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Invasive ant *Tapinoma melanocephalum* (Hymenoptera: Formicidae): A rare guest or increasingly common indoor pest in Europe?

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Abstract. The ghost ant (GA), *Tapinoma melanocephalum* (Fabricius, 1793), is one of the most common invasive species of ants (Hymenoptera: Formicidae) in the world. While in its native tropical region it is both an ordinary indoor and outdoor pest, it occurs only indoors in the temperate zone, where increasingly more records of this species have been published since 1887. In this study, the current distribution of GA in Europe, including the new records published since Wetterer (2009), is reviewed. Furthermore, we report the first record of GA in the Czech Republic, where a large colony of GA was discovered in a block of flats in České Budějovice in 2014, and present a case study of its eradication. The revised distribution of GA shows that despite previous concerns about the threats posed by this new pest only three other European countries (including Czech Republic) reported the presence of this species after 2009. Although GA is currently documented as occurring in 18 European countries, which were invaded mainly after 1990, there is only a single (or dubious) record for ten of these countries. Abundance of workers was monitored in two flats in an infested building using traps baited with yolk-honey and GA were subsequently eradicated with imidacloprid (0.01% w/w). The pre-treatment revealed abundances that ranged up to 524 workers per trap (mean = 99, S.D. = 142, 80% of baits occupied). Despite the initial success of the treatment (no ants observed after 3 weeks), monitoring of the building a year later revealed it was still infested with GA and in a similar rate. We suggest alternative methods of eradicating GA in the temperate zone based on studies carried out in the tropics. Our study indicates the difficulty of eradicating the species from buildings when its colony is already established. Furthermore, it highlights the bias in the discovery-probability of GA as a household pest probably due to the species cryptic appearance and lack of attention to it outside of the scientific community.

INTRODUCTION

Many organisms have spread beyond their native ranges during past centuries with the rise of globalization and word-wide trade and have become established in new areas (Shigesada & Kawasaki, 1997; Vaes-Petignat & Nentwig, 2014). Ants are some of the most numerous and ecologically important animals in the world and occur in most terrestrial biomes from the tropics to the arctic zone (Lach et al., 2010). Although invasive ants comprise less than 1% of all ant species (McGlynn, 1999; Lach et al., 2010), five of the 100 organisms currently considered as the most invasive on Earth are ants (ISSG, 2015). Invasive ant species hence pose a very serious ecological risk and are responsible for environmental damage worldwide, especially in warm regions (Whittman, 2014). For instance, the argentine ant *Linepithema humile* (Mayr, 1868) now occurs throughout the tropics even extending into the Mediterranean region (Giraud et al., 2002). However, some species of ants also occur in areas with a cold climate where they survive as indoor pests of humans and are a public health risk and damage food, e.g. the pharaoh ant *Monomorium pharaonis* (Linnaeus, 1758) (Beatson, 1972; Frouz et al., 2009). The key features that determine the ability of these species of ants to spread successfully to new areas are still being debated, but usually involve a combination of ecological and genetic characters such as polydomy, unicoloniality, resilience to (or benefit from) disturbance, low genetic variation and the ability to outcompete other species (Giraud et al., 2002; King & Tschinkel, 2008; Lach et al., 2010). Considerable effort and resources have been invested in eradicating these species of ants with varying degrees of success (Hoffmann et al., 2010).

In this study, we focus on the invasive ant *Tapinoma melanocephalum* (Fabricius, 1793), revise its current distribution in Europe and investigate a case of infested block of flats by the species. This species is thought to originate most likely from the Indo-Pacific region (Wetterer, 2009) but is now a ubiquitous pest throughout much of the tropics and subtropics. It is a typical tramp species (Allaby, 2010) that can easily relocate its colonies and is often associated with environmental disturbance and human activity. Its worker small size (< 1.5 mm), pale colour of the legs and abdomen and quick movements are reminiscent of a "ghostly appearance", which gave the species its species common name, the ghost ant (GA). The oldest record of GA in Europe goes back to 1886, when this species was found in a greenhouse in London (Billups, 1887). Since then, the species has spread to most temperate regions (Europe, North America, China, Korea and Japan), but is restricted there to heated places such as greenhouses,

