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Conservation Translocations

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Wood Ant Nest Translocations

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The translocation of wood ant nests is sometimes necessary as mitigation for development, or for conservation projects and research. Currently, there is no guidance on wood ant nest translocation methods in the UK and little literature documenting previous attempts. Using documented examples, as well as other research, a translocation method is proposed. It is hoped that this article will encourage a more structured approach to wood ant nest translocations.

Photo 1. Hairy wood ant. © Chris Cathrine.

Introduction

When wood ant nests are encountered at development sites it is best practice to retain these at their original location. However, translocation may be necessary when the nest would otherwise be destroyed. Wood ant translocations may also be used to increase colony numbers in declining populations, as re-introductions or for academic research.

Although a number of wood ant translocations have been undertaken in recent years, no formal guidance exists and reports describing methods and results often remain unpublished. This article provides an overview of documented wood ant translocations from the UK, while also drawing upon examples from Europe and research projects. An ecologically structured translocation methodology is proposed, suitable for the hairy wood ant *Formica lugubris* (Photo 1), Scottish wood ant *F. aquilonia*, red wood ant *F. rufa*, narrow-headed ant *F. exsecta* and slave-maker ant *F. sanguinea*. The conservation status and habitat preference of each species is summarised in Table 1. All wood ant nests offer suitable habitat for the shining-guest ant *Formicoxenus nitidulus*, which is listed on Section 41 and 42 of the Natural Environment and Rural Communities (NERC) Act 2006 (NERC S41 and NERC S42) and the Scottish Biodiversity List (SBL) (Cathrine 2010). Shining-guest ants are difficult to detect so all wood ant nests should be considered as potential habitat for this species. Species and habitats included on NERC S41 (England), NERCS42 (Wales), SBL (Scotland) and Northern Ireland Priority Species are the foundation of the devolved 'Biodiversity Duty' of public authorities.

Table 1. Summary of conservation status, distribution and habitat preferences of wood ants.

Species	Conservation Status	UK Distribution	General Habitat Preference
Scottish wood ant *Formica aquilonia*	NIPS, NS	Found throughout Scotland north of the Central Belt and Argyll. Known from a limited number of sites in Northern Ireland, near Armagh. Absent from England and Wales.	Mature woodland/ plantation
Red wood ant *Formica rufa*		Predominantly southern distribution in England and Wales, becoming less common further north. Absent from Scotland and Northern Ireland.	Woodland succession/edge
Hairy wood ant *Formica lugubris*		Predominantly northern distribution in England and Wales; absent from the south. Found throughout Scotland north of the Central Belt and in Argyll, but less common than the Scottish wood ant. Absent from Northern Ireland.	Woodland succession/edge and fragmented woodland
Narrow-headed ant *Formica exsecta*	SBL, NERC S41, RDB1	The rarest UK wood ant, restricted to the Scottish Highlands and a single population in Devon. Absent from Wales and Northern Ireland.	Open glade/forest rides (cannot persist in closed canopy)
Slave-maker ant *Formica sanguinea*	NS	Disjunct distribution, with populations in the south of England and the Scottish Highlands. There are a small number of records from Wales. Absent from Northern Ireland.	Open glade/early woodland succession (cannot persist in closed canopy)

NERC S41 = Section 41 of the Natural Environment and Rural Communities Act 2006 (foundation for Biodiversity Duty in England)

NIPS = Northern Ireland Priority Species (foundation for Biodiversity Duty in Northern Ireland)

SBL = Scottish Biodiversity List (foundation for Biodiversity Duty in Scotland)

RDB1 = Endangered: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are taxa which are known as a single population in only one 10 km square, taxa which occur in habitats known to be especially vulnerable, and taxa which have shown a continuous decline over the last 20 years and now exist in five or fewer 10 km squares. Note that other RDB categories cover species with a greater distribution than RDB1 but less than NS (see below). (Shirt 1987) (No statutory significance.)

