

**Rapid Communication****First report of the invasive ant *Nylanderia fulva* (Mayr, 1862) (Hymenoptera: Formicidae) in Panama**Ingrid L. Murgas<sup>1,\*</sup>, Cristian Pitti<sup>2</sup>, Roberto J. Miranda<sup>1</sup> and Roberto A. Cambra<sup>3</sup><sup>1</sup>Departamento de Investigación en Entomología Médica, Instituto Conmemorativo Gorgas de Estudios de la Salud, Panamá<sup>2</sup>Pest Control CHD services, Panamá<sup>3</sup>Museo de Invertebrados G. B Fairchild, Universidad de Panamá, Panamá

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**OPEN ACCESS****Abstract**

The ant *Nylanderia fulva*, is a native species of southern Brazil that has been introduced in several countries in the Nearctic, Neotropic and Palearctic. In the areas they invade, they establish very dense and extensive super colonies. Here, *N. fulva* is reported for the first time in Panama. All the stages and castes of this species were collected in six localities of the Boquete District, Chiriquí Province. We advocate for additional local searches and studies for *N. fulva* to provide information on the status of its distribution and to generate information on the various agricultural implications.

**Key words:** Central America, Panama, crazy ant, human dwellings**Introduction**

*Nylanderia* Emery 1906 (Formicidae: Formicinae), constitutes one of the most diverse and abundant genera of ants in the Neotropics, having 125 described species, 25 valid subspecies, two fossil species (Bolton 2022) and many more species known to be undescribed. This genus contains species occupying an immense variety of environments ranging from tropical forests to arid zones (LaPolla et al. 2011).

The tawny crazy ant, *Nylanderia fulva* (Mayr, 1862), is native to southern Brazil, and to the border area between Paraguay, Uruguay and Argentina, and has been accidentally introduced to several countries in the Nearctic, Neotropic and Palearctic (Kumar et al. 2015; AntWeb 2022). This species is particularly well established in the United States, where it has been reported in the states of Louisiana, Mississippi, Alabama, Florida, Georgia and Texas (Wang et al. 2016).

In its non-native range, *N. fulva* behaves as a pest species, causing considerable economic losses (MacGown and Layton 2010). In particular, this species develops a mutualistic relationship with sap-sucking insects such as aphids and other homopterans, which secrete sugary substances that serve as food for the ants and, in return, the latter provide protection

**Table 1.** Locations in Boquete where *Nylanderia fulva* was found in May 2021.

Township	Latitude	Longitude	Elevation (meters)
Alto Boquete	8.668825	-82.430691	1021
Bajo Boquete	8.729082	-82.424872	1132
Caldera	8.668272	-82.369311	358
Jaramillo	8.759497	-82.404092	1132
Los Naranjos	8.765081	-82.451707	1277
Palmira	8.734861	-82.459054	848

against natural enemies (Zenner de Polania and Ruiz 1985; Sharma et al. 2013). The species also forms very dense and extensive polygynous and polydomous populations (Meyers and Gold 2008; Wang et al. 2016) which become pestiferous within buildings.

Despite *N. fulva*, being present in Costa Rica and Colombia for several years (Kempf 1972; AntWeb 2022), to date it has not been reported from Panama. Here we report the first occurrences of this species in Panama.

