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SHORT NOTE

"Empty spaces 'Where' we are living for" – First record of *Dinoponera quadriceps* reusing nests of *Atta sexdens*

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Abstract
The reuse of nests by the same or different species can save a colony energy and resources. Furthermore, it can increase colony growth and the production of brood. The queenless ant *Dinoponera quadriceps* builds deep nests in Caatinga to escape from the dry and hot environment. The reuse of deep nests from other species can provide *D. quadriceps* with protection from high temperature, whilst saving on the energy required to build new nests. Here, we present the first finding of *D. quadriceps* reusing the nest of *Atta sexdens* species.

The queenless ant *Dinoponera quadriceps* (Formicidae: Ponerinae) is distributed throughout northeastern Brazil (Paiva & Brandão, 1995; Lenhart et al., 2013) particularly in the Caatinga biome. This environment, which covers approximately 800.000 km^2 (Santos et al., 2011), is characterized by dry and nutrient poor soil (Menezes et al., 2012). *Dinoponera quadriceps* are predominantly predators, but solitary individuals also forage small fruits (Araújo & Rodrigues, 2006). Their body size can vary from 3-4cm (Paiva & Brandão, 1995). Active nests can be identified by twigs around and/or above the nest entrance (Paiva & Brandão, 1995; personal observation). Here we report *D. quadriceps* colonizing empty *Atta sexdens* nests and using them to raise brood.

The hot and arid conditions found in the natural range of *D. quadriceps* require them to dig deep nests, often over 3m in depth, with as many as 16 chambers below, but with a single entrance (Vasconcelos et al., 2004). Nests in Caatinga are deeper than in Atlantic Forest, possibly because of the hotter temperatures and drier air found in this biome. The foundation of a new nest occurs via colony fission (Paiva & Brandão, 1995; Monnin & Peeters, 1998), as the new gamergate and several workers search for a suitable location to establish a new nest (Medeiros & Araújo, 2014). Nests of *A. sexdens* can reach up to seven meters of depth (Moreira et al., 2004), again to protect against desiccation from the high temperatures. (Camargo et al., 2011). It is plausible that the new founding members may cohabit their new nest with A*tta* workers (personal observation).

Nests are energetically expensive to produce in a natural environment (Hansell, 1993); hence reusing the nests of hetero or conspecifics may confer a benefit in reduced energy and time expenditure (Jimenez-Franco et al., 2014). For instance, new queens of the social wasp *Polistes dominula* can reuse an old nest, accelerating the process of brood production (Nakar et al., 2015).

We sampled *D. quadriceps*' nests in Caatinga biome in Campo Formoso, Bahia state in Brazil (10° 30' 32" S, 40° 19' 15" W) (Fig 1). A total of 24 *D. quadriceps* colonies were located in the field, from which five (20.84% of all nests found) had utilized abandoned (or nests with a low population) nests belonging to *A. sexdens* (Fig 2). These nests were dispersed across a field which had previously been used for cattle grazing.

In conclusion, we propose that *D. quadriceps* can facultatively use the pre-dug nests of particular *Atta* species as their own, in order to save energy expenditure. It would seem likely that this may be the case for other Atta species with similarly deep nests – indeed, it would be surprising if this was not more commonly observed in other species, given the likely vast energy savings gained from nest-reuse.

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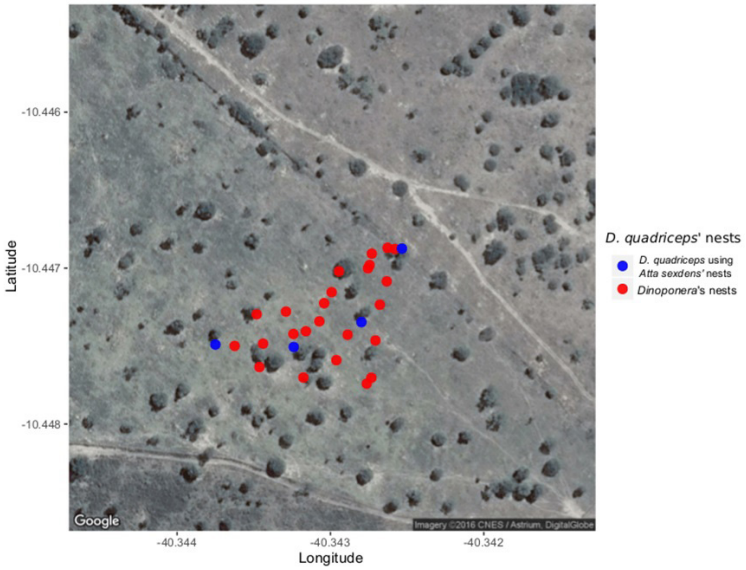

Fig 1. Sampled nests, in blue nests of *Atta sexdens* used by *Dinoponera quadriceps*.

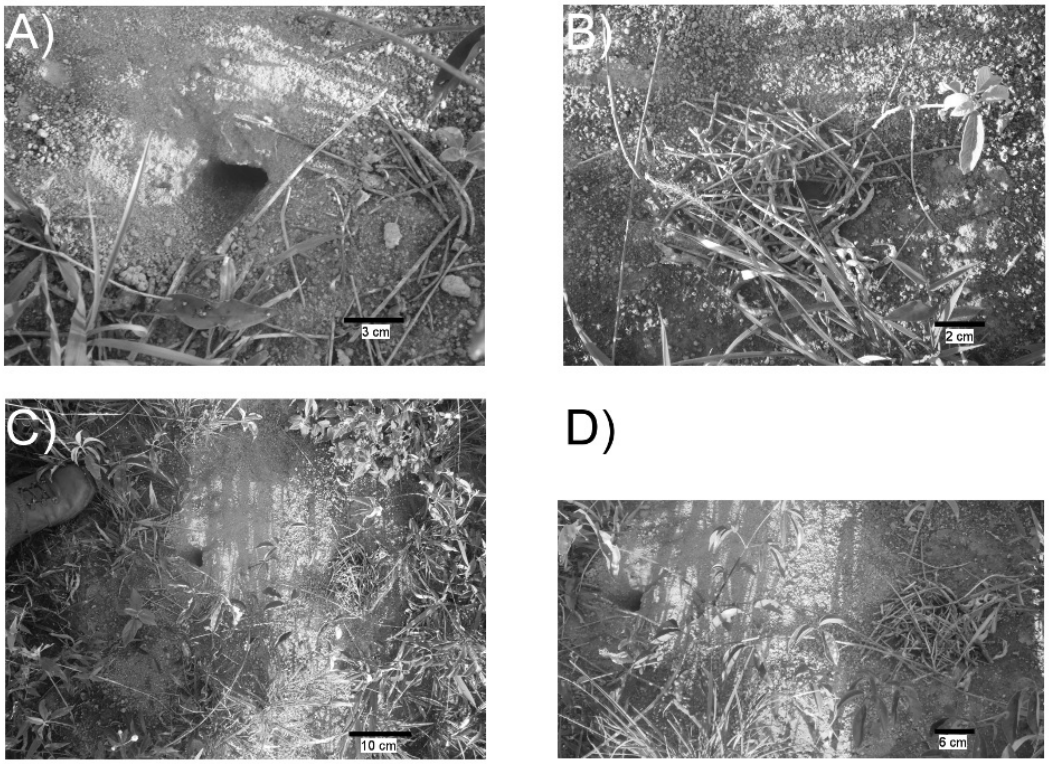

Fig 2. Nest of *Atta* used by *Dinoponera quadriceps*. A) Atta entrance; B) *Dinoponera quadriceps* entrance; C) and D) the entrances sight above.

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