NS = Nationally Scarce: Taxa recorded in 16-100 10 km squares since 1 January 1980. (No statutory significance.)

Translocation Examples

In Scotland, documented wood ant translocation projects include the A9 road upgrade in 2009 (33 nests) (Fullarton 2012), Aviemore Primary School in 2012 (one nest) (MacIver 2012, Cathrine and MacIver 2014) and Scottish and Southern Energy (SSE) Beauly-Denny power line works in 2014 (eight nests) (SSE 2014). In England, a narrow-headed ant nest threatened by off-road activities was moved from Bovey Heathfield in Devon to an enclosure in Paignton Zoo during the 1990s, and an attempt was made to return this colony in 2004 (Carroll 2009). The translocation of red wood ants at Pear Wood Nature Reserve, London, has not been documented (P. Attewell pers. comm.). In Europe, wood ant translocations have been attempted in Finland (Sorvari *et al*. 2013) and guidelines have been published in Germany by Deutsche Ameisenschutzwarte e.V. (Fleischmann 2007). In addition, at the time of writing, a hairy wood ant translocation project is being completed for a new A9 upgrade following a protocol based on the German guidance and Pear Wood Nature Reserve translocations (Atkins 2015).

The A9 upgrade project in Scotland in 2009 is perhaps the best-documented wood ant translocation, and included control nests that were not moved. Long-term monitoring found a 50% survival rate of control nests compared with a 13% survival rate of translocated nests between 2009 and 2011 (Fullarton 2012). Similarly, while translocation from Bovey Heathfield to Paignton Zoo was successful, the translocation to return this nest failed (Carroll 2009). More recently, wood ant nests were translocated in April 2014 as part of the SSE Beauly-Denny project but of the eight nests moved only four were found to remain active four months later (SSE 2014, Wiswell 2014). The poor survival rates in these examples clearly demonstrate that translocation of wood ant nests should never be the first option.

Translocation Principles

Hughes (2008) set out four key principles for wood ant translocations:

- Principle 1: Wood ant nests should only be moved as a last resort
- Principle 2: Wood ant nests should be moved in a way that retains the nest architecture
- Principle 3: Donor sites should be chosen and prepared well in advance of the wood ants being moved
- Principle 4: Wood ants should only be moved when they are relatively inactive.

All documented examples followed Principles 1 and 2. However, the Pear Wood Nature Reserve translocation did not follow Principles 2 or 4; neither are they included in the German guidelines (Fleischman 2007, P. Attewell pers. comm.).

Principle 2 advocates that nest structure is maintained. Wood ant nests are not symmetrical, being designed to perform functions such as thermoregulation, which are dependent on architecture and orientation. The translocation of red wood ants at Pear Wood Nature Reserve disregarded nest architecture and instead gathered nest material and ants into bags using hand tools, a method also advocated in the German guidelines (Fleischman 2007, P. Attewell pers. comm.). Using this method, the material is placed at the receptor site where the ants must construct a new nest. These red wood ant nests naturally lose structure each winter through damage by weather and predators (e.g. badgers), and are rebuilt in spring (P. Attewell, pers. comm.) so translocation in winter (see below) relies on natural nest-building activity to rebuild the colony. Wood ant nests elsewhere tend to retain the structure of their nest throughout winter and so this method would require them to build a new nest, placing additional demands on the ants in an already stressful situation. It has been suggested that wood ant nests suffering greater disturbance during translocation are more likely to fail, forcing the colony to establish new nests (Wiswell 2014). This can result in an apparent increase in wood ant colonies following translocation, which does not necessarily indicate long-term success (Cathrine and MacIver 2014, Wiswell 2014).

