

Note

First record and new host record of the obligate dulotic ant, *Polyergus bicolor* (Hymenoptera: Formicidae), in Alberta, Canada

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Abstract

We describe the discovery of *Polyergus bicolor*, an obligate slave-making ant species, as a new provincial record in Alberta. This species was previously known mostly from eastern Canada and the northeastern United States and has been sparsely collected: only once in the past 50 years. *Polyergus bicolor* was discovered parasitizing *Formica podzolica*, which is also a new host for the species. This discovery marks a significant expansion of both range and host for *P. bicolor*.

Key words: *Polyergus bicolor*; dulotic parasitism; range expansion; host expansion; Alberta; *Formica podzolica*

Polyergus (Latreille 1804) is a predominantly holarctic genus of ants that contains 14 species, 11 of which are present in North America (Trager 2013). All *Polyergus* display obligate dulotic behaviour (slave-making), making them a remarkable genus that has received a good deal of research interest.

Colony foundation occurs when a mated *Polyergus* queen enters a *Formica* nest, kills the queen, and usurps her role, with *Formica* workers taking care of her and her brood (Hölldobler and Wilson 1990). To maintain *Formica* worker populations in the colony, *Polyergus* workers locate a host nest, and then raid it for pupae, prepupae, and occasionally last-instar larvae. When the *Formica* pupae mature to adults in the *Polyergus* nest, they accept that nest as their own, and perform the majority of tasks within the colony (Trager 2013). Host *Formica* species vary, depending on the *Polyergus* species: some *Polyergus* will parasitize only one *Formica* species, while others are capable of parasitizing multiple species. Generally, the host species is from the *Formica fusca* group or the *Formica pallidefulva* group (Trager 2013).

In western North America, *Polyergus* is overwhelmingly represented by *Polyergus mexicanus* (Trager 2013; Glasier *et al.* 2016); in Idaho, *P. breviceps* is also present (Wheeler 1917; Smith 1947;

Trager 2013). (Note: there are generally no accepted common names for ants.) *Polyergus bicolor* was previously reported as restricted to eastern North America: Ontario to Illinois (Smith 1947; Wheeler 1968; Trager 2013). It was reported as far west as Saskatchewan and Montana by Wheeler (1917) as *Polyergus rufescens bicolor*. It was only confirmed as far west as the Dakotas by Trager (2013), who raised it to the status of species. Trager noted that he was unable to collect any *P. bicolor* during the course of his study within its historical range, save for one collection made in Wisconsin. In the last 50 years, he had found no *P. bicolor* collection records from its historical range (Trager 2013).

We first found *P. bicolor* in Alberta in summer 2017. We collected two colonies in Jarvis Bay Provincial Park, on Sylvan Lake, while collecting and observing *Formica* colony behaviour. Jarvis Bay Provincial Park is a drywood boreal forest characterized by mostly deciduous stands dominated by Trembling Aspen (*Populus tremuloides* Michaux), Balsam Poplar (*Populus balsamifera* L.), Black Spruce (*Picea mariana* (Miller) Britton, Sterns and Poggenburgh), and White Spruce (*Picea glauca* (Moench) Voss); prior records of *P. bicolor* note that it nests mostly in mesic forest, generally in rotten

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stumps or fallen logs, thus habitat similar to Jarvis Bay (Trager 2013).

The specimens were collected by hand around the provincial park campsite after mistaking them for a species of the *Formica rufa* or *Formica sanguinea* species groups. They were found in domed dirt and debris mounds with the host species *Formica podzolica*, identified using published keys (Francoeur 1973; Glasier *et al.* 2013). Our *Polyergus* specimens were identified using Trager's revised key to global *Polyergus* species (Trager 2013). They differ from *P. mexicanus*, the other known *Polyergus* species in the area, by the degree of dark colouration on the abdomen and a complete lack of pilosity on both the vertex of the petiole and the pronotum (Glasier *et al.* 2013; Trager 2013).

A second collection occurred in July 2018 near Hay Lakes, Alberta, an area dominated by mixed deciduous woodlands (Trembling Aspen and Balsam Poplar) similar to Sylvan Lake. They were collected from a rounded mound within a grass meadow and were also using *F. podzolica* as a host. *Polyergus bicolor* has been formally recorded parasitizing both *Formica neorufibarbis* and *Formica subaenescens*, but not *F. podzolica*. The mounds in which we found *P. bicolor* were unlike their normal reported nesting sites, but this could be the result of their using a different host species.

This discovery represents a significant expansion of *P. bicolor*'s previously known range, although it supports Wheeler's (1917) reports of *P. bicolor* in Saskatchewan as *P. r. bicolor*. Although the habitat where we found *P. bicolor* in Alberta is similar to the type of habitat from which it was previously known, the climate of Alberta is distinct from that of southern Ontario and the northeastern United States. The expansion of host species to include *F. podzolica* is also notable; *Polyergus* may use one or several hosts species but tends to show high fidelity to one host for a given population. Within a *Polyergus* species, if different populations are using different hosts, they are often highly specialized to their own host species. Populations show distinct chemical and genetic divergence from one another, perhaps reflecting incipient speciation (Torres *et al.* 2018). Because newly mated *Polyergus* queens typically stay with the host species of their parent colony, this fidelity is passed down from generation to generation (Hölldobler and Wilson 1990). *Formica podzolica* is widespread throughout North America and its range overlaps with that of *P. bicolor* in the northeastern United States (Wheeler and Kanno 1994; Ellison *et al.* 2007); thus, it is difficult to say where host expansion took place. Further genetic work would shed light on potential divergence between *P. bicolor* pop-

ulations in western and eastern North America, contingent on their host species.