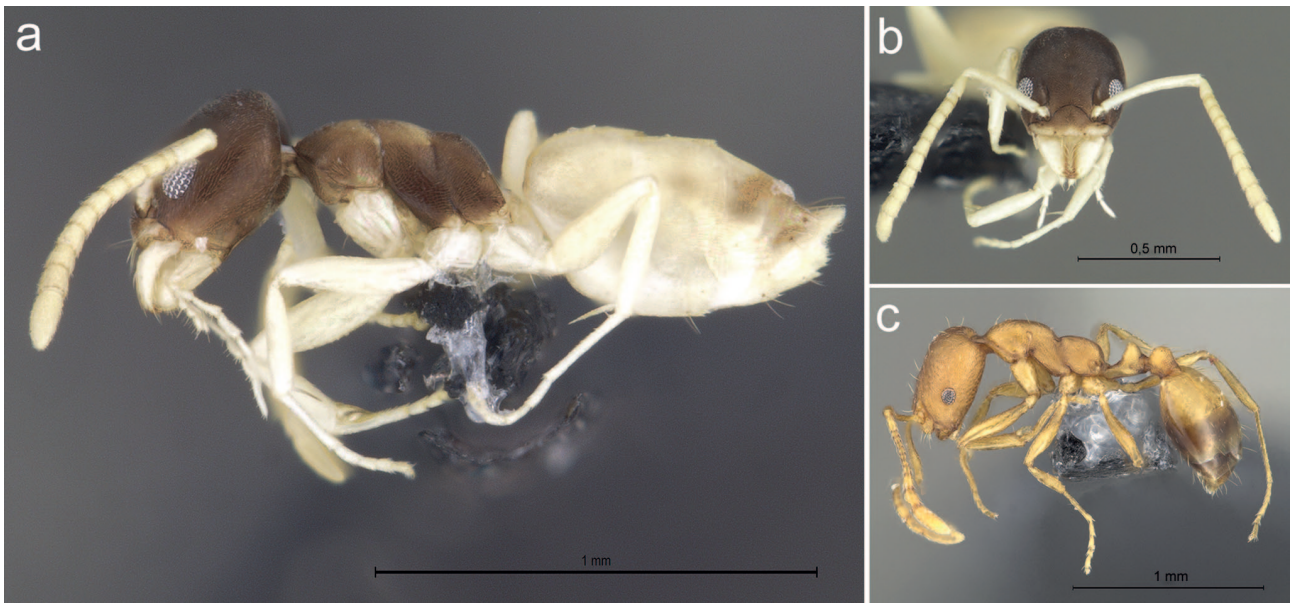

Fig. 1. Photographs of *Tapinoma melanocephalum* worker collected from an established colony in a block of flats in the Czech Republic (České Budějovice, Jírovcova): a – lateral view of a worker, b – frontal view of its head; c – the common indoor ant, *Monomorium pharaonis*, from the same town, which non-experts often confuse with *T. melanocephalum* (photographs by P. Klimeš).

swimming pools and houses (Dekoninck et al., 2006; Wetterer, 2009; Dekoninck & Brouckaert, 2011). The closest outdoor population of GA to continental Europe is in the Canary Islands (Spain) situated in the African subtropics (Espadaler, 2007, X. Espadaler, pers. comm.).

Although GA has an insubstantial bite and lacks a sting, it may present a serious health risk by spreading microbes. For instance, this species is one of the most frequently recorded pests in hospitals in the tropics and is associated with a high diversity of fungal strains that are a possible danger for patients (Fowler et al., 1993; Rodovalho et al., 2007; Pantoja et al., 2009). In buildings, it is usually seen in kitchen corridors and bathrooms (Scheurer & Liebig, 1998; Espadaler & Espejo, 2002; Dekoninck et al., 2006). Similar to the pharaoh ant, the most common indoor ant introduced to Europe, GA can infest stored food. Despite their diminutive size, workers are able to use their mandibles to penetrate even the thick plastic of sugar packages (P. Klimeš, pers. observ.). In greenhouses, GA could potentially spread invasive Hemiptera, although this has been only recorded in the field so far (Zhou et al., 2014).

