

A technique for the translocation of ant colonies and termite mounds to protect species and improve restoration efforts

Timothy J. King¹  | Julia Balfour² 

¹Department of Plant Sciences, University of Oxford, Oxford, UK

²Department of Ecology, Royal Parks, Richmond, UK

Correspondence

Timothy J. King, Wolfson College, Linton Road, Oxford OX2 6UD, UK.

Email: timothy.king@wolfson.ox.ac.uk

Funding information

Royal Parks

Abstract

Ant colonies or termite mounds, particularly of rare species, sometimes require translocation for conservation of the species and their associated fauna. Translocations often increase the species richness of the receptor habitat. A wide range of appropriate grabs, causing least colony disturbance, can be fitted to maneuverable compact loaders. Compact loaders allow rapid nest transport between donor and receptor sites. We discuss the advantages of this technique. In this case a tree spade attached to a compact loader was used to rapidly insert occupied *Lasius flavus* ant-hills into a recipient site 1 km away. The colonies had all survived 18 months later despite two lengthy droughts.

KEYWORDS

ant-hills, ecological engineers, grasslands, *Lasius flavus*, social insects, translocation

1 | INTRODUCTION

Some ant and termite species are among the most important allogenic ecological engineers on the planet (Jones, Lawton, & Shachak, 1994). Their long-lasting constructions, in grasslands in particular, often increase biodiversity, and impose patterns on the landscape which influence plants, vertebrates, invertebrates, and microbes over wide areas (e.g., Okullo & Moes, 2012; Schutz, Kretz, Dekoninck, Travani, & Risch, 2008). In intensively farmed landscapes, where the area of old grassland is declining and fragmented, biodiversity is under pressure, even on nature reserves (Hallmann et al., 2017; Seibold et al., 2019). Attempts are frequently made to introduce rare or iconic bird or mammalian species. Introducing suitable ant or termite colonies, however, is just as important. In arable reversion they impose a more

characteristic trophic structure on the recipient community. They immediately increase the heterogeneity of the habitat, and alter the patterns of numerous associated species. Transfer of ant or termite colonies is sometimes desirable when they are threatened.

Ant colonies have been successfully moved on at least four occasions. Diffuse polydomous wood ant colonies, such as those of the *Formica rufa* and *Formica aquilonia* complexes, have been moved by car after placing the colony cores in buckets (Sorvari, Huhta, & Hakkrainen, 2014). There have been two successful phases of translocation of *F. rufa* colonies by van from Burnham Beeches National Nature Reserve (NNR), UK. The small, discrete underground colonies of *Lasius niger* L. have been moved after digging around and beneath them (Elmes, 1971). Mounds of *Lasius flavus*, however, have a complex soil structure up to 70–100 L and often only have a one or

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2020 The Authors. Conservation Science and Practice published by Wiley Periodicals, Inc. on behalf of Society for Conservation Biology

two queens. Pontin (1969) successfully moved four ant-hills as part of an experiment to investigate competition between the ants *L. flavus* and *L. niger*. Box (1987) moved over 30 mounds threatened by the building of a road. They both dug out a circular turf at the recipient site, dug up the ant-hill to 10–15 cm beneath the level of the surrounding soil, put it on a galvanized metal plate, moved it in a wheelbarrow, deposited it in the hole and used the turf to fill the donor site. Box (1987) refined the procedure by picking up and depositing the ant-hill with the wheelbarrow on its side. In this underground species the integrity of the soil structure needs to be maintained. The preservation of its intact root aphid fauna makes it desirable to move as much surrounding soil as possible. So a tree spade seems more suitable than a wheelbarrow.

Indeed, maneuverable compact loaders are widely available to which a variety of spades, grabs and boxes, appropriate to the species, can be attached. As a model, this paper explains a successful transfer of colonies of the yellow meadow ant, *L. flavus* F., within a British Nature reserve. This efficient method, however, could easily be adapted to move colonies of other mound-building species.

