply.
* The woodlouse *Platyarthrus hoffmannseggii* is only found in ant nests. It is adapted to living in the dark chambers of the nest, having lost its eyes and pigmentation.

# Selected References

[**www.woodants.org.uk/**](http://www.woodants.org.uk/)Accessed 08/09/13

UK wood ants is the website of the UK Wood Ants Steering Group. It has comprehensive information on ecology and conservation of all species as well as news and current research. It provides a list of publications, including doctoral and undergraduate theses and research projects.

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Some general background to *Formica aquilonia, Formica lugubris, Formica exsecta* and *Formica sanguinea* in Scotland*.*

[**http://myrmecologicalnews.org/cms/**](http://myrmecologicalnews.org/cms/)Accessed 08/09/13

Myrmecological News is an independent, international, peer reviewed, non-profit journal printed at least once a year. It offers rapid means of publication on all fields of ant research, including a mix of research and review articles.

[**www.buglife.org.uk/bugs-and-habitats/narrow-headed-ant**](http://www.buglife.org.uk/bugs-and-habitats/narrow-headed-ant)Accessed 08/09/13

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Investigates, and provides support for, the hypothesis that monogynous ant colonies (one queen, one nest) are more likely to occur in young forest or smaller forest fragments, and they can exploit new locations by flight. Polygynous colonies that disperse primarily through nest budding to form large numbers of connected nests within one area are more likely to be found in larger areas of old forest.

**Skinner, G.J. (1980). The feeding habits of the wood ant *Formica rufa* (Hymenoptera: Formicidae) in limestone woodland in northwest England. *Journal of Animal Ecology* 49, 417–433.**

Investigated foraging behaviour in F. Rufa. Honeydew from aphids was the most important food source. Fly larva and caterpillars were also taken. Different trees were preferred for foraging at different times of the year, related to food availability.

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Leaflet produced by Forestry Commission, Scottish Natural Heritage, Scottish Wildlife Trust and Woodland Trust Scotland.

**Macdonald, M. (2013). Highland Ants: Distribution, Ecology and Conservation. HBRG, Inverness. ISBN 978 0 9552211 4 9.**

The new Highland ant atlas contains a key to all wood ants and related species found in Scotland. **Available from the Highland Biological Recording Group,** [**www.hbrg.org.uk**](http://www.hbrg.org.uk)

**University of York:** [**www.york.ac.uk/news-and-events/features/ant-behaviour/**](http://www.york.ac.uk/news-and-events/features/ant-behaviour/)Accessed 08/09/13

Researchers are fitting one thousand northern hairy wood ants with tiny radio receivers in a world first experiment to find out how they communicate and travel between their complex nests. The three-year research project (PhD student Samuel Ellis) is taking place on the National Trust’s Longshaw Estate in Derbyshire a site that contains more than a thousand nests.

1. <http://www.woodants.org.uk/species/significance> Accessed 10/12/13 [↑](#footnote-ref-1)
2. <http://www.woodants.org.uk/species> Accessed 10/12/13 [↑](#footnote-ref-2)
3. Bolton, B., and Collingwood C. A. (1975). Hymenoptera: Formicidae. Handbooks for the Identification of British Insects. Royal Entomological Society of London. [↑](#footnote-ref-3)
4. Skinner, G.J. (1980). The feeding habits of the wood ant *Formica rufa* (Hymenoptera: Formicidae) in limestone woodland in northwest England. *Journal of Animal Ecology* 49, 417–433. [↑](#footnote-ref-4)
5. http://www.woodants.org.uk/species/significance [↑](#footnote-ref-5)