Here we review the current distribution of GA in countries in the European geographic region and discuss the possible reasons for the few reports of indoor infestations of this ant. Furthermore, we report the first record of an indoor colony of GA in the Czech Republic and investigate their abundance in infested flats before and after insecticide treatment in 2014 and their abundance at the same site one year later. Finally, we recommend some methods for eradicating GA based on studies carried out in the tropics.

MATERIAL AND METHODS

New record of ant species for the Czech Republic

Ghost ant (GA), *Tapinoma melanocephalum* (Hymenoptera: Formicidae), Jírovcova st., České Budějovice (48°58´59.20˝N, 14°28´39.04˝E), inside a heated building (290 workers in 96% ethanol, 17.i.2014, lgt. J. Okrouhlík). These specimens are deposited in the collection of the first author at the Institute of Entomology BC CAS (3 workers pinned and the rest in ethanol). A worker of GA from the new site plus a worker of the common indoor ant pest *M. pharaonis* from a different nearby building (Pekárenská, České Budějovice, lgt. P. Klimeš) were pinned and documented using a Leica DFC450 camera fitted with macroscope Leica Z16 APO (Fig. 1). The photographs were folded in Helicon Focus version 5.3.

Revision of the current GA distribution in Europe

First, we determined the validity of the literature records cited in Wetterer (2009) for Europe (i.e. until 2009) and the time of the oldest record cited. Then we searched for new records published between 2009−2015 using online resources (Web of Science at http://apps.webofknowledge.com; database Antweb at www.antweb.org). Lastly, we asked for additional records and literature on the occurrences of this species from colleagues (see Acknowledgements) in every European country where contacts to myrmecologist experts are available (Antwiki, 2015 and pers. comm.). Only records of established colonies (such as the new record from Czech Republic detailed above) and not those of infested luggage and imports (i.e. Jucker et al., 2008) were considered. A distribution map of countries where infestations were recorded was created using R version 3.1.0 (2014) and adapted in Adobe Photoshop. We categorized countries based on whether there were only dubious records for them (without locality and collection information), or only a single record, or multiple verified records of GA. In addition, we ranked all countries based on the oldest known record for each country and compared the time of infestation of countries with coastal access (i.e. by the North Atlantic Ocean, Baltic Sea or Mediterranean Sea) versus those situated inland in Europe to assess the possible effect of shipping on the spread of GA since its first appearance in the 19th century.

Monitoring and treatment of the GA infestation at the new locality

In 2014 an ant infestation in a four-storey block of flats in České Budějovice (South Bohemia, Czech Republic) was reported by

Table 1. List of countries in Europe where *Tapinoma melanocephalum* has been recorded ordered in terms of the oldest known records for those countries. Those in bold are based on unverified records of colonies. Years and sources with an asterisk are corrected or based on new information than those cited by Wetterer (2009).

Country	Position	The first record of ghost ant	Source
United Kingdom	Coastal	1887	Billups (1887)
Netherlands	Coastal	1917*	Boer & Vierbergen (2008)
Germany	Coastal	1926	Wetterer (2009)
Finland	Coastal	1991*	Rosengren (1992)*
France	Coastal	1995	Hugel et al. (2003)
Norway	Coastal	1995*	A. Aak & T. Birkemoe, pers. comm.
Sweden	Coastal	1995	Douwes (1995)
Russia	Coastal	1997	Kunashev & Niyazova (1998)
Switzerland	Inland	1997	Dorn et al. (1997)
Spain	Coastal	1999	Espadaler & Espejo (2002)
Austria	Inland	2001	Steiner et al. (2003)
Denmark	Coastal	2002	Jespersen & Christensen (2003)
Romania	Inland	2004	Fauna Europaea (2015)
Belgium	Coastal	2006	Dekoninck et al. (2006)
Italy	Coastal	2007*	Jucker et al. (2008)
Hungary	Inland	2009*	Csosz et al. (2011)
Ukraine	Inland	2014*	Radchenko et al. (2015)
Czech Republic	Inland	2014*	Present study

