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The northernmost record of the invasive garden ant, *Lasius neglectus* (Hymenoptera: Formicidae)

Roland SCHULTZ & Thilo BUSCH

Abstract

The invasive garden ant, *Lasius neglectus* VAN LOON, BOOMSMA & ANDRÁSFALVY, 1990, possibly native to Asia Minor, is currently spreading through urban areas of Europe and Middle Asia. In June 2008, we discovered three populations of *L. neglectus* in Rostock, Germany (54.1° N, 12.1° E), the most northern location recorded for this species. The main Rostock population covers more than seven hectares, centering on an urban park. Two much smaller populations occur in a botanical garden 1.5 km to the west. Near the centre of the main population, we found no other ant species present. It is unclear how much farther north this species will spread.

Key words: Invasive species, range expansion, climate change, *Lasius neglectus.*

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Dr. Roland Schultz (contact author), Senckenberg Museum of Natural History Görlitz, Am Museum 1, D-02826 Görlitz, Germany. E-mail: roland.schultz@senckenberg.de

Thilo Busch, Im Garten 22, D-18057 Rostock, Germany. E-mail: myrmecophilus@gmx.de

Introduction

Since its description in 1990, the range expansion of the invasive garden ant *Lasius neglectus* VAN LOON, BOOMSMA & ANDRÁSFALVY, 1990 is being closely followed by European myrmecologists (MARKÓ 1998, CZECHOWSKA & CZECHOWSKI 1999, ESPADALER 1999, SEIFERT 2000, DEKONINCK & al. 2002, CZECHOWSKA & CZECHOWSKI 2003, ESPADALER & BERNAL 2003, TARTALLY 2006, ESPADALER & al. 2007, CREMER & al. 2008, NAGY & al. 2009). From its possible point of origin, Asia Minor (SEIFERT 2000), *L. neglectus* was transported along with organic material, probably potted plants (VAN LOON & al. 1990), to Budapest, where its invasive character first became obvious (VAN LOON & al. 1990). Since then, this species has been reported on more than 100 sites, ranging from the Canary Islands to Kyrgyzstan (for comprehensive overviews, see CREMER & al. 2008, ESPADALER & BERNAL 2009). In all cases, parks, botanical gardens, greenhouses or the like provided ingress (VAN LOON & al. 1990, SEIFERT 2000). The northernmost line of distribution known in Europe is currently Ghent (Belgium, 51.0° N, DEKONINCK & al. 2002), Jena (Germany, 50.9° N, SEIFERT 2000), and Warsaw (Poland, 52.3° N, CZECHOWSKA & CZECHOWSKI 1999). In this paper we describe a new population of *Lasius neglectus* in northern Germany, currently the northernmost location known, and discuss the species' potential northern range limit.

Methods and Results

On 16 July 2008, both authors investigated a population of *Lasius neglectus* in the city of Rostock (54° 05' 26" N, 12° 07' 13" E, ca. 20 m a.s.l.; Figs. 1, 2). Rostock is a city and port on the Baltic Sea. The *L. neglectus* population was discovered by T.B. several weeks earlier in the park of the University Ophthalmic Clinic. Interviews with the employees revealed that *L. neglectus* was first detected nearly ten years ago in the garden of the neighbouring Botanical Institute.

Today, the population covers the entire park, garden and yard area along the Doberaner Strasse and is delimited on the west and east side by roads. Southward, the ants have already overcome the four-lane Doberaner Strasse and can be found on the street trees of the other side. Northward, the ants overcame a smaller road and inhabit the grounds bordering business premises. Owners report that the ants have been in this part for five years. The whole area occupied by the population was 7.3 hectares in 2008.

Within the area populated by *L. neglectus*, all available homopterans (aphids and scale insects), were used. In July 2008, all trees with aphids showed heavily used ant trails (on their warmest southwestern sides; note that this contrasts the situation in Hungary where, in the summer months, the cold north sides of the trees are used, A. Tartally, pers. comm.). Nest entrances were below trees, near stones, in sidewalks and under the foundations of buildings. The ants have also entered the buildings, where they target all available food sources. All eradication measures have been unsuccessful.

In a greenhouse of the Botanical Institute, dead males were found outside nests on the hairy and sticky leaves of tobacco plants. It is unclear how they got there. Swarming was not observed by the authors or the employees.

In the central parts of the population, no other ants could be found (cf. NAGY & al. 2009). On the periphery, *Lasius*

niger (LINNAEUS, 1758), *L. brunneus* (LATREILLE, 1798), *L. fuliginosus* (LATREILLE, 1798) and *Myrmica rugulosa* NYLANDER, 1849 were observed.

