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Source: Florida Entomologist, 86(4) : 460-463

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/0015-4040(2003)086[0460:AHFONN]2.0.CO;2

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ANTS (HYMENOPTERA: FORMICIDAE) ON NON-NATIVE NEOTROPICAL ANT-ACACIAS (FABALES: FABACEAE) IN FLORIDA

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ABSTRACT

One of the best-known symbioses in the Neotropics is the association between ant-acacias and *Pseudomyrmex* ants that live in the acacia's hollow thorns. We surveyed ants on two species of ant-acacia, *Acacia cornigera* (L.) and *Acacia sphaerocephala* Schlechtendal & Chamisso, growing outside their native range at five sites in Florida. We found eleven ant species: five native Florida ants (*Brachymyrmex* sp. nr. *obscurior*, *Camponotus floridanus* (Buckley), *Pseudomyrmex cubaensis* (Forel), *Pseudomyrmex ejectus* (Smith), and *Pseudomyrmex elongatus* (Mayr)), two Neotropical exotics (*Camponotus sexguttatus* (Fabr.) and *Pseudomyrmex gracilis* (Fabr.)), and four Old World exotics (*Monomorium floricola* (Jerdon), *Paratrechina longicornis* (Latreille), *Pheidole megacephala* (Fabr.), and *Technomyrmex albipes* (Smith)). Only the two Neotropical exotics, *Ps. gracilis* and *C. sexguttatus*, inhabited thorns with holes that appeared to have been perforated by ants as entrances. For *Ps. gracilis*, and perhaps also for *C. sexguttatus*, their association with ant-acacias in Florida represents the reconstitution in an exotic locale of a facultative symbiosis evolved in the Neotropics.

Key Words: Acacia-ants, ant-plants, *Camponotus*, *Pseudomyrmex*, symbiosis

RESUMEN

Una de las simbiosis Neotropicales más conocidas es la asociación entre los cornizuelos y las hormigas de *Pseudomyrmex* que viven en las espinas ahuecadas del cornizuelo. Estudiamos las hormigas en dos especies del cornizuelo, *Acacia cornigera* (L.) y *Acacia sphaerocephala* Schlechtendal & Chamisso, creciendo fuera de su rango nativo en cinco sitios de la Florida. Encontramos once especies de la hormiga: cinco hormigas nativas de la Florida (*Brachymyrmex* sp. nr. *obscurior*, *Camponotus floridanus* (Buckley), *Pseudomyrmex cubaensis* (Forel), *Pseudomyrmex ejectus* (Smith), y *Pseudomyrmex elongatus* (Mayr)), dos exóticas Neotropicales (*Camponotus sexguttatus* (Fabr.) y *Pseudomyrmex gracilis* (Fabr.)), y cuatro exóticas del Viejo Mundo (*Monomorium floricola* (Jerdon), *Paratrechina longicornis* (Latreille), *Pheidole megacephala* (Fabr.), y *Technomyrmex albipes* (Smith)). Solemente las exóticas Neotropicales, *Ps. gracilis* y *C. sexguttatus*, ambas habitaban las espinas con los agujeros que aparecían haber sido perforados como entradas por las hormigas. Para *Ps. gracilis*, y quizás también *C. sexguttatus*, esta asociación con los cornizuelos en la Florida representa la reconstitución en un locale exótico de una simbiosis facultativa desarrollada en el Neotrópico.

Translation provided by author

One of the best-known Neotropical symbioses is the association between *Acacia* trees and *Pseudomyrmex* ants (Belt 1874; Janzen 1966; 1967; Hölldobler & Wilson 1990). Thirteen Neotropical *Acacia* species are "ant-acacias," specialized myrmecophytes that house ants in their thorns and provide ants with extrafloral nectaries and nutritious Beltian bodies (Seigler & Ebinger 1995). Thirteen Neotropical *Pseudomyrmex* ant species obligately live in ant-acacias. Nine of these species vigorously defend the *Acacia* from herbivory and overgrowth by vines, whereas the other four provide little or no defense (Ward 1993). In addition, numerous other ant species live opportunistically in ant-acacias, but also nest elsewhere, typically in hollow twigs (Wheeler 1913). Only two of these facultative symbionts, *Pseudomyrmex gracilis* (Fabr.) and *Camponotus planatus* Roger, are known to show specialized behaviors in exploiting ant-acacia thorns.