owners to a pest control company (Měšťan, www.mestaning.cz), which targeted the location as part of a commercial treatment of *M. pharaonis*. However, examination by the second author revealed the presence of a different ant species, GA, at the site. In addition to the commercial eradication, we therefore monitored the activity of the ants before and after treatment, in two flats for which we obtained the owners agreement, i.e. one flat on the first floor and one on the top floor in the first hallway of the three in the building. Each hallway shared an entrance, a stairway, ventilation, water distribution and sewage systems. Monitoring traps were placed in several places in each flat around the kitchen and bathroom area (n = 5 per flat). Each trap consisted of a 15-ml polypropylene centrifuge tube filled with approximately 5 g of bait consisting of a mixture of boiled egg yolk and honey (5 : 1). Open tubes were placed in the flat in the evening and closed the following morning after approximately 10 h of exposure to ants. Traps were then frozen and dead worker ants counted. In this way the presence and severity of the GA infestation was checked one week (i.e. week −1) and one day before (week 0), and 1−3 weeks after the treatment, i.e. subsequent monitoring was done weekly for a month, 5 controls in total (January−February 2014). The treatment consisted of a sugar-based gel containing 0.01% w/w imidacloprid as the active substance (Gervais et al., 2010), which was applied once at a rate of 0.2 g/m^2. Temperature and moisture were recorded in each flat weekly using a data logger EL-USB-2+ (Lascar Electronisc). The effects of treatment on abundance of GA were determined by a repeated measure analysis of variance (rmANOVA) with effects FLAT and TIME and their interaction (4 monitoring times; week 3 excluded due to null variation) using Statistica 12 (StatSoft, 2010). Worker abundance was log-transformed before the analysis.

To determine whether the commercial treatment in 2014 was a success in the long term, the site was revisited by the authors in April 2015 (14 months later) and the two flats were sampled for ants again using the same method (i.e. the same exposure time and placement of traps). As the owners reported that GA were present continuously over the last few months, an additional three flats associated with the first hallway (one more on the 1st floor and two on the 2nd floor) and also three flats in the second hallway (another part of the building), were investigated to determine the ability of GA to persist at the site. Only the abundance data from the two flats sampled twice by the same method in 2014 (week 0) and 2015 were compared using a paired t-test.

RESULTS

Distribution of GA in Europe

Wetterer (2009) summarized the world distribution of GA based on both published and unpublished records, listing 15 European countries in terms of the oldest records. Our literature investigation revealed that since then infestations of GA have been reported in three other countries in Europe: Hungary, where nine workers were caught in a building in Budapest (Csosz et al., 2011), Ukraine with three new records for Kiev (Radchenko et al., 2015; A. Radchenko, pers. comm.) and the Czech Republic, this study (Table 1). In addition, two new records of GA are known for Belgium after 2009 (W. Dekoninck, pers. comm.): several workers were caught in a swimming pool at Oostduinkerke (Dekoninck & Brouckaert, 2011) and a flat was infested in Vorst (Volsemstraat, kitchen, 04.ii.2014, leg. L. Bernaerts, det. W. Dekoninck). Furthermore, Wetterer (2009) reports only a single location for Norway, however, since the discovery of GA at Oslo airport in 1995 several other cities have been found to be infested: Fredrikstad, Bergen, Stavanger, Haugesund and Elverum (11 unpublished records in the database of Norwegian Institute of Public Health with the last record dated 23.x.2013; A. Aak & T. Birkemoe, pers. comm.). Inquiries with other myrmecologists (listed in Acknowledgements) did not reveal any other records since 2009 than those described above. Moreover, records for two of the 15 countries listed in Wetterer (2009) provided no specific information on collected material and locality, i.e. Romania (Fauna Europaea, 2015) and Denmark (Jespersen & Christensen, 2003). The record for Romania might be a mistake in the database, though