Two much smaller sites with *Lasius neglectus* were discovered in the Botanical Garden, about 1.5 km to the west (54° 05' 29" N, 12° 05' 40" E). Both spots were about 50 m apart and had no connection with each other. Gardeners stated that palms were recently transported from the Botanical Institute to the Botanical Garden. *Lasius neglectus* was found in and outside a small greenhouse that sheltered these palms. The infested area covers about 6 m^2. The second site was located near a compost heap (about 5 m^2), with another small nest 10 m away. These small populations will probably spread within the next few years if they are not dealt with.

Even if we have not tested it yet, we assume the *L. neglectus* population near the Doberaner Strasse to be one supercolony. Its origin has to be a plant transport to the Botanical Institute at least ten years ago. The fact that *L. neglectus* was first discovered here, and has later reached other parts of the now populated area (see above), supports this assumption. Multiple introductions, as suggested by BUCZKOWSKI & al. (2004) for the Argentine ant (*Linepithema humile* (MAYR, 1868)) should be possible, but seem unlikely. The introduction of the two small populations to the Botanical Garden with material transported from the Botanical Institute seems most likely (see above).

Discussion – Where could the northernmost border be?

SUAREZ & al. (2001) used a dual model to describe, at different spatial and temporal scales, the expansion pattern in *Linepithema humile*. The first process was diffusion. It implies colony budding and produces much shorter distances – by three orders of magnitude – than the second process, long-distance jump-dispersal. The latter involves small colony fragments unintentionally introduced by humans. ESPADALER & al. (2007) adapted this model for *Lasius neglectus*: local expansion through colony growth and regional expansion, induced by human transportation.

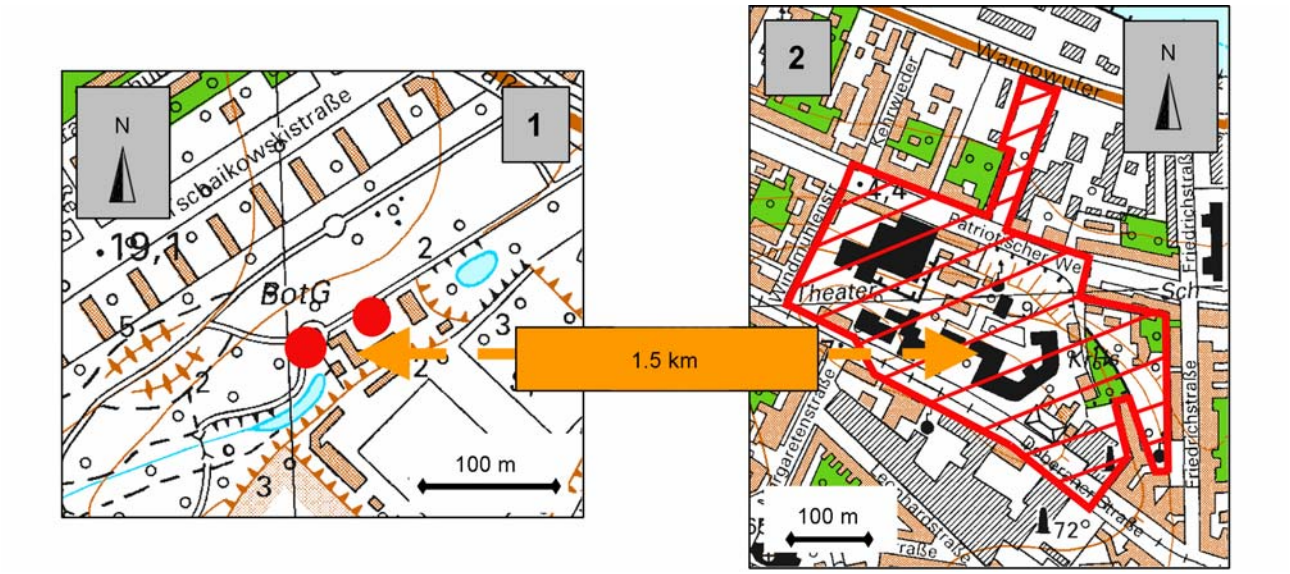
Clearly, the long-term expansion in *L. neglectus* is related to human transportation (VAN LOON & al. 1990, SEIFERT 2000, ESPADALER & al. 2007). Storage sites for organic material that provide the possibility for ant settlements are probably the preferred initial points for an expansion. A certain latent stage of population development (SCHULTZ & SEIFERT 2005) has to be overcome. This makes botanical gardens and arboretums (e.g., Jena / Germany, SEIFERT 2000; Icod / Canary Islands, Spain, ESPADALER & BERNAL 2003; Debrecen / Hungary, TARTALLY 2006) ideal steppingstones. Such facilities regularly exchange plants with similar institutions and provide an opportunity for undisturbed settlement in the initial stage of colony growth (see development of two populations in Rostock's Botanical Garden, initiated by plant transportation from the Botanical Institute). Unsuitable conditions that limit the survival in the initial state can be overcome in greenhouses, which maintain the appropriate range of temperature and other environmental conditions (sensu CALLCOTT & COLLINS 1996, SUAREZ & al. 2001). In Rostock, *L. neglectus* was first observed by employees in the greenhouses of the Botanical Institute. After introduction to the Botanical Garden, the species first settled in the small palm-house (see above).