It is generally accepted that nests should not be moved in winter when queens are hibernating because exposure to low temperatures, when there are only limited numbers of workers in the colony, can have a detrimental effect. Ideally, translocation should be completed in spring when ants are clustering, which maintains a relatively constant temperature within the nest, leaving the rest of the season to make repairs (Hughes 2008, Cathrine and MacIver 2014). Some sources recommend completing work during the 'rising phase' in spring when queens are present on the surface of the nest, and workers are sunbathing here (Fleischmann 2007, Atkins 2015). This ensures that queens and many workers are translocated without the need to fully excavate the nest (Atkins 2015).

Translocation protocols generally consider that wood ant nest are polygynous (have multiple queens), although the same species may exist as monogynous nests (have a single queen). When translocating a monogynous nest it is essential that the queen is moved or the nest will fail. Unfortunately, it is not possible to determine if a nest is polygynous or monogynous without damaging the nest, unless a genetic study is completed (Breen 1976, Bernasconi *et al*. 2005). If there is uncertainty, the precautionary principle should be followed and the entire nest moved.

Overall, it is recommended that wood ant translocations follow all four of the Principles set out by Hughes (2008). These are applicable to all UK wood ant species, and have been used for the majority of documented translocations with some success.

Proposed Translocation Methodology

The translocation methodology can be subdivided into three stages that distinguish the assessment of donor site and selection of receptor site; the translocation itself; and post-translocation monitoring.

1. Assessment of Donor and Receptor Sites

Donor site:

In order to identify appropriate receptor sites, the donor site must first be assessed. It is essential to identify the resident ant species because different species have differing habitat requirements (Table 1). The micro-habitat surrounding the nest is also important – these are the features that led to the ants selecting the particular location and which have influenced the nest engineering. As far as is known, the Aviemore Primary School wood ant nest translocation is the only documented example where micro-habitat at both the donor and receptor sites was compared (MacIver 2012). A method for monitoring micro-habitat and nests developed for a research project in Switzerland was adapted for Aviemore Primary School, using 8 m and 25 m buffers (Freitag *et al*. 2011, Cathrine & MacIver 2014). An example field sheet is shown in Figure 1. Features to record include:

- Nest aspect
- Slope
- Elevation
- Hill shading
- Canopy shading
- Location and size (diameter at breast height) of trees within the survey area (particularly Scots pine *Pinus sylvestris* and birch *Betula* spp.)
- Other topographical features (e.g. habitats and landuse).

Wood ants will occupy both coniferous and broadleaf-dominated woodlands, and a variety of soil types.

Receptor site:

The receptor site should provide, or replicate, as many of the key features of the donor site as possible. There should be no barriers to wood ant dispersal and the receptor site should be located as close to the donor site as possible, ideally within 100 m, to maximise familiarity with the colony's new surroundings.

Competition with other ant colonies has been a factor in failed translocations (Carroll 2009, Fullarton 2012). Fullarton

Photo 2. Narrow-headed ant nest. © Chris Cathrine.

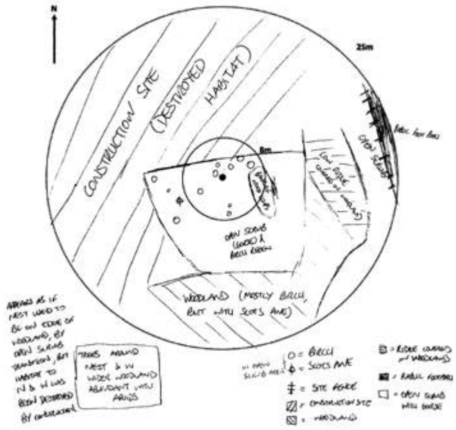

Figure 1. Wood ant nest micro-habitat field sheet. © Chris Cathrine.

(2012) recommends a 20 m buffer between nests (10 m minimum) but research has shown that wood ants have a foraging range of between 20 m and 100 m (Sorvari 2009). Therefore, it is recommended that other ant colonies within 100 m of the receptor site should be considered (and avoided if possible) when assessing potential sites.