The present study was motivated by our observation in September 1999 of *Pseudomyrmex* ants living in an ant-acacia tree growing at Mounts Botanical Garden in West Palm Beach, Florida. We noticed a thorn on an *Acacia cornigera* (L.) tree that had a round hole indicative of an ant entrance. Breaking open the thorn, we found it full of adult *Pseudomyrmex gracilis* ants and brood. This unexpected discovery of ants inhabiting domatia of a non-native myrmecophyte contrasted with an earlier finding concerning another well-known Neotropical myrmecophyte,

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Cecropia obtusifolia Bertol. In Hawaii, where neither *Cecropia* nor ants are native, Wetterer (1997) found no ants inhabiting the hollow trunks and branches of the exotic *Cecropia obtusifolia* trees that grow abundantly in the disturbed lowlands.

In the present study, we wished to determine what ant species live on and in exotic ant-acacias growing in Florida, a region devoid of both native ant-acacias and obligate acacia-ants.

Methods and Results

We contacted and visited numerous botanical gardens around Florida looking for live ant-acacia specimens, and found ant-acacias growing at four locations in addition to Mounts Botanical Garden: Fairchild Tropical Garden in Miami, University of South Florida Botanical Garden in Tampa, Walt Disney World in Orlando, and on the property of G. Joyner in West Palm Beach.

On 10 May 2000, at Fairchild Tropical Garden, we collected ants on three ant-acacias: one bullhorn acacia tree, *Acacia cornigera*; and two bee wattles, *Acacia sphaerocephala* Schlechtendal & Chamisso. We found five ant species: *Brachymyrmex* cf. *obscurior*, *Camponotus floridanus* (Buckley), *Monomorium floricola* (Jerdon), *Pseudomyrmex cubaensis* (Forel), and *Technomyrmex albipes* (Smith) (Table 1). We found no ant entrance holes on any thorns.

On 13 May 2000, at Mounts Botanical Garden, we collected ants on one *A. cornigera*, grown from seed. We found four ant species: *Paratrechina longicornis* (Latreille), *Pseudomyrmex cubaensis*, *Pseudomyrmex ejectus* (Smith), and *Pseudomyrmex gracilis* (Table 1). As in December 1999, we again noted smooth, round ant entrance holes on thorns of this tree. The ants inhabiting the hollowed thorns were *Ps. gracilis*.

On 19 May 2000, at University of South Florida Botanical Garden, we collected ants on one small *A. cornigera*. We found a single *Ps. gracilis* worker (Table 1) but did not observe any ant entrance holes.

On 21 May 2000, at Animal Kingdom, a part of Walt Disney World, we collected ants on one *A. cornigera* growing in a planter in the Africa section. The tree was purchased in Miami; the store had received it from a customer (J. Thompson, pers. comm.). On this tree we found *Brachymyrmex* cf. *obscurior* workers on the trunk (Table 1). We found one thorn with a smooth, round ant entrance hole. We broke open this one thorn and found *Camponotus sexguttatus* (Fabr.) workers and brood inside (Table 1).

On 12 June 2000, on Alexander Street in West Palm Beach, we collected ants on an *A. cornigera* grown from seed by G. Joyner. This tree differed from the well-pruned trees we had examined in botanical gardens because it had many dead branches and twigs, which we were free to break open. We also broke open many dead and live thorns. We found four ant species: *Brachymyrmex* cf. *obscurior*, *Pheidole megacephala* (Fabr.), *Pseudomyrmex elongatus* (Mayr), and *Pseudomyrmex ejectus* (Table 1). Inside many dead twigs, we found *Ps. ejectus* colonies with brood, including alates. In a few dead thorns we found *Pheidole megacephala*, *Pseudomyrmex elongatus*, and *Pseudomyrmex ejectus*, in some cases with brood. None of the entrance holes to these thorns were smoothly rounded, suggesting that none were created by ants.

Discussion

We found eleven ant species living on or in exotic ant-acacia trees in Florida. Five of these ant species are native to Florida (*Brachymyrmex* cf. *obscurior*, *Camponotus floridanus*, *Pseudomyrmex cubaensis*, *Pseudomyrmex ejectus*, *Pseudomyrmex elongatus*), though the last three are also found in the Neotropics (native/exotic designations from Deyrup et al. 1988, 1989). Two ant species we found are New World exotics (*Camponotus sexguttatus* and *Pseudomyrmex gracilis*) and four are Old World exotics (*Monomorium floricola*, *Paratrechina longicornis*, *Pheidole megacephala*, and *Technomyrmex albipes*). Of greatest interest were *Ps. gracilis* and *C. sexguttatus*, the only ants we found inhabiting *Acacia cornigera* thorns that appeared to have been perforated by ants.