Rostock is situated in north-east Germany on the coast of the Baltic Sea. Its climate is suboceanic, with relatively mild winter (January mean: 0.2°C, February mean: 0.7°C) and summer (July mean: 16.8°C) temperatures. The mean annual temperature is 8.4°C and the total annual precipitation is 589 mm (data from DWD data service for the normal period 1961 to 1990, DEUTSCHER WETTERDIENST 2009). These temperatures should have increased in recent years, but no newer data are available to the authors.

For the prediction of the possible geographical range of invasive species, several models based on environmental (especially climate) data have been used (e.g., ROURA-PASCUAL & SUAREZ 2008, STEINER & al. 2008). Unfortunately such an approach has not been applied to *L. neglectus* until today. SEIFERT (2000) and SCHULTZ & SEIFERT (2005) assumed that the winter temperature could be a limiting factor for the range expansion of *L. neglectus* and that the species could probably survive a mean temperature of -4.5 to -6°C in the coldest month. In Scandinavia, this temperature could be reached very far north owing to the Gulf Stream. The respective mean January isotherm line would be reached in south-central Scandinavia, in Norway along the coast up to the North Cape, in Sweden from west to east (60° N, north of Vännern lake) to 62° N (Baltic Sea coast) and in Finland at least along the south coast (TUOMENVIRTA & al. 2001). In populated areas, the probable entry points, *L. neglectus* might extend even further north.

Climate change would shift the geographical range of species to the north (e.g., THUILLER 2007). *Lasius neglectus* with its proven ability to expand its range through human transportation should surely benefit from rising temperatures. The average global temperature over land and ocean has risen 0.07°C / 10 years from 1901 to 2000, but 0.13°C / 10 years in the last 50 years (JONES & MOBERG 2003, SMITH & REYNOLDS 2005, MÜLLER-WESTERMEIER & al. 2008). In Germany the average annual air temperature rose 0.06°C / 10 years from 1901 to 2000, but as much as 0.40°C / 10 years in the period 1965 to 2005 (MÜLLER-WESTERMEIER 2002, DEUTSCHER WETTERDIENST 2009). In Scandinavia the magnitude of twentieth-century warming is about the same as that of the global mean temperature, with the largest positive trends (more than 1°C in 100 years) in cities, owing to urbanisation (TUOMENVIRTA & al. 2001).

So far, inquiries at botanical gardens, arboretums and similar facilities in Denmark, Sweden, Norway, and Finland have yielded no positive results (R. Schultz, unpubl.). But *Lasius neglectus* has now reached the south coast of the Baltic Sea and should be expected in Scandinavia in the next few years. Expected beachheads for the entry are bigger towns, especially those with heated greenhouses. To date, *L. neglectus* has not been recorded in natural habitats (SCHLICK-STEINER & al. 2003, CREMER & al. 2008). As in Central Asia (Kyrgyzstan, see SCHULTZ & SEIFERT 2005), however, the species is expected to spread to the periphery of human settlements and possibly to agriculturally used areas. For the more northern and mountainous parts of Scandinavia, the climate will probably be the most important long-term limiting factor (see also HARTLEY & LESTER 2003). *Lasius neglectus* populations pose a threat to man-made ecosystems in the cold-temperate climate zones that have as yet suffered very little from invasive ants (CREMER & al. 2008).



Figs. 1 - 2: (1) Two small populations of *L. neglectus* in Rostock Botanical Garden. (2) Main population of *L. neglectus* in Rostock near Doberaner Strasse (Theatre, University Ophthalmic Clinic, Botanical Institute with greenhouses). Original map, "TK 10", with permission of Federal State Office for Surveying Mecklenburg-Western Pomerania © LVermA M-V No.V/1/2000. All rights reserved.