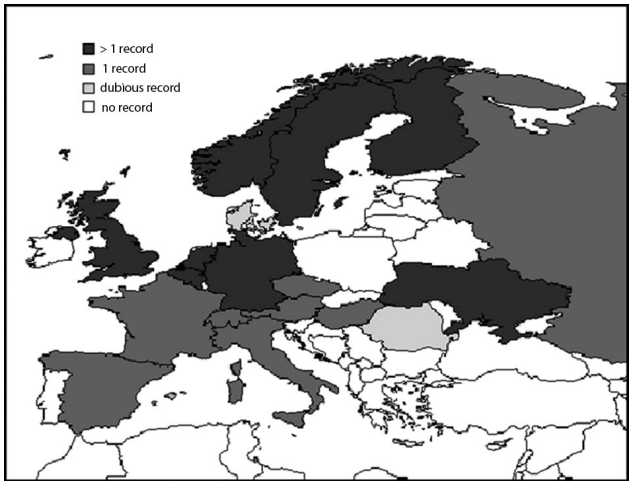

Fig. 2. The current distribution of *T. melanocephalum* in Europe based on published records and the results of this study (see Table 1). Countries in dark grey depict those with documented multiple cases of infestation by the species.

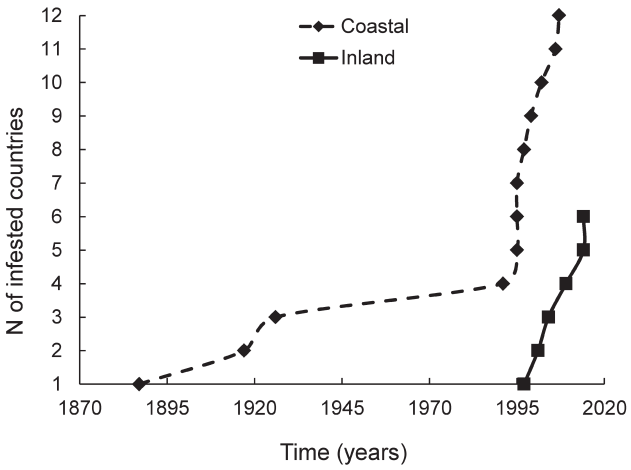

Fig. 3. Cumulative curve of the number European countries with *T. melanocephalum* plotted relative to time of the oldest known record of this species for each country and whether they are accessible by sea (coastal countries: diamonds) or situated inland (squares).

this species is likely to occur there (Markó, 2009) and in Denmark (Nielsen, 2011).

Altogether, GA is reported in 18 European countries (Table 1). However, for only eight of the countries are there well-documented multiple infestations of this species: Finland (Rosengren, 1992; Sorvari, 2003), Germany (Scheurer & Liebig, 1998; Wetterer, 2009), Netherlands (Boer & Vierbergen, 2008), Sweden (Hagstrom et al., 2005; Wetterer, 2009), UK (Billups, 1887; Shah & Pininger, 1996), Ukraine (Radchenko et al., 2015), Belgium and Norway (see above). All eight of these countries are situated in Northern and Western Europe, with the exception of the Ukraine (Fig. 2). The cumulative number of countries in which infestations of this species are recorded is increasing rapidly in time for both coastal and inland countries in Europe, but with the infestations in the latter being recorded mainly during the most recent period 1997−2015 (Fig. 3). The only three countries for which there are records of GA prior to 1930 are all coastal: UK, Germany and the Netherlands (Table 1). All verified records were for GA inside buildings.

Monitoring and treatment of infestations of GA

The numbers of workers per trap in the pre-treatment in 2014 ranged from zero to 524 individuals (mean = 99, S.E. = 33.4) and 80% of traps were visited by ants prior to the treatment. The mean temperature was 23.5°C and humidity 52% in the flat on the 1st floor, and 22.3°C and 57% on the 4th floor. The mean abundance significantly declined to 18.8 workers per trap in the 1st floor flat and to zero in the other flat two weeks after the treatment (rmANOVA, log + 1 transformed data: TIME factor, $F_{3,24} = 10.4$, $p < 0.001$). The number of ants per trap was much higher in the 1st floor flat (mean = 115.1 and S.E. = 37.4 individuals) than the 4th floor flat (mean = 3.8 and S.E. = 1.5 individuals; FLAT factor, $F_{1,8} = 16.5$, $p = 0.003$), with no significant interaction between the factors FLAT and TIME ($F_{3,24} = 0.53$, $p = 0.67$). In total, 2302 and 76 workers were trapped in the two flats, respectively. No ants were recorded three weeks after the treatment (Fig. 4a).