L. flavus is probably the most wide-ranging and abundant ant in northern Europe, reaching a fresh weight of 165 kg ha⁻¹ in grazed grasslands and moving up to 7 t of

mineral soil ha⁻¹ yr⁻¹ (Seifert, 2018). Its mounds may last for hundreds of years (King, 1981a, 2017), have a distinctive fauna (Donisthorpe, 1927) and considerably enhance environmental heterogeneity and biodiversity (King, 1977, 1981b, 2006). For example, they provide feeding sites for birds such as the green woodpecker (*Picus viridis*) (Alder & Marsden, 2010) and oviposition sites for many invertebrates such as grasshoppers (*Corthippus* spp.) (Richards & Waloff, 1954). In mature pastures their surfaces may constitute 20% of the area, providing a habitat within a habitat, a continual source of bare soil. For that reason they are worth transferring to fields which lack them.

2 | METHODS AND RESULTS

Translocation of five ant-hills at Richmond Park NNR, UK, using a tree spade mounted on a Kramer 520 compact loader took place on April 24, 2018 and took two and a half hours (Figure 1). The scoop had a diameter of 1.1 m and produced a conical soil lump about 0.85 m deep. This four-wheel steer and four-wheel drive compact loader offers maximum maneuverability and minimum ground disturbance.



FIGURE 1 Stages in the translocation of an ant-hill with a tree spade mounted on a compact loader. Grassland core R1 was first taken from the Recipient site (R) to the Donor site (D); an ant-hill was taken from D1 to R and deposited in the R1 hole, then another grassland core taken from R2 to D and deposited in the D1 ant-hill hole and so on, until, at the end, the original grassland core R1 at D was placed in the hole at D5 vacated by the removal of the last ant-hill

The translocated ant-hills were of a variety of sizes up to 0.7 m diameter. They all had some recently heaped bare soil on the surface, and workers came to the surface when the tops were disturbed, indicating that they were occupied by colonies.

The donor and recipient sites were both in acidic grassland (National Vegetation Classification MG5, U4, Rodwell, 1992), deer-grazed for centuries. The donor site at 51.45142 N, 0.25814 W (TQ 212739) had sustained considerable public pressure but had ant-hills up to 0.3 m high. The soil was a sandy loam to sandy silt loam (O'Hare Associates, 2010 Profile 3) of surface pH about 5.3 with a extractable phosphorus level of 19 mg/L. Stones were encountered at a depth of 1 m. Earthworms were abundant. The profile had been considerably disturbed.

The recipient site was 1 km away at 51.44945 N, 0.27233 W (TQ 202737). Most of this field had been mown for years in an annual autumn hay cut. It only possessed occasional sparse ant-hills, all <0.1 m high. The recipient site had a lower pH (4.9) and a low level of extractable phosphorus (7 mg/L). Few earthworms were present. Tall stakes were placed at the corners of the recipient area to deter future mowing.

The five translocated ant-hills were placed at least 2.5 m apart to avoid competition between colonies and deposited with the same north–south orientation as originally. Detailed notes were made on each of the translocated ant-hills on seven occasions during the next 18 months. On each occasion each ant-hill was photographed. In June, a black ceramic tile 10 × 20 cm was placed on the surface of each mound. This was to stimulate the building of channels and the accumulation of the brood beneath in occupied mounds (Pontin, 1969). On August 3 and October 9, 2018, one soil core from each mound was taken to 15 cm depth with a Burkard soil corer 5 cm in diameter.

In June to October 2018 *L. flavus* workers occurred in four of the five mounds and there was unmistakable evidence of their continued activity in the other (King, 2018). In September 2019, 17 months after translocation, workers were abundant in all five mounds. The recipient site was exposed to full sunlight from the south. The summers of 2018 and 2019 were particularly dry and air temperatures reached 33°C. The grassy vegetation was parched. Since all the *L. flavus* colonies in translocated ant-hills survived these conditions, this technique seems robust.

3 | DISCUSSION

Although this translocation method is more expensive than using a spade and a wheelbarrow, it is far more

efficient. The costs may often be met by mitigation financial contributions, especially in large projects, when compact loaders will be on site already.

Using a compact loader is less labor intensive and time-consuming than using a wheelbarrow. The attachment can be chosen so that it is appropriate to the nests being transferred. A range of forks, grabs, shovels, and buckets is available. Since the recipient turves and the ant-hill samples are of exactly the same shape and size, mismatches are unlikely with a tree spade. It is far less likely, with a compact loader attachment, that the ant-hill will deteriorate during excavation or transport than with a wheelbarrow. Furthermore, a loader travelling at more than 20 km/hr considerably reduces the time delay between excavation and deposition.