## Materials and methods

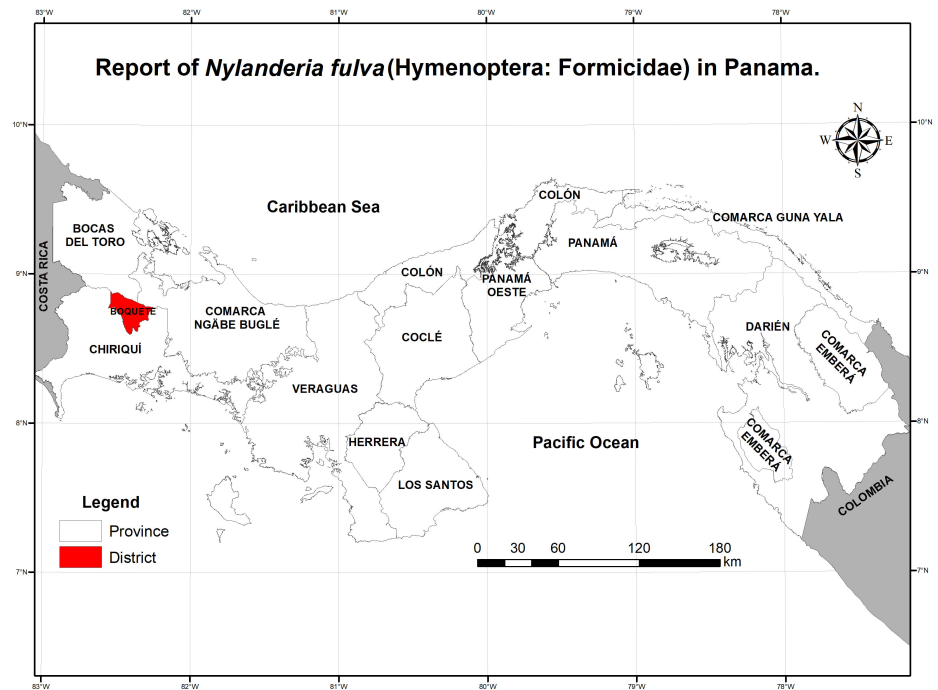
Boquete is an area of agricultural and tourist importance in Chiriquí Province in western Panama, covering 488.4 km<sup>2</sup> and with elevations between 800 and 2800 m. The climate is temperate, with an average annual temperature of 20.5 °C (range 4 to 31 °C), average annual relative humidity of 85% (range = 64.2 to 97%), and an average rainfall of 203.5 mm per year (Empresa de Transmisión Eléctrica, S.A. Datos climáticos históricos, accessed 20 May 2021, <https://www.hidromet.com.pa/es/clima-historicos>).

On April 6, 2021, residents of the District of Boquete requested help to deal with an explosion of ants that invaded the interior and the grounds of their homes. In May 2021 a daytime inspection was conducted with ants collected in six localities (Table 1) of the Boquete District (Figure 1): Bajo Boquete, Alto Boquete, Caldera, Jaramillo, Los Naranjos and Palmira (Table 1).

Specimens, including all the stages and castes, were manually collected with a sheet of paper and preserved in ethanol. Taxonomic identification was carried out following LaPolla and Kallal (2019). Specimens were examined with a Leica M165 C and photographs taken with a Scanning Electron Microscope (SEM) Zeiss Evo 40 VP. Specimens are deposited in the Museo de Invertebrados G. B. Fairchild, Universidad de Panamá and the Laboratorio de Artrópodos Venenosos y Causantes de Alergias, Instituto Conmemorativo Gorgas de Estudios de la Salud (ICGES).

## Results

The houses investigated had a large infestation of ants, both indoors (mainly on the floors) and outside, including in the gardens (Figure 2). There were no reports of damage to the infrastructure or electrical components of the affected homes. Colonies were also observed in home gardens planted with potted ornamentals and cultivated plants.

