

MYRMECOPHILES IN ANT NESTS, BIG BEND NATIONAL PARK,
TEXAS

William H. Clark & Arnold F. Van Pelt

Orma J. Smith Museum of Natural History
Albertson College of Idaho
Caldwell, ID 83605
bclark@albertson.edu

and

Greensboro College
Greensboro NC 27401
Avanpelt@aol.com

ABSTRACT

This paper reports a portion of a study conducted by the authors independently on social guests andinquilines (myrmecophiles or ant guests) in ant nests at Big Bend National Park, Texas. The data collected indicated that arthropod guests are commonly found in ant nests in the park. The data accumulated were obtained during studies on mountain ants and inventories of park insects (Van Pelt), and during research on desert ants (Clark). Silverfish (Thysanura) are the most common ant guests in ant nests and are abundant in some nests, in the desert. The beetles (Coleoptera) *Cremastocheilus* and *Araeoschizus* are present but seem to be rare in ant nests. Staphylinid beetles are common in ant nests of various species, and act as social parasites eliciting regurgitation from host workers. The syrphid fly (Diptera) *Microdon baliopterus* lays eggs on or near the host nest, and the larvae crawl down into the nest to feed on the host larvae. The ant cricket, *Myrmecophila* (Orthoptera) has been found in harvester ant, *Pogonomyrmex*, nests. In the Hymenoptera, several eucharitid genera, including *Orasema*, produce larvae, which are endoparasitic on the host brood. Several species of spiders are found near or in ant

nests and some lay their eggs in the nests. They may also be found running along the ant emigration or foraging trails.

Keywords: myrmecophiles, ant guests, ants, Big Bend National Park, Texas, biodiversity

INTRODUCTION

Big Bend National Park, Texas (Figure 1) is one of the largest of the United States national parks, yet one of the least visited. It is over 800,000 acres in size. Van Pelt (1983) documented the ants in the Chisos Mountains and listed the known insect species for the Park (Van Pelt 2007). Clark has begun a biodiversity study of the desert ants and ant guests of the Park (Clark 2005, 2006, Clark and Van Pelt 2007, Clark et al. 2007).

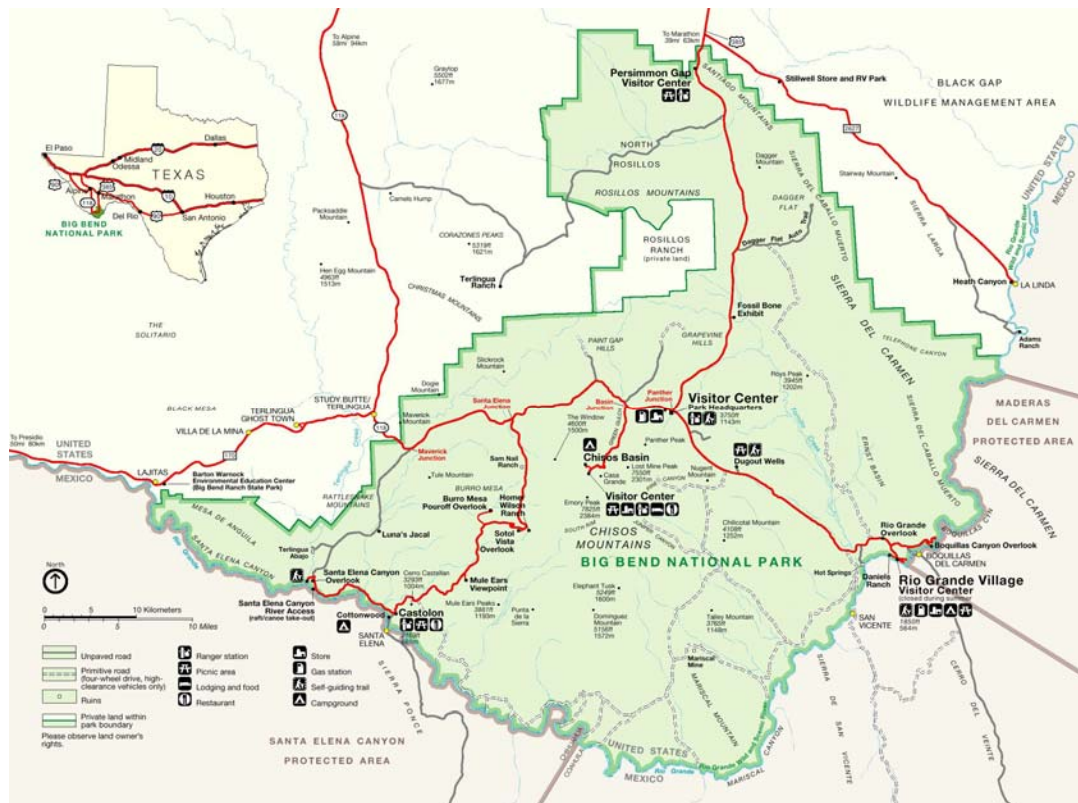


Figure 1. Map of Big Bend National Park, Texas showing the Chisos Mountains in the center of the park, the Rio Grande River forming the southern boundary, with the remaