

LASIUS NEGLECTUS (HYMENOPTERA: FORMICIDAE) IN THE UK: STATUS, IMPACT AND MANAGEMENT

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Abstract The Invasive Garden Ant, *Lasius neglectus*, was first recognised in Europe in 1990, and has now been recorded from at least ten European countries. It was first found in the UK in 2009 in Hidcote Manor Garden, Gloucestershire, UK, where the ant is believed to have been present for several decades. A survey of the garden shows that the ant currently occurs over an area of c. 12 ha, and is found in the formal garden, buildings, adjacent woodlands, pasture, and around the edges of arable fields. Within this area, native ant species appear to have been almost entirely displaced. In buildings, the ant is a nuisance to residents, a pest in food catering facilities, and can cause damage to electrical installations. A number of measures have been put in place to reduce the risk of onward transmission of the ant to other locations, including holding all garden and building wastes on site, cessation of sending Hidcote-grown plants to other gardens, and an ant control programme using insecticide baits. Experimental treatments with 0.03% imidacloprid ant gel within the cottages at Hidcote resulted in a c. 90% reduction in ant numbers. Surveys and investigations elsewhere in the UK have not found any other locations of this species, so an eradication programme at Hidcote is being considered.

Key words Invasive garden ant, imidacloprid.

INTRODUCTION

Invasive species are one of the most important drivers of biodiversity loss, and have been calculated to cause damage costing 12 billion Euros/year in Europe (EEA, 2012). Managing this threat requires an integrated approach involving prevention, detection and response.

Lasius neglectus (Van Loon, Boomsma and Andrásfalvy) is a native of Turkey, Iran, the Black Sea area, and other areas of Asia Minor. Outside of its native range, the first colony was detected in Budapest, Hungary where it had been known since the 1970s, but was not identified as *L. neglectus* until 1990 (Van Loon et al., 1990). Colonies have since been identified in ten European countries (Espadaler and Bernal, 2010), and most recently in the UK, at Hidcote Manor Garden in Gloucestershire. This species is considered by Rey and Espadaler (2004) to have the potential to become as serious a problem in Europe as the Argentine ant (*Linepithema humile*).

Lasius neglectus worker ants are superficially similar to the black garden ant *Lasius niger*, but are slightly smaller and paler. They may be found within buildings, on the ground outdoors, and trailing up the stems or trunks of plants. Where they are well established, *L. neglectus* is noticeably at a higher density than would normally be the case for *L. niger* (Fox, 2010). Differentiation of *L. neglectus* from similar species requires examination of a number of morphological characters, including the presence or absence of short erect hairs on the scapes and tibia (Espadaler and Bernal, 2010; Fox, 2010).

The nests of *L. neglectus* are typically in protected locations, such as under stones, paving slabs, logs, or in the soil around plants with a high population of aphids (Espadaler and Bernal, 2008).

Individual nests are normally occupied by several queens (Van Loon et al., 1990), unlike *L. niger*. Nests may separate or coalesce depending on local factors, and the ants in any one area become in effect a 'super-colony', comprising large numbers of interlinked nests. In Spain, one super-colony covering 14 ha was estimated to contain 2,500 queens and 8 million worker ants per hectare (Espadaler et al., 2003). Some super-colonies are known to cover several hundred hectares (Espadaler et al., 2007). The queens mate within the nest (Van Loon et al., 1990), and as there is no nuptial flight; new nests are typically founded by budding (Espadaler and Bernal, 2008). A single queen ant is sufficient to establish a new colony (Espadaler and Rey, 2001). The rate of colony expansion ranges from c.3 to 90m/year (Espadaler et al., 2007).

This ant is dependent feeds on the aphid honeydew and other sap-sucking insects, and most activity is concentrated on plants and trees, that have large aphid populations (Espadaler and Bernal 2008). Ants have been seen carrying small insect prey, such as collembolans (Espadaler and Rey, 2008). In buildings the ant feeds on carbohydrate-rich foodstuffs. In continental Europe, most colonies are found in disturbed urban and suburban areas. Outdoor habitats include grass beside roads, parks and gardens, waste ground, and patches of woodland in city areas (Espadaler and Bernal, 2008).

The only known colony of this species in the UK is in Hidcote Manor Garden in Gloucestershire, southern England. The estate consists of c. 10 ha of ornamental garden, ten cottages, a manor house and farm buildings, together with some areas of woodland and farmland. The garden was created in the early 20th century by Lawrence Johnston, an American horticulturist, with plants obtained from several continents, including Asia (Pearson, 2007). The garden is of international significance owing to its design, and is open to the public, attracting around 160,000 visitors per year. It is in the care of the National Trust, a charitable organisation that manages and protects many sites of high historical or natural importance in England, Wales and Northern Ireland.

Residents in the cottages reported that the ants have been present on the estate for several decades. Their continual presence within their homes, even in winter, is a nuisance, while staff in the catering facilities have to take care to avoid food contamination. This ant species is attracted to electrical installations, and in some buildings light switches, power sockets and electrical security systems have been damaged by its activity. In 2009 the ants were identified as *Lasius neglectus* - the first colony of this ant to be identified in the UK (Fox, 2010).

The objectives of the work reported here were to establish the extent of the ant colony, identify effective techniques for its control, identify and implement measures to reduce the risk of spread of the ants to other locations, and to determine if this ant was present at other locations in the UK. Part of the work reported here was funded by the National Trust, and part by Bayer Environmental Science.

METHODS AND MATERIALS

Ant surveys. To establish the extent of the area colonised by *Lasius neglectus*, the garden and surrounding farmland were systematically surveyed for ants in July and August 2013. Any ants seen under stones, on the ground, tree trunks, or walls etc were collected and placed into labelled tubes for identification. In addition, honey-baited insect detectors (AF Crawling Insect Detector, Killgerm Ltd) were used to detect ants present in areas where they were not visible on inspection. The monitors were placed in likely locations, collected 48 h later, and any ants identified.

Hidcote Manor Garden had from time to time donated plants from its gardens to other large ornamental gardens elsewhere in the UK. Three such gardens were identified, and ant surveys using

honey-baited detectors was carried out in the areas of these gardens where plants obtained from Hidcote Manor Garden had been planted. Finally, to try to establish whether pest control companies were aware of any other infestations of this ant, announcements were placed in two of the UK pest control magazines, these requested companies who were aware of any unusual black ant infestations, to make contact.

Ant management at Hidcote Manor Garden. Once it became apparent that the garden may hold the only UK colony of this ant species, the various activities at the site were assessed in order to identify those that were at high risk of inadvertently spreading ants to other locations, and how that risk could be minimised.

Additionally, to identify the effectiveness of insecticidal control measures against this ant, a trial of an insecticidal bait was carried out in the ten residential cottages. Honey-baited crawling insect monitors were used to assess ant numbers, with between five and seven used in each cottage. Monitors were placed in situ for 48 h, and then collected and examined. Monitor assessments were carried out twice prior to treatment, and then for four consecutive weeks after treatment, and finally at 19 weeks after treatment. Maxforce Quantum (0.03% imidacloprid gel) was applied using a B&G gel applicator, set to deliver c. 0.2g of gel at each pull of the trigger. Gel was applied at the label rate of 0.2g/m², with beads of gel being applied either directly into cracks and crevices, or into small plastic bait stations. All rooms and hallways within the cottages were treated. In addition, treatments were also applied around the external footings of the buildings to create a 'buffer zone' to reduce the re-invasion from outside. In these outdoor areas, some gel was also applied into cracks and crevices and some into bait stations. At 3 weeks after the initial treatment, a partial re-treatment with imidacloprid gel was carried out in areas where ants were still active. In all, eight cottages were treated, while two were left as untreated controls.

RESULTS AND DISCUSSION

Distribution and Spread at Hidcote Manor Garden

The survey found that *L. neglectus* occupied a broad range of habitats in the garden such as flower-beds, lawns, paths, rock gardens, kitchen gardens, green-waste composting areas and log piles. However it was also present in numbers in adjoining damp and shaded woodland areas, on the edges of arable fields, in permanent pasture up to 50m from the garden, and on farm tracks and around farm buildings. The greatest numbers of ants were usually seen on the trunks of trees, where dense columns were sometimes found, presumably accessing aphids and other sap-feeding insects in the foliage. In total, *L. neglectus* was found to occupy an area of c. 12 ha (Figure 1).

Natural budding of ant nests is likely to be responsible for the spread of the ants in some areas, for example where they have colonised the pasture to the west of the garden. Human activity is also likely to have contributed to the spread of ants through the gardens. The ants were present in numbers in the composting area, and it is likely that the frequent movement of infested compost onto the garden had contributed to its spread. In several peripheral areas of the estate, ants were found on rough tracks. Investigation revealed potholes in the tracks filled with loose rubble, which had been obtained from piles of broken stone within the garden, in which ants were active.

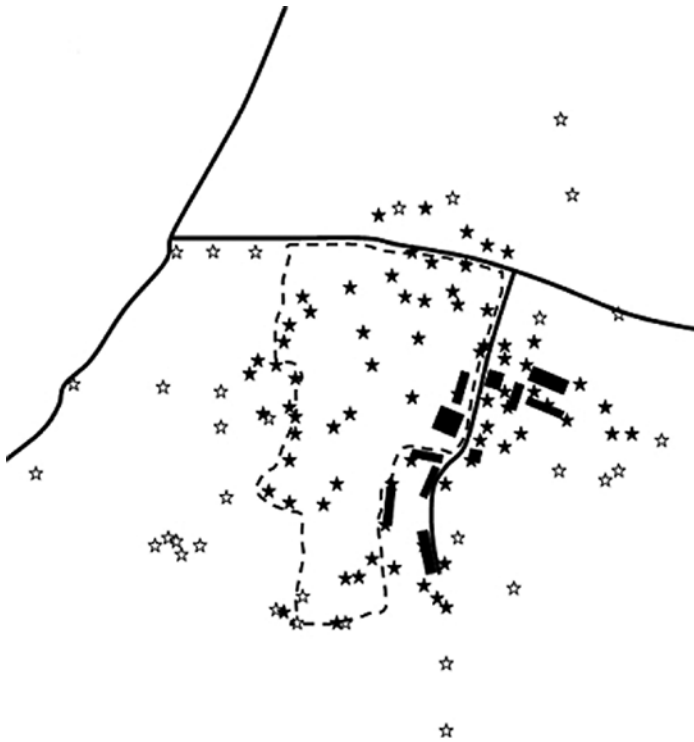


Figure 1. Diagram showing distribution of ants in and around Hidcote Manor Garden. Solid line = road or track; solid rectangle = building; dashed line = garden boundary; open star = native ant species; solid star = *Lasius neglectus*.

Interaction Between *L. neglectus* and Native Ant Species

At Hidcote Manor Garden, outside the main area occupied by *L. neglectus*, several native ant species were present, including *L. niger* (widespread), *L. brunneus* (mainly associated with old oak trees), *L. flavus* (in grassland), and a *Myrmica* species. No native ant species were present within the central area occupied by *L. neglectus* in the garden (Figure 1). At a nearby (1km distant) and similar garden, where *L. neglectus* has not been found, native ant species were present. Around the boundary of the area colonised by *L. neglectus*, the distribution of invasive and native species overlapped slightly at several locations. Aggressive behaviour between *L. neglectus* and other ant species has been reported (Cremer et al., 2006).

Other *L. neglectus* Colonies in the UK

Surveys of gardens which had received plants from Hidcote Manor Garden, did not reveal any colonies of *L. neglectus*. There was one independent introduction of *L. neglectus*, in 2010. Natural tufa rock imported from Italy to Stowe Landscape Gardens in Buckinghamshire was found to harbour a small number of *L. neglectus* individuals. This colony was destroyed by fumigating the tufa with phosphine, while the surrounding area was monitored and treated with imidacloprid ant gel. No more *L. neglectus* have been seen at this location since. A few pest control organisations have made contact regarding unusual ant infestations, but none of these have been *L. neglectus*.

Preventing Spread Outside Hidcote Manor Garden

A number of activities in the garden were identified that were high risk in terms of exporting *L. neglectus* to other locations. To reduce the risk of dispersal, a number of changes in procedures were made (Table 1).

Table 1. Changes to procedures at Hidcote Manor Garden, to reduce the risk of dispersion of the Invasive Garden Ant

Risk	Mitigation measure
Sales of garden-grown plants to the public.	Cease selling garden-grown plants.
Sales of bought-in plants to the public. (These plants are cultivated elsewhere, and are brought to the garden for onward selling only.)	Control ants in plant sales and stock holding area.
Transfer of garden-grown plants to other professional gardens.	Cease transfer of plants from the garden.
Movement of plants grown in cottage gardens on the estate.	Cease removal of plants from the cottage gardens.
Disposal of soil and building waste off-site.	Retain soil and building waste on-site.
Disposal of green waste off-site.	Compost and use all green waste on-site.

Control at Hidcote Manor Garden

Examination of the bait stations showed that the imidacloprid bait was readily consumed by the ants. Monitoring data showed that at one week after the initial treatment, ant activity within the cottages was reduced by 91% (Figure 2). Large accumulations of dead ants were visible in some places. At the 19 week post-treatment assessment, ant numbers per monitor within the cottages still showed a 91% reduction compared to pre-treatment counts. Around the external footings of the buildings, although there was a substantial kill of ants in places, the overall reduction in numbers was not as great as seen indoors. This is likely to be a result of re-invasion of ants from nests outside the treated area.

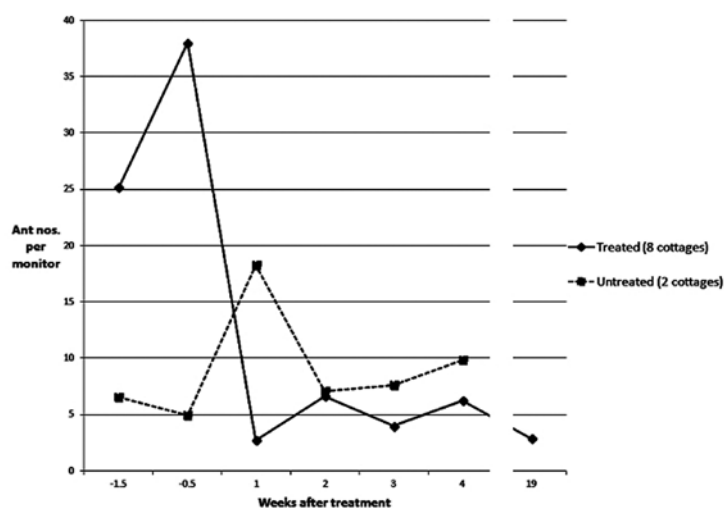


Figure 2. Effectiveness of imidicloprid bait against *Lasius neglectus* in cottages at Hidcote Manor Garden

Future Strategy for Ant Management at Hidcote Manor Garden

Control of *L. neglectus*, at Hidcote Manor Garden, is underway, not only to prevent damage and nuisance to the estate itself, but to reduce the risk of its spread. The overall control strategy depends on

whether this is the only UK colony. The feasibility of eradication at Hidcote is being considered. Area-wide ant eradication programmes have been carried out against *Linepithema humile* in New Zealand (Harris et al., 2002), and *Wasmannia auropunctata* in the Galapagos Island (Causton et al., 2005). The treatment technique, effectiveness, and environmental impact will be important considerations for an eradication project at Hidcote Manor Garden. A pilot study in part of the infested area will be essential to enable some of these issues to be tested and understood better.

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