Translocated wood ants may have negative impacts on other invertebrates through predation or alterations to habitat at the receptor site so the area should be surveyed for species of conservation concern. In addition, the site must offer populations of tree-dwelling aphid species which wood ants 'milk' for honey-dew (essential food source) (Maggini *et al*. 2002, Hughes 2006, Stockan *et al*. 2010).

2. Translocation Protocol

1. Move nest during times of low activity in early spring.
2. Prepare receptor site prior to translocation by digging a hole equal to or exceeding nest size.
3. Clear route between donor and receptor sites and complete trial run to identify/ remove hazards when not using existing roads or tracks (minimising risk of vibration damaging nest architecture).
4. Move nest as early as possible in the morning when temperatures are between 5°C and 10°C.
5. Use thermal coverings to help retain heat within nest.
6. Move nest as one single unit to retain nest architecture).
7. Move nest as slowly and steadily as possible (around 2.5 miles per hour if using an excavator).
8. Maintain nest orientation (e.g. facing south-east) at receptor site.
9. Provide supplementary sugary food (e.g. beefood dough, honey-bread-water mash, or jam) at receptor site daily for first two weeks post-move (Fleischmann 2007.
10. Protect nest with physical barriers (e.g. barrier fencing) to minimise risk of damage from construction traffic and other disturbance.

To date, most wood ant translocations have largely been completed by hand. For example, nests were excavated using hand tools for the A9 upgrade and Beauly-Denny projects, and transferred to wooden trays. These were carried by hand over short distances, or in an excavator bucket or pick-up truck over longer distances (Fullarton 2012, SSE 2014). However, it is difficult to maintain nest structure when using hand tools (SSE 2014, Wiswell 2014). At Aviemore Primary School, an excavator was found to be extremely gentle and precise when controlled by a skilled operator. Excavators can also be fitted with different-sized buckets making it possible to excavate an entire wood ant nest (which range from 1.5 m to 3 m in diameter, including integral features such as trees or decaying stumps (Sorvari 2009, Cathrine & MacIver 2014). Therefore, it is recommended that machinery is used for translocations wherever possible (Wiswell 2014, Cathrine 2015). Figure 2 shows various stages of the Aviemore Primary School translocation.

3. Monitoring Protocol

Monitoring should be undertaken for translocations in accordance with published guidance (IUCN/SSC 2013, National Species Reintroduction Forum 2014). Both short-term (daily visits during the first week

Figure 2. Aviemore Primary School wood ant translocation. a) Nest; b) Route preparation; c) Receptor site preparation; d) Nest removal; e) Nest placement at receptor site; f) Nest two years later. Photos a to e: © Cameron MacIver; photo © Eamonn Flood.

Photo 3. Scottish wood ant nest.
© Kirsty Cathrine.

then a further visit at six weeks, three months and six months) and long-term (one visit at one year, two years and three years) monitoring should be carried out. Monitoring should use a standard field sheet (Figure 1) to allow before and after comparisons as wood ant nests will change location and size over time in response to environmental factors. Monitoring should also include satellite nests, where the colony persists but has moved to a new location(s). Careful monitoring is crucial to confirm that translocation methods have been successful, to identify any signs of colony decline and to provide an opportunity for intervention if necessary. A standardised approach to monitoring will allow straightforward comparisons between different projects and will assist with refining translocation methods.

Concluding remarks

The translocation method described here was successfully applied at Aviemore Primary School where the hairy wood ants were still using the same nest two years after translocation, with no reduction in size (MacIver 2012). The use of a methodology that considers wood ant ecology is preferential to *ad hoc* practices and is more likely to be successful. By monitoring translocated nests using a standardised protocol and making the results publically available, the methodology can be reviewed and further refined in the future.

About the Author

Chris Cathrine has a broad range of ecological skills, gained as a consultant and through employment with public bodies and charities. He has particular expertise in invertebrates, and is based in Scotland.

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Much information regarding wood ant translocations is not widely available. This article aimed to synthesise this information and make key elements available to a wider audience. Please contact the author for assistance with obtaining source materials.

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