Voucher specimens

Canada, Alberta: Sylvan Lake Jarvis Bay, 52.347°N, 114.091°W and 52.345°N, 114.089°W, hand collected, 21 July 2017, C. Sosiak (Figure 1, personal collections of Christine Sosiak and Mari West).

Canada, Alberta: 4 km SE of Hay Lakes, Aspen Parkland, 53.165°N, 113.014°W, hand collected, with *F. podzolica*, 27 July 2018, J.R.N. Glasier (Strickland Museum and personal collection of J.R.N. Glasier). Strickland Museum accession numbers: *P. bicolor* specimens UASM396245, UASM396246; *F. podzolica* specimens UASM396247, UASM396248.

Author Contributions

Writing – Original Draft: C.E.S.; Writing – Review & Editing: C.E.S., M.W., and J.R.N.G.; Species Collection: C.E.S., M.W., and J.R.N.G.; Species Identification: C.E.S. and J.R.N.G.; Funding Acquisition: M.W.

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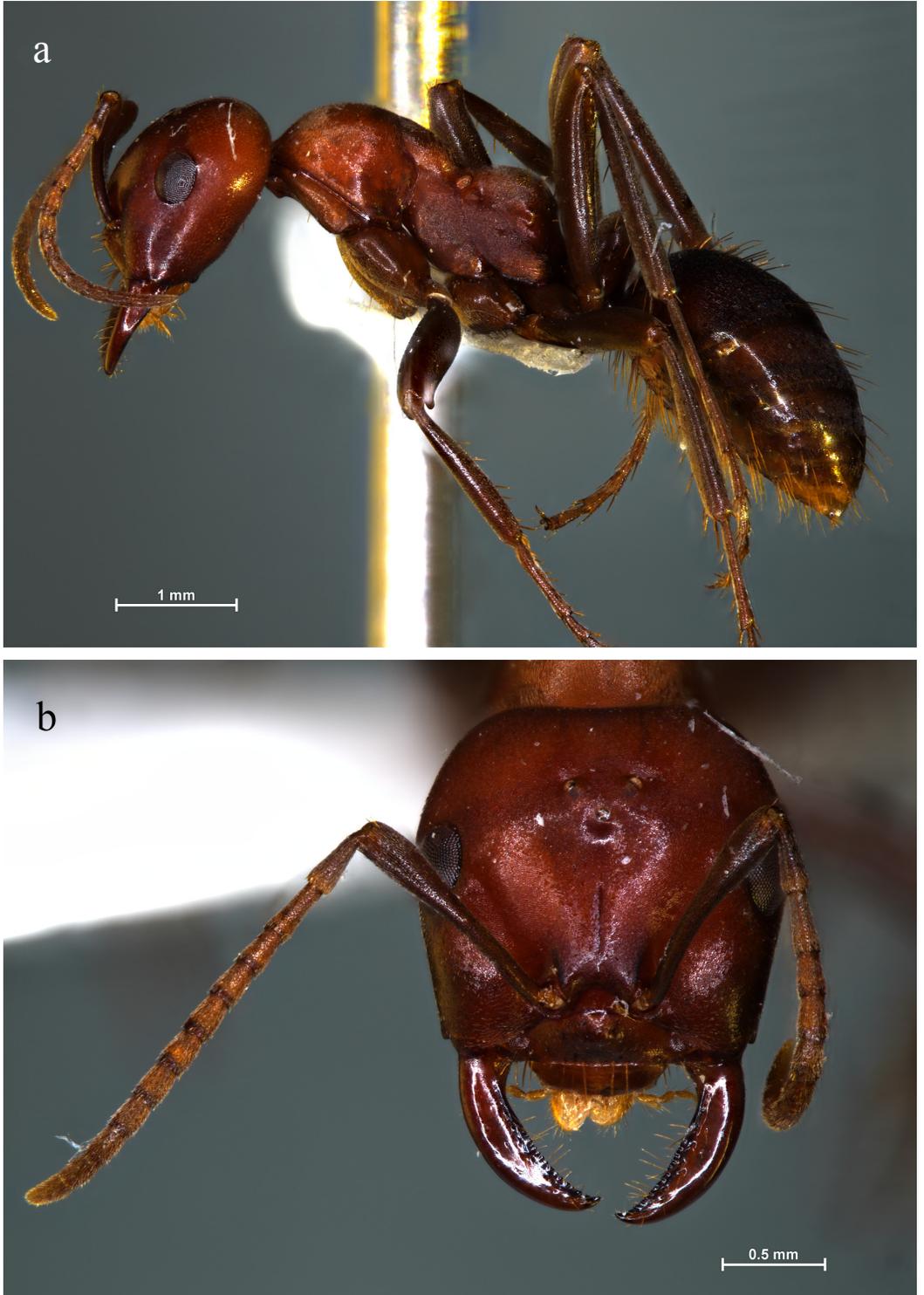


FIGURE 1. Lateral a. and frontal b. views of a *Polyergus bicolor* specimen collected in Jarvis Bay Provincial Park, Sylvan Lake. Photos: Christine Sosiak.

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