

Stealing a spot among the Oriental myrmecofauna; first record of invasion of mainland Eurasia by the New World thief ant *Solenopsis globularia*

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INTRODUCTION

The geographic range of any given species is merely a reflection of a single point in time, with gradual changes in distribution patterns being a natural part of its existence. As the ranges of different species are grown and shrunk by changing abiotic factors, they necessarily come to overlap with each other in new ways, creating opportunities for novel biological interactions, both positive and negative. While this has been the norm for all of known natural history, there is no denying that human activities, particularly our movement around the globe, have accelerated this process manifold, enabling the unprecedented proliferation of those organisms particularly well-suited to colonizing new environments: invasive species. Five of the world's 100 worst invasive species are ants, which should be unsurprising given their often generalist nature and capacity for ecologically significant interaction with a relatively large number of faunal and floral species. One among these five is the Red Imported Fire Ant (*Solenopsis invicta* Buren) which, along with its congener the Tropical Fire Ant, *Solenopsis geminata* (Fabricius), has spread far outside its native range in the New World. Both species are notorious and aptly named for their painful stings, but their destructive potential is far from limited to the physical discomfort they can cause. These two species do not provide a fair representation of the genus as a whole, though, since the majority of their congeners are much smaller, less aggressive and more cryptic. Dubbed "thief ants" for the tendency of some species to pilfer the nests of other ants, they are both impressively diverse and difficult to study. Thus, even if they do exhibit the invasive potential of their larger relatives, it would not be surprising if this behavior has gone undocumented; here reported for the first time is the presence of the thief ant *Solenopsis globularia* (Smith) on mainland Eurasia, indicating that this may in fact be the case.

METHOD

Seven worker specimens in total were collected opportunistically by hand, over the course of two visits, as part of a larger exploratory survey of the Goan ant fauna. They were located foraging on the ground at the base of a concrete railing surrounding an open garden in Panjim city, Goa, India (15.49331°N; 73.817944°E), and coaxed into plastic containers. They were then killed by storage in a freezer, and identified by observation through a simple compound microscope (and dissection in one case) followed by a stereozoom microscope. Specimens were subsequently stored in 70% ethanol in plastic vials before their eventual retrieval for the purpose of further examination, point mounting, photography and measurement. Notes on the faunal and floral diversity of the collection site were made during later visits in the hope that clues about the species' ecology within its new environment could be gathered from the data; additional specimens were not observed after the onset of the monsoons, and a very thorough search involving a greater pool of resources would likely be required to collect more henceforth on account of their cryptic nature.



Figure 1. a) Map of Goa with collection site marked in red. b) Geotagged photograph of the collection site at Panjim city, Goa.

RESULTS & DISCUSSION

The specimens were found to largely fit existing descriptions of *S. globularia*; only those characters which are known to be variable, and those which represent notable departures are mentioned as follows: the specimens are all concolorous yellow, (never light to dark brown or bicoloured), the posterior edge of the propodeum appears rounded rather than angulate in profile, the metapleuron is horizontally striated in profile except for a large smooth patch anterior to the propodeal spiracle, the remainder of the propodeum is fully striated, and the Postpetiole Length as well as the Weber's Length exceed the upper limit of the described range (by 0.001 mm and 0.118 mm respectively). Given how widespread the species is, these differences are attributed to regional intraspecific variation. The small sample size meant that not much data on intracolony worker size variation could be collected, and no conclusions on polymorphism could confidently be drawn. India is currently known to harbor only two *Solenopsis* species, *S. nitens* Bingham and the invasive *S. geminata*, both of which conspicuously lack the greatly dilated, globose postpetiole of *S. globularia*, making it fairly easy to distinguish specimens of the latter species from those of the former two.



Figure 2. a) World map colour-coded based on the regional status of *S. globularia*: blue indicates native, orange indicates invasive as previously established, and red indicates invasive as per the findings presented here.

b) Map of India with the distribution of *S. globularia* marked in red.

RESULTS & DISCUSSION

While not much data could be gathered through field observations of the specimens themselves, due to their size and tendency to forage in and around loose soil at the base of concrete railings and among pavement tiles, information about the locality's flora and fauna is provided here that could prove useful in identifying more prospective collection sites. The location in question is a bustling roadside urban area; as far as flora is concerned, it is dominated by ornamental species, including *Bauhinia* sp., *Terminalia catappa*, *Casuarina equisetifolia*, *Cocos nucifera*, *Albizia saman* and *Peltophorum pterocarpum*. The area is well shaded by the canopy of large trees, and the ground is littered with plant debris. Brief examination of the concrete railing revealed a surprising faunal diversity for an urban area; ant-mimicking micropezid flies and salticid spiders, millipedes, woodlice, centipedes, frogs, ladybugs and their larvae were seen foraging in significant numbers amidst the noise of city life. But the ant diversity in particular was found to be truly remarkable: over 20 species belonging to 17 genera were seen conspicuously foraging on artificial substrates in relatively large numbers. Notably, three of these genera have not been previously reported from the state, including *Vollenhovia* (a genus of rare species usually restricted to protected areas). Moreover, two of these species were later assessed as likely being new to science. While this is certainly in part a testament to the neglect with which Goa's ant fauna has been treated so far, it also highlights both the capacity urban habitats have for supporting biodiversity, and what stands to be lost if invasive species are allowed to proliferate unchecked in areas where conservation is not usually a consideration. Since urban areas are generally exposed to invasive species first, a better understanding of how they impact native taxa in urban ecosystems could prove beneficial in implementing control measures and taking steps toward identifying and conserving those species most at risk due to invasion.

This brief documentation of the invasion of Eurasia by *S. globularia* is intended to trigger a closer look at the ant fauna of nearby regions, given that the likelihood of this species having spread only to the single smallest Indian state, while avoiding nearby regions with greater human traffic, seems very low. Future work will hopefully uncover the full extent of the invasion, as well as the implications it will have for native taxa.



Figure 3. *Solenopsis globularia* specimen images: a) Profile view. b) Full-face view. c) Dorsal view. d) Magnified profile view displaying mesosomal striations.

CONCLUSION

Solenopsis globularia has been documented spreading far outside its native range in the New World in recent years, and it is reported here for the first time from mainland Eurasia. While there appear to be some small differences between the newly collected specimens and those described in the literature, these were judged to be within the scope of regional intraspecific variation. The specimens were collected from a busy urban centre that was found to be unexpectedly biodiverse even based on very limited assessment, although the significance of these findings beyond range extensions for several species has yet to be explored in detail. While robust conclusions about the ecology of *S. globularia* in non-native environments cannot be drawn at this stage, the presence of this species in Goa hints at an unseen invasion, at least of the Indian subcontinent, that is likely much greater in total scale.

FUTURE WORK

More rigorous sampling within Goa is required to determine the true extent of the invasion by *S. globularia* in the state. Further collaboration with researchers in neighboring states and even countries, where this species is likely to turn up in the near future, could yield new insights into its ecology and the threats it may pose. Furthermore, the presence of new records and likely undescribed species in the middle of a major city calls for a thorough assessment of the state's urban ant diversity and ecology.