With a digger, the soil cores can be larger and heavier than those excavated and moved by hand. In *L. flavus* in particular, the ant-hill queens are bound to be included in a core 85 cm deep. When founding a colony, queens initially burrow down about 6 cm beneath the surface. If the workers happen to be overwintering 10 cm deep (Eidmann, 1942) they will be present in the conical cores. A wide core is more likely to contain the myrmecophilous root aphids on which the ants depend (Ivens, Kronauer, Pen, Weissing, & Boomsma, 2012; Pontin, 1978; Seifert, 2018), with appropriate grasses and other plant species for them to feed on. The more basal and surrounding soil is translocated with the ant-hill, the less the ant-hill itself will be damaged.

The *L. flavus* ant-hills successfully translocated by Pontin (1969) and Box (1987) were moved in March. In this case, 24 April seemed the last possible date before many workers were foraging away from the mounds. Over much of its range, success seems most likely in March or early April, when most of the workers will still be confined to the mounds after winter hibernation, the groups of aphids overwintering in the mounds will not yet have been reached the roots of the grasses nearby, and the ground is softer.

Thus ant (or termite) colonies can be successfully translocated when the colonies are inactive using a compact loader with a suitable attachment. This method may be the most rapid and cost-effective when numerous colonies need to be re-located at the same time. This is a potentially useful method for introducing the yellow meadow ant, *L. flavus*, which has positive effects on grassland diversity (King, 2006), to sites where grassland restoration is being attempted. Since this species is a relatively late colonist of newly created grasslands (Boomsma & van Loon, 1982; Dauber & Wolters, 2005; Seifert, 2017) recipient grasslands should be at least 15 years old before translocation is attempted.

ACKNOWLEDGMENTS

This project was funded by the Royal Parks, London, and by Mission:Invertebrate 2018, funded by the UK Postcode Lottery. Simon Richards suggested the use of the tree spade. Lonneke Klein-Aarts provided the information about Burnham Beeches NNR translocations.

CONFLICT OF INTEREST

The authors are unaware of any conflicts of interest.

AUTHOR CONTRIBUTIONS

J.B. designed the methodology and its funding. Both authors supervised the translocation. T.K. monitored the colonies after transfer, wrote the project report King (2018) and the drafts of this paper.

DATA ACCESSIBILITY STATEMENT

Data on the progress of the translocated ant-hills are in King (2018).

ETHICAL CONSIDERATIONS

In the UK, The Code of Conservation Practice for the Conservation of Invertebrates (JCCBI, 2010) must be followed. *L. flavus* is or was, however, so frequent throughout most of Britain that any recipient site is likely to be within the range of the species. For wood ant species, the protocol of Cathrine and MacIver (2014) is mandatory.

ORCID

Timothy J. King  <https://orcid.org/0000-0001-7976-289X>

Julia Balfour  <https://orcid.org/0000-0002-5060-8300>

REFERENCES

- Alder, D., & Marsden, S. (2010). Characteristics of feeding-site selection by breeding green woodpeckers *Picus viridis* in a UK agricultural landscape. *Bird Study*, 57, 100–107.
- Boomsma, J. J., & van Loon, A. J. (1982). Structure and diversity of ant communities in successive coastal dune valleys. *Journal of Animal Ecology*, 51, 957–974.
- Box, J. D. (1987). A simple technique for the translocation of ant-hills. *Field Studies*, 6, 617–618.
- Cathrine, C., & MacIver, C. (2014). *Caledonian Conservation Ltd Technical Note 1: Wood ant translocation protocol*. Hamilton, England: Caledonian Conservation Ltd. <https://doi.org/10.13140/2.1.2781.1846>
- Dauber, J., & Wolters, V. (2005). Colonisation of temperate grassland by ants. *Basic and Applied Ecology*, 6, 83–91.
- Donisthorpe, H. (1927). *The guests of British ants*. London, England: Routledge.
- Eidmann, H. (1942). Die Überwinterung der Ameisen. *Zeitschrift Fur Morphologie Und Ökologie der Tiere*, 39(2), 217–275.
- Elmes, G. W. (1971). An experimental study on the distribution of heathland ants. *Journal of Animal Ecology*, 40(2), 495–499.
- Hallmann, C. A., Sorg, M., Jongejans, E., Siepel, H., Hofland, N., Schwan, H., ... de Kroon, H. (2017). More than 75 per cent decline over 27 years in total flying insect biomass in protected areas. *PLoS One*, 12(10), e0185809. <https://doi.org/10.1371/journal.pone.0185809>
- Ivens, A. B. F., Kronauer, D. J. C., Pen, I., Weissing, F. J., & Boomsma, J. J. (2012). Ants farm subterranean aphids mostly in single clone groups—An example of prudent husbandry for carbohydrates and proteins? *BMC Evolutionary Biology*, 12, 106. <https://doi.org/10.1186/1471-2148-12-106>
- Joint Committee for the Conservation of British Invertebrates. (2010). Invertebrate translocation—A code of conservation practice. *British Journal of Entomology and Natural History*, 23, 207–217.
- Jones, C. G., Lawton, J. H., & Shachak, M. (1994). Organisms as ecosystem engineers. *Oikos*, 69(3), 373–386.
- King, T. J. (1977). The plant ecology of ant-hills in calcareous grasslands. 1. Patterns of species in relation to ant-hills in southern England. *Journal of Ecology*, 65, 237–256.
- King, T. J. (1981a). Ant-hills and grassland history. *Journal of Biogeography*, 8, 329–334.
- King, T. J. (1981b). Ant-hill vegetation of acidic grasslands in the Gower Peninsula, South Wales. *New Phytologist*, 88, 559–571.
- King, T. J. (2006). The value of ant-hills in grasslands. *British Wildlife*, 17(6), 392–397.
- King, T. J. (2017). A Citizen Science project: Relationships between ant-hills built by the yellow meadow ant (*Lasius flavus*) and the history and management of acidic grasslands at Richmond Park, London. Mission:Invertebrate. Royal Parks, London.
- King, T. J. (2018). Translocation of ant-hills at Richmond Park in 2018. Mission:Invertebrate. Royal Parks, London.
- O'Hare Associates. (2010). Soil survey for Richmond Park, Surrey. Internal report. Royal Parks, London.
- Okullo, P., & Moes, R. (2012). Termite activity, not grazing, is the main determinant of spatial variation in savanna herbaceous vegetation. *Journal of Ecology*, 100, 232–241.
- Pontin, A. J. (1969). Experimental transplantation of nest mounds of the ant *Lasius flavus* (F.) in a habitat containing also *L. niger* (L.) and *Myrmica scabrinodis* Nyl. *Journal of Animal Ecology*, 40, 747–754.
- Pontin, A. J. (1978). The numbers and distribution of subterranean aphids and their exploitation by the ant *Lasius flavus* (Fabr.). *Ecological Entomology*, 3, 203–207.
- Richards, O. W., & Waloff, N. (1954). Studies on the biology and population dynamics of British grasshoppers. *Ant-Locust Bulletin*, 17, 1–182.
- Rodwell, J. S. (Ed.). (1992). *British plant communities. Grasslands and Montane communities* (Vol. 3). Cambridge, England: Cambridge University Press.
- Schutz, M., Kretz, C., Dekoninck, L., Travani, M., & Risch, A. C. (2008). Impact of *Formica exsecta* Nyl. on seed bank and vegetation patterns in a subalpine grassland ecosystem. *Journal of Applied Entomology*, 132, 295–305.
- Seibold, S., Gossner, M. M., Simons, N. K., Bluthgen, N., Muller, J., Ambarli, D., ... Weissner, W. W. (2019). Arthropod decline in grasslands and forests is associated with landscape-scale drivers. *Nature*, 574, 671–674. <https://doi.org/10.1038/s41586-019-1684-3>

- Seifert, B. (2017). The ecology of central European non-arboreal ants—37 years of a broad spectrum analysis under permanent taxonomic control. *Soil Organisms*, 89(1), 1–67.
- Seifert, B. (2018). *The ants of central and north Europe*. Tauer, Germany: Lutra Verlags- und Vertriebsgesellschaft.
- Sorvari, J., Huhta, E., & Hakkrainen, H. (2014). Survival of transplanted nests of the red wood ant *Formica aquilonia* (Hymenoptera: Formicidae): The effects of intraspecific competition and forest clear-cutting. *Insect Science*, 21, 486–492. <https://doi.org/10.1111/1744-7917.12043>

How to cite this article: King TJ, Balfour J. A technique for the translocation of ant colonies and termite mounds to protect species and improve restoration efforts. *Conservation Science and Practice*. 2020;2:e154. <https://doi.org/10.1111/csp2.154>