As far as the authors are aware, the two initial nesting areas in Rostock's Botanical Garden present a unique opportunity to follow the latent stage of population development (SCHULTZ & SEIFERT 2005) and / or to test theoretical and actual colony expansion (see TARTALLY 2006, ESPADALER & al. 2007). On the other hand, at least in these initial populations, effective reduction seems to be possible. For a lasting treatment programme, reducing a large-scale *L. neglectus* infestation, see REY & ESPADALER (2004).

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Zusammenfassung

Lasius neglectus VAN LOON, BOOMSMA & ANDRÁSFALVY, 1990, möglicherweise ursprünglich in Kleinasien beheimatet, breitet sich gegenwärtig in urbanen Gebieten Europas und Mittelasiens aus. Im Juni 2008 wurden drei Populationen von *L. neglectus* in Rostock, Deutschland (54.1° N, 12.1° E) entdeckt. Dies ist der nördlichste bisher bekannte Fundort dieser Art. Die Hauptpopulation besiedelt mehr als sieben Hektar, mit Schwerpunkt in einer städtischen Parkanlage. Zwei wesentlich kleinere Populationen befinden sich im Botanischen Garten etwa 1,5 km westlich. Im Zentrum der Hauptpopulation konnten keine weiteren Ameisenarten nachgewiesen werden. Gegenwärtig ist nicht klar, wie weit sich diese Art noch nach Norden ausbreiten wird.

References

BUCZKOWSKI, G., VARGO, E.L. & SILVERMAN, J. 2004: The diminutive supercolony: the Argentine ants of the southeastern United States. – Molecular Ecology 13: 2235-2242.

CALLCOTT, A.-M. & COLLINS, H.L. 1996: Invasion and range expansion of imported fire ants (Hymenoptera: Formicidae) in North America from 1918 - 1995. – Florida Entomologist 79: 240-251.

CREMER, S., UGELVIG, L.V., DRIJFHOUT, F.P., SCHLICK-STEINER, B.C., STEINER, F.M., SEIFERT, B., HUGHES, D.P., SCHULZ, A., PETERSEN, K.S., KONRAD, H., STAUFFER, C., KIRAN, K., ESPADALER, X., D'ETTORRE, P., AKTAÇ, N., EILENBERG, J., JONES, G.R, NASH, D.R., PEDERSEN, J.S. & BOOMSMA, J.J. 2008: The evolution of invasiveness in garden ants. – Public Library of Science One 3: e3838.

CZECHOWSKA, W. & CZECHOWSKI, W. 1999: *Lasius neglectus* VAN LOON, BOOMSMA & ANDRÁSFALVY, 1990 (Hymenoptera, Formicidae), nowy dla Polski gatunek mrówki w Warszawie. – Przegląd Zoologiczny 43: 189-191.

CZECHOWSKA, W. & CZECHOWSKI, W. 2003: Further record of *Lasius neglectus* VAN LOON, BOOMSMA & ANDRÁSFALVY (Hymenoptera: Formicidae) from Warsaw, with a key to the Polish species of the subgenus *Lasius* s.str. – Fragmenta Faunistica 46: 195-202.

DEKONINCK, W., DE BAERE, C., MERTENS, J. & MAELFAIT, J.-P. 2002: On the arrival of the Asian invader ant *Lasius neglectus* in Belgium (Hymenoptera, Formicidae). – Bulletin de la Société Royale Belge d'Entomologie 138: 45-48.

DEUTSCHER WETTERDIENST 2009: Wetter und Klima. – <http://www.dwd.de>, retrieved on 31 January 2009.

ESPADALER, X. 1999: *Lasius neglectus* VAN LOON, BOOMSMA & ANDRÁSFALVY, 1990 (Hymenoptera, Formicidae), a potential pest ant in Spain. – Orsis 14: 43-46.

ESPADALER, X. & BERNAL, V. 2003: Exotic ants in the Canary Islands, Spain (Hymenoptera, Formicidae). – Vieraea 31: 1-7.

ESPADALER, X. & BERNAL, V. 2009: *Lasius neglectus*, a polygynous, sometimes invasive, ant. – <http://www.creaf.uab.es/xeg/Lasius/index.htm>, retrieved on 31 January 2009.

ESPADALER, X., TARTALLY, A., SCHULTZ, R., SEIFERT, B. & NAGY, C. 2007: Regional trends and local expansion rate in the invasive garden ant, *Lasius neglectus* (Hymenoptera, Formicidae). – Insectes Sociaux 54: 293-301.

HARTLEY, S. & LESTER, P.J. 2003: Temperature-dependent development of the Argentine ant, *Linepithema humile* (MAYR) (Hy-

menoptera: Formicidae): a degree-day model with implications for range limits in New Zealand. – New Zealand Entomologist 26: 91-100.

JONES, P.D. & MOBERG, A. 2003: Hemispheric and large-scale surface air temperature variations: an extensive revision and an update to 2001. – Journal of Climate 16: 206-223.

MARKÓ, B. 1998: Six new ant species (Hymenoptera: Formicidae) for the Romanian myrmecofauna. – Entomologica Romanica 3: 119-123.

MÜLLER-WESTERMEIER, G. 2002: Klimatrends in Deutschland. – Deutscher Wetterdienst, Offenbach, Klimastatusbericht 2001: 114-124.

MÜLLER-WESTERMEIER, G., LEFEBVRE, C., NITSCHE, H., RIECKE, W., ZIMMERMANN, K. 2008: Die Witterung in Deutschland. In: MÜLLER-WESTERMEIER, G. & WILLING, P. (Eds.): Klimastatusbericht 2007. – Deutscher Wetterdienst, Offenbach, 109 pp.

NAGY, C., TARTALLY, A., VILISICS, F., MERKL, O., SZITA, É., SZEL, G., PODLUSSÁNY, A., RÉDEI, D., CSŐSZ, S., POZSGAI, G., OROSZ, A., SZÖVÉNYI, G. & MARKÓ, V. 2009: Effects of the invasive garden ant, *Lasius neglectus* VAN LOON, BOOMSMA & ANDRÁSFALVY, 1990 (Hymenoptera: Formicidae), on arthropod-assemblages: pattern analyses in the type supercolony. – Myrmecological News 12: 171-181.

REY, S. & ESPADALER, X. 2004: Area-wide management of the invasive garden ant *Lasius neglectus* (Hymenoptera: Formicidae) in northeast Spain. – Journal of Agricultural and Urban Entomology 21: 99-112.

ROURA-PASCUAL, N. & SUAREZ, A.V. 2008: The utility of species distribution models to predict the spread of invasive ants (Hymenoptera: Formicidae) and to anticipate changes in their ranges in the face of global climate change. – Myrmecological News 11: 67-77.

SCHLICK-STEINER, B.C., STEINER, F.M., SCHÖDL, S. & SEIFERT, B. 2003: *Lasius austriacus* sp.n., a Central European ant related to the invasive species *Lasius neglectus*. – Sociobiology 41: 725-736.

SCHULTZ, R. & SEIFERT, B. 2005: *Lasius neglectus* (Hymenoptera: Formicidae) – a widely distributed tramp species in Central Asia. – Myrmecological News 7: 47-50.

SEIFERT, B. 2000: Rapid range expansion in *Lasius neglectus* (Hymenoptera, Formicidae) – an Asian invader swamps Europe. – Mitteilungen aus dem Museum für Naturkunde in Berlin, Deutsche Entomologische Zeitschrift 47: 173-179.

SMITH, T.M. & REYNOLDS, R.W. 2005: A global merged land air and sea surface temperature reconstruction based on historical observations (1880 - 1997). – Journal of Climate 18: 2021-2036.

STEINER, F.M., SCHLICK-STEINER, B.C., VANDERWAL, J., REUTHER, K.D., CHRISTIAN, E., STAUFFER, C., SUAREZ, A.V., WILLIAMS, S.E. & CROZIER, R.H. 2008: Combined modelling of distribution and niche in invasion biology: a case study of two invasive *Tetramorium* ant species. – Diversity and Distributions 14: 538-545.

SUAREZ, A.V., HOLWAY, D.A. & CASE, T.J. 2001: Patterns of spread in biological invasions dominated by long-distance jump dispersal: insights from Argentine ants. – Proceedings of the National Academy of Sciences of the United States of America 98: 1095-1100.

TARTALLY, A. 2006: Long term expansion of a supercolony of the invasive garden ant *Lasius neglectus* (Hymenoptera: Formicidae). – Myrmecologische Nachrichten 9: 21-25.

THUILLER, W. 2007: Climate change and the ecologist. – Nature 448: 550-552.

TUOMENVIRTA, H., DREBS, A., FØRLAND, E., TVEITO, O.E., ALEXANDERSSON, H., VAARBY LAURSEN, E. & JÓNSSON, T. 2001: Nordklim data set 1.0 – description and illustrations. – DNMI Report 08/01: 1-26.

VAN LOON, A.J., BOOMSMA, J.J. & ANDRÁSFALVY, A. 1990: A new polygynous *Lasius* species (Hymenoptera; Formicidae) from Central Europe. – Insectes Sociaux 37: 348-362.