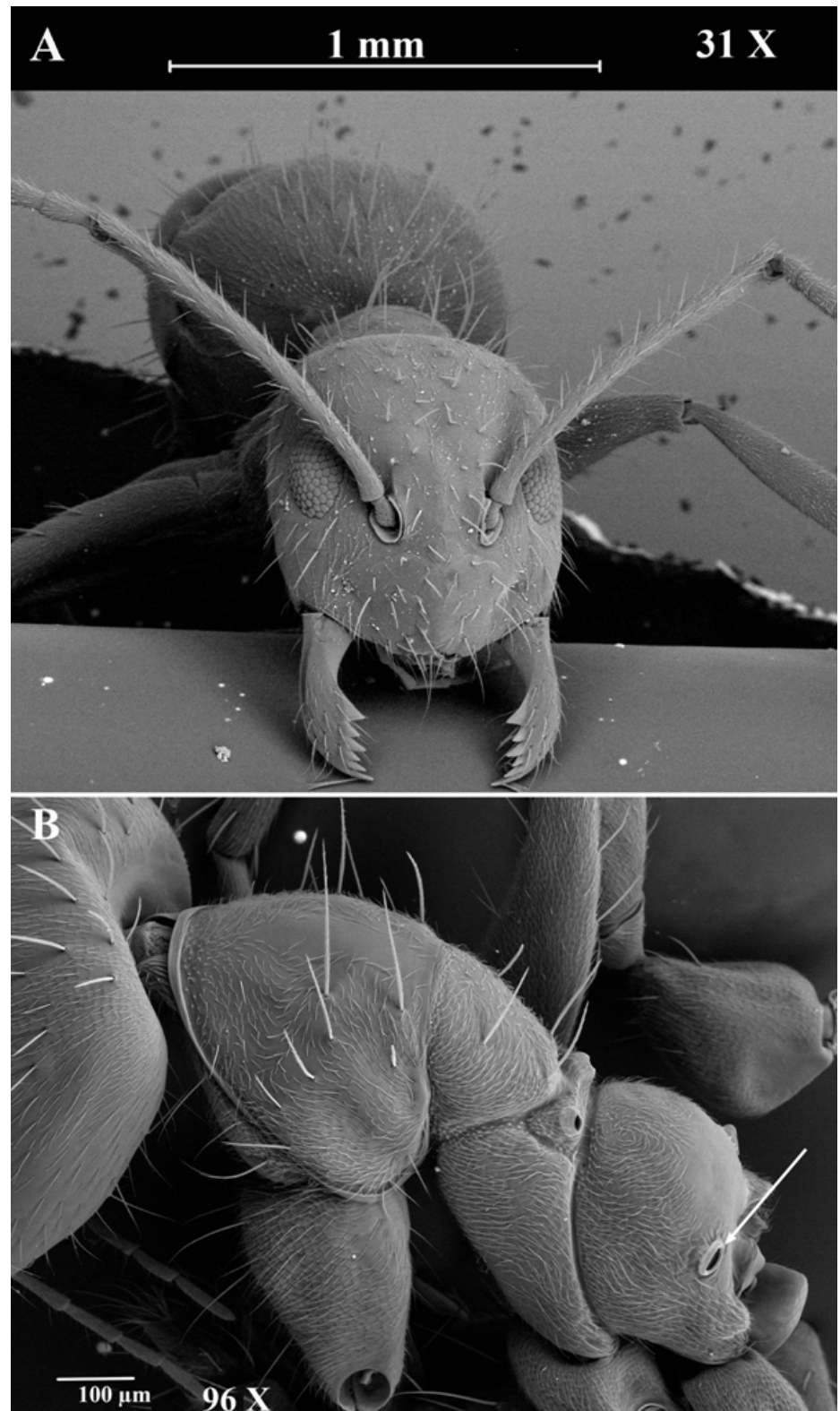


**Figure 1.** Map of Panama, with Boquete District highlighted in red.



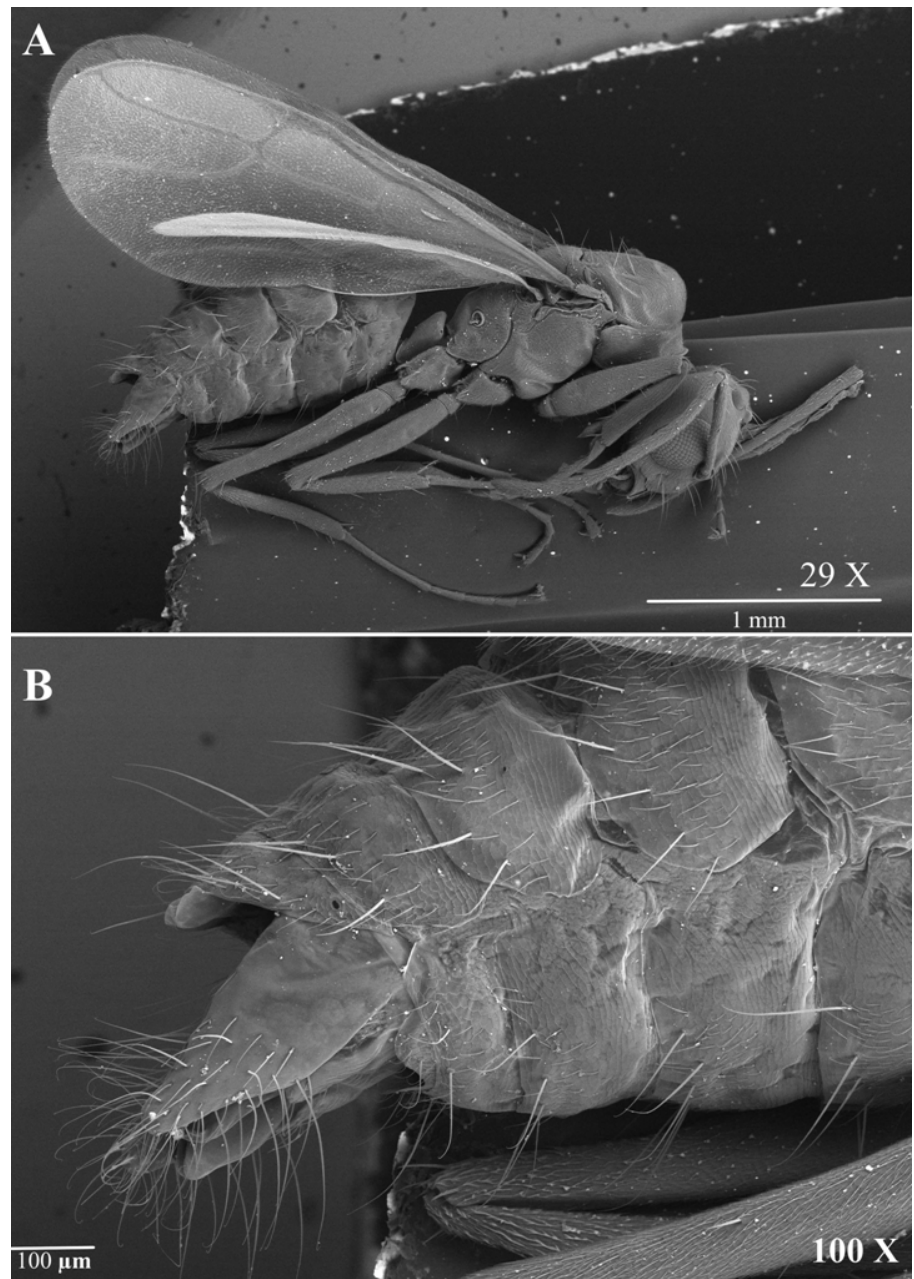
**Figure 2.** Discarded dead bodies of *Nylanderia fulva* and frass in indoor environments in Boquete. Photo by Cristian Pitti.