Pseudomyrmex gracilis ranges from Argentina to Texas and the Caribbean (Kempf 1972; Jaffe & Lattke 1994) and has invaded Hawaii and Florida (Beardsley 1979; McGlynn 1999). The earliest *Ps. gracilis* records in Florida were from Miami ca. 1960 (Whitcomb et al. 1972). By 1970, *Ps. gracilis* was common throughout southeastern Florida, as far north as West Palm Beach (Whitcomb et al. 1972), and by 1988, *Ps. gracilis* was found from the Florida Keys north to Duval County, near the Georgia border (Johnson 1986; Deyrup et al. 1988, 1989). *Pseudomyrmex gracilis* opportunistically nest in acacias, providing little or no defense for the tree, but also commonly nests in hollow branches, twigs, and stems, as well as building crevices (Buren & Whitcomb 1977; Cassani 1986; Ward 1993; Klotz et al. 1995). Wheeler (1942) found that *Ps. gracilis*, "though a very frequent tenant of dead twigs and *Cordia* domatia in regions where there are no Acacias, nevertheless exhibits a strong proclivity not only to inhabit the spines of these plants [ant-acacias], wherever they are available, but also to perforate them at the same point, to visit the foliar nectaries and to collect food-bodies."

Camponotus sexguttatus ranges from Argentina to Nicaragua and the Caribbean (Kempf 1972) and has invaded Florida and Hawaii (McGlynn 1999). The earliest known Florida specimens date to 1993 (Deyrup et al. 2000). Our

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TABLE 1. ANTS ON TWO SPECIES OF EXOTIC ANT-ACACIAS (*ACACIA CORNIGERA* AND *ACACIA SPHAEROCEPHALA*) IN FLORIDA.

	Acacia cornigera					*Acacia sphaerocephala*	
	M	F	D	U	W	F	F
Brachymyrmex "obscurior"		X	X		X	X	X
Camponotus floridanus		X					
Camponotus sexguttatus			X				
Monomorium floricola		X				X	
Paratrechina longicornis	X						
Pheidole megacephala					X		
Pseudomyrmex cubaensis	X					X	X
Pseudomyrmex ejectus	X				X		
Pseudomyrmex elongatus					X		
Pseudomyrmex gracilis	X			X			
Technomyrmex albipes		X				X	X

M = Mounts Botanical Garden, F = Fairchild Tropical Garden, D = Walt Disney World, U = University of South Florida Arboretum, W = West Palm Beach.

observation is the first record of *C. sexguttatus* inside the thorns of an ant-acacia. It is unclear whether the *C. sexguttatus* simply occupy previously prepared thorns or if they perforate and hollow out the thorns themselves, as do another species of carpenter ant, *C. planatus*. *Camponotus planatus* ranges from Columbia to Texas and the Caribbean (Kempf 1972) and has invaded Florida, Hawaii, and the Galapagos Islands (McGlynn 1999). Like *Ps. gracilis*, Wheeler (1942) considered *C. planatus* "of special interest" because of its specialized behaviors in exploiting ant-acacias. Wheeler (1913) observed *C. planatus* workers perforating a new thorn, indicating that this species does not merely take possession of thorns excavated and abandoned by other ants, but actually opens and excavates its own acacia thorns. Wheeler (1913) considered it "extraordinary that *C. planatus*, which throughout tropical America so constantly lives in hollow twigs, should be able in widely separated localities to utilize the acacia thorns as perfectly and in precisely the same manner as the regular Pseudomyrmas." *Camponotus planatus* occurs in southernmost Florida (Deyrup et al. 1988), though we did not find any on the ant-acacias we examined.

The native range of *A. cornigera* trees in Central America and Mexico (Seigler & Ebinger 1995) overlaps with the native ranges of both *Ps. gracilis* and *C. sexguttatus* ants. Thus, for *Ps. gracilis*, and perhaps also *C. sexguttatus*, their association with *A. cornigera* in Florida represents the reconstitution in an exotic locale of a facultative symbiosis evolved in the Neotropics. Seigler and Ebinger (1995) report that naturalized populations of *A. cornigera* occur in the Caribbean and in southern Florida. In the future, we hope to study the ant fauna of these and other non-native ant-acacias populations.

ACKNOWLEDGMENTS

We thank S. Cover for ant identification; M. Wetterer for comments on this manuscript; S. Wetterer for field assistance; R. Wunderlin at the Institute for Systematic Botany at the University of South Florida and K. Perkins at the University of Florida Herbarium for information on ant-acacia specimens collected in Florida; J. Thompson for information on the acacia at Walt Disney World; G. Joyner for information on and access to his acacia; and Florida Atlantic University for financial support.

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