The investigation a year later, in 2015, did not confirm, however, that GA was no longer present at the site. The mean number of workers per trap in the two flats in 2014 (week 0) and 2015 did not differ significantly (mean in 2014 = 104, mean in 2015 = 64, paired t-test, $t_9 = 0.72$, $p = 0.48$) (Fig. 4b). Moreover, the additional examination of another three flats in the first hallway revealed that GA was present in all three flats, although only one of the five traps was visited in each of the flats (the mean = 43.3 individuals per visited trap). In one of the highly visited traps there were not only workers but also one gyne. Investigation of the second hallway revealed that GA was present in low numbers in only one of the three flats investigated (individual workers), but owners of 10 of 12 flats reported seeing ants in their properties during the past year. We did not have access to the third hallway of the block of flats to confirm that this species was present in the whole building, but it is likely that this was the case.

DISCUSSION

The number of tropical species of insects recorded in European countries has increased considerably over the last few decades (Vaes-Petignat & Nentwig, 2014). Some of those species are still restricted to indoor habitats (as shown here for the GA), while others are able to survive outdoors where they can compete with the native fauna, e.g. herbivorous insects (Fanning & Baars, 2014; Macek & Šípek, 2015) and wasps (Monceau et al., 2014). For ants, one of the insect groups with the greatest economic impacts, continuous monitoring of their spread is especially important (Hoffmann et al., 2010; Whittman, 2014). The results of our study demonstrate that there is an increasing trend in number of countries invaded by GA, especially in the past ten years. However, these results and recent reports of stable indoor populations in Central and Eastern Europe

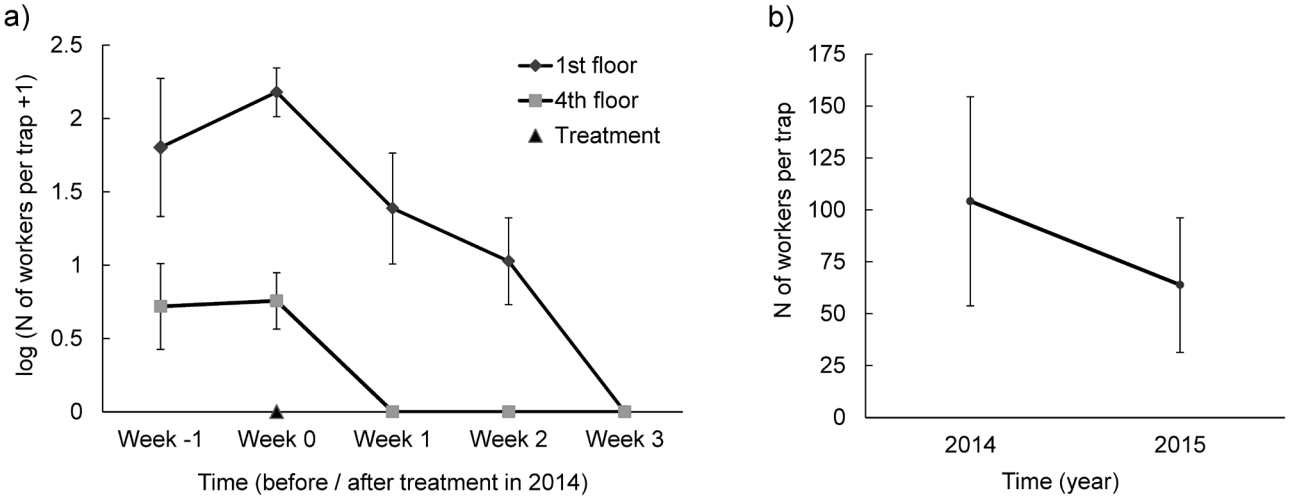

Fig. 4. Number of *T. melanocephalum* workers (a) plotted on logarithmic scale (mean ± S.E.) recorded in the two flats on the first and fourth floor, respectively, in course of treatment with insecticide, and (b) comparison of the mean number (± S.E.) before the treatment in 2014 and a year later. The x axis in (a) indicates the weakly monitoring of the traps before (week 0 and −1) and after (week 1−3) the treatment and the year sampled, respectively.