Specimens had the following diagnostic characters. **Workers** (Figure 3): average body length of 2.7 mm, light brown. Head with 12-segmented antenna, palps 4–6, mandibles with 6 teeth, eyes well developed; metapleura with pleural gland orifice with setal tuft, sternite I without transverse groove behind the helcium. Dorsum of body with thick setae; mesopleuron, head and mesosoma with very thin and short, dense setae. **Queens**: total length 4.55 mm; eyes large and conspicuous, with three well developed ocelli; mesosoma large, mesonotum large and flat; gaster very large. **Males** (Figures 4–5): average body length 2.7 mm, genitalia very large, paramere with apices triangular and weakly sclerotized; macrosetae originating from



**Figure 3.** SEM images of a *Nylanderia fulva* worker: A. frontal view of head, B. mesosoma, with the arrow locating the opening of metapleural gland. Photo by Jorge Ceballos.

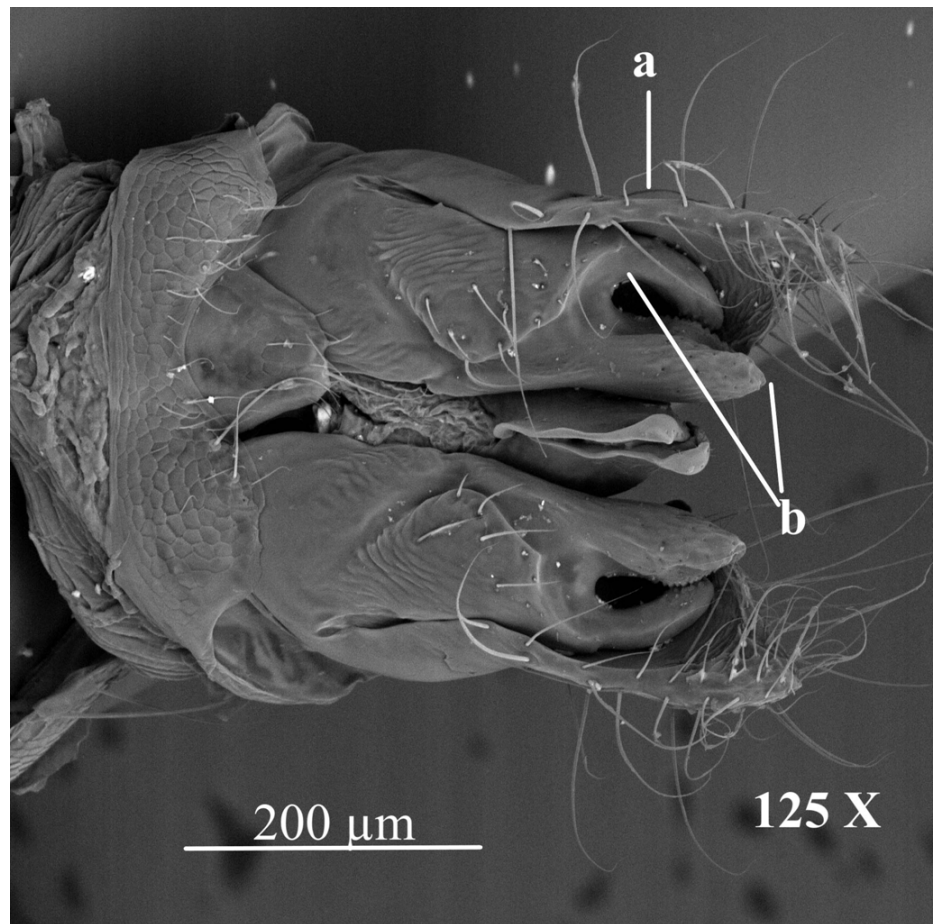
the paramere margin scattered and not fan-like. The features correspond to the subfamily Formicinae, tribe Lasiini, genus *Nylanderia*, and species *Nylanderia fulva* (Kallal & LaPolla, 2012).