(i.e. Czech Republic and Ukraine), while the majority of countries report only a single record of GA or none, point to a possible underestimate of its indoor occurrences in the temperate zone. This lack of a reliable database of GA occurrence is worrying, as our results also suggest that its eradication might be difficult once it becomes established.

Previous studies warned that GA could become a serious pest in Europe due to its potential to spread very quickly (Shah & Pininger, 1996; Sellenschlo, 1997; Wetterer, 2009), similar to *M. pharaonis*, which arrived in Europe in 1828 and is now a very common pest (Wetterer, 2010). Our literature survey does not strongly support this opinion. Although the number of countries in which infestations have been recorded has increased considerably during the last two decades (Fig. 3), there are still only single records for most countries, or verified information on established colonies is lacking (Fig. 2, Table 1). However, GA was first recorded in most European countries 50−100 years later than the pharaoh ant (Wetterer, 2010). Thus GA has had much less time to become established in Europe and we cannot exclude the possibility that it could become a common pest like *M. pharaonis* in the future.

Interestingly, the countries in Europe that were the last to be colonized by GA are located inland, indicating that shipping could have had a significant effect on the spread of this species. A similar case is documented for the fire ants, *Solenopsis invicta* Buren, 1972, for which DNA nuclear data strongly support this hypothesis (Ascunce et al., 2011). However, for GA such molecular data are lacking (Wetterer, 2009) and there are alternative explanations of this pattern. Western and Northern European countries historically have a better pest management systems and tracking of the records (e.g. UK, Germany and Norway) than Central and East-European states. Furthermore, there is evidence that some of the more recent records resulted rather from GA arriving in cargos on aircraft even in countries with coastlines, e.g. Italy, Spain and Germany (Sellenscho, 1999; Espadaler & Espejo, 2002; Boer & Vierbergen, 2008; Jucker et al., 2008). For instance, there is a documented case of a GA colony introduced in to the Netherlands in 2000 in an infested soccer boot from Brazil (Boer & Vierbergen, 2008) and the first record of a colony in Norway is from Oslo airport in 1995 (T. Birkemoe, pers. comm.).

It is thus evident that the more frequent travel to tropical regions has made it easier for GA to extend its range and it is likely that this species will eventually be present "in every major city in the world" as stated by Wetterer (2009). However, evidence from the literature is relatively poor and possibly biased for this species' current distribution, with new cases reported much less frequently for GA than for pharaoh ants in the temperate zone (compare maps in Wetterer, 2009, 2010). In the Czech Republic, we do not know of any other verified record of GA, but we cannot exclude the possibility that this species has been previously overlooked. For instance, an owner of a flat in Sezimovo Ústí (K Hájence st., South Bohemia) described a large infestation of several blocks flats in 1999 by a species of ant closely fitting the description of GA (M. Vyhnánek, pers. comm.), however, it is not possible to verify this old record. Although we were successful in contacting myrmecologists in most European countries, including those with no GA records (see Acknowledgements), this may not be the best evidence, as scientists often admit a complete lack of research on household insects within their country (A. Jesovnik, Ch. Georgiadis, pers. comm.). Indeed, in a recent survey conducted in Kiev, multiple cases of structures infested with GA were reported (A. Radchenko, pers. comm.). GA appears also to receive less attention as a recognized part of the ant fauna in some countries where it has been documented many times, e.g. it is not cited in the ant species checklist of Germany, unlike the indoor tramp species *M. pharaonis* (Seifert, 2007). It is thus likely that many instances of this species occurring inside buildings

are not reported, which could be especially true for countries like France, Spain and Denmark, given their proximity to countries with many GA records.