**Figure 4.** SEM images of *Nylanderia fulva* male, A. lateral view, B. external genitalia. Photo by Jorge Ceballos.

### Discussion

To date, only three species of the genus *Nylanderia* are known to inhabit Panama: *N. caeciliae* (Forel, 1899), *N. steinheili* (Forel, 1893), and *N. guatemalensis* (Forel, 1885) (Fernández and Sendoya 2004; AntWeb 2022). Some authors have included Panama within the distribution of *N. fulva* (Wang et al. 2016; Hill et al. 2017), but without indicating the work on which they based their report, nor a specific location where it could be found. To our knowledge, this work represents the first report of the presence of *N. fulva* in Panama. The collection of numerous individuals of all castes and stages in six localities indicates that the species is well established in residential areas of the Boquete district.



**Figure 5.** SEM image of *Nylanderia fulva* male genitalia, ventral view: a. paramere, b. volsellar lobes. Photo by Jorge Ceballos.

Examination of the male genitalia is the only way to separate *N. fulva* from *N. pubens*, which is a related species and is also considered invasive (Gotzek et al. 2012).

As an invasive species, *N. fulva* may cause changes in the organization of regional arthropod assemblages (LeBrun et al. 2014). They become very numerous and monopolize available resources, displacing other ants, whether native or invasive (Wang et al. 2016). In the United States, it has been observed that it can even take on the imported fire ant *Solenopsis invicta* and displace it, thanks to the ability to detoxify its venom (LeBrun et al. 2013; LeBrun et al. 2014). This ant can also behave as an urban pest, invading homes, business offices, parks, and becoming a major concern for homeowners (Wang et al. 2016), as is the case described in this report. In addition to being a nuisance, they can cause damage to electrical installations and gardens (Echeverri 2013).

The detrimental impact of large population explosions of this ant has been recorded in Colombia, where it affects various crops, such as sugar cane (*Saccharum officinarum*), cocoa (*Theobroma cacao*), lemon (*Citrus* spp.), ornamental plants, rubber (*Hevea brasiliensis*) and coffee (*Coffea arabica*) (Serna et al. 2019). The ant forms mutualistic interactions with several

species of hemipteran insects that attack these crops (Sharma et al. 2013; Mendoza et al. 2019). They can also be a nuisance to farm and domestic animals (Zenner de Polania and Ruiz 1983). It has been observed that large densities of workers can cause eye conditions, and occupy the nostrils making it difficult to breathe (Zenner de Polania and Ruiz 1983).

The main economic activities of the District of Boquete are related to agriculture, specifically with the cultivation of coffee, vegetables and flowers (MIDA 2011), so clearly this species may become a significant economic pest. We recommended the conduct of local studies of *N. fulva* to provide information on the status of its distribution and generate information on the various agricultural, ecological implications and structural impacts present on local buildings.

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### Authors' contribution

ILM: investigation, data collection and original draft; CP: sample design and data collection; RJM: writing, review and editing; RAC: data analysis, interpretation, review and editing.

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