However, there are several difficulties in obtaining new records for particular species, when studying indoor populations of insects such as ants. Household pests are commonly misidentified, because eradication companies often include many species in the same taxon, even though they vary greatly in their morphology, behaviour and feeding habits. These attributes have consequences for their vulnerability to particular pest management methods (Lee, 2002; David & Venkatesha, 2013). Although it might seem unlikely to an entomologist, this first record of GA in the Czech Republic, was originally assumed by the owners and the eradication company to be pharaoh ants, a common pest in this region. These two species of ants, however, differ greatly in their appearance, body size and behaviour (Wetterer, 2009, 2010) (Fig. 1). The small size, whitish colour and erratic quick movements of GA (Fig. 1, Youtube, 2015) sometimes result in the assumption by non-entomologists that they are not even ants, but a different kind of insect (pers. comm. with flat owners). A further obstacle to obtaining accurate information on household pests such as GA is that there is no published data on their abundance and reaction to pesticides, because eradication companies and health-care institutions do not publicize this information, or do not keep a database of their records. In addition, the owners of buildings often do not wish to make their properties accessible to researchers, or report infestations.

Hence, although the data presented here on GA are only for single building and a small number of flats and baits, they are unique. The high numbers of worker ants recorded (up to hundreds of individual workers per bait in a given time) indicate a very large colony of this species in the building, probably established on the lower floors, where the temperature is higher during winter, and from where it spread to the most of the flats. Moreover, although the short-term data from our monitoring in 2014 suggested a successful and quick eradication of this species in the building, our survey of the building a year later revealed that this species was still present and even similarly abundant. The colony has been there hence for at least 2 years (since 2013 according to the owners). The finding of GA in two hallways in the building in 2015 and the variable abundance recorded in the different flats indicates the presence of multiple nests at this site (polygynous colony). Similar difficulties with eradicating GA were reported in London (Shah & Pininger, 1996).

Due to the scarcity of research on GA in buildings in temperate regions, it is not known whether GA would be better controlled by using a different insecticide than that used to control pharaoh ants, although its seems likely to us based on data available for the tropics. There is also evidence that GA is difficult to eradicate in natural environments, at least in tropical forests where unlike other ant taxa this species surprisingly increased in numbers after insecticide treatment (Klimes et al., 2011). Comparable studies on GA in the tropics indicate that for the complete eradication of this species a sugar-based bait (Lee, 2002; David & Venkatesha, 2013) and a general insecticide, e.g. boric acid or imidacloprid, applied in liquid form rather than a gel, is needed (Ulloa-Chacon & Jaramillo, 2003; Wang & Luo, 2011; Luo & Chang, 2013). In contrast, *M. pharaonis* is less effectively controlled by these treatments and prefers protein-based baits (Klotz et al., 1996). Based on the above, we recommend sugar-based liquid baits for controlling GA infestations. Where it is difficult to apply this treatment, commercially available baits for controlling the native black garden ants, *Lasius niger* (Linnaeus, 1758), based on sugar compounds are likely to be more efficient than those used to control pharaoh ants. However, the failure to eradicate GA at our site could be explained also by the fact that it may require the repeated use of poison baits in the whole building, as the treatment with imidacloprid in a gel resulted to a very quick and significant decline in the abundance of the ant. Furthermore, our interview with flat owners in 2015 revealed that some of the owners did not agree to the previous treatments and/or tried controlling the ants using locally-available commercial products (Lafarex K®, Lach-Ner, S-methoprene 0.5% w/w; Blattanex®, Bayer, Imidicloprid 0.0003% w/w). These factors might make the successful eradication in the whole building unlikely.

In summary, the GA is likely to be a much more common indoor species in Europe than suggested by the scientific literature and some countries might have overlooked this species because they do not have a system for monitoring and reporting insect pests in buildings. However, it is likely that the ghost ant occurs less frequently than pharaoh ant in the temperate zone and has only begun to spread across Europe relatively recently. We found no evidence of GA occurring outside heated structures in Europe, as occasionally recorded for *M. pharaonis* (Wetterer, 2010). Its relative rareness compared to other tropical ants is true for the Czech Republic and Slovakia, where a recent census of ants in zoological and botanical greenhouses did not discover this species (Pech & Dvořáčková, 2015; M. Klesniaková, pers. comm.). This is, however, in contrast to nearby countries such as Germany and Ukraine (Sellenschlo, 1997; Radchenko et al., 2015). We hope that this study might stimulate interest in this cryptic species of ant by both the scientific community and the public and result in a better assessment of its potential for becoming a common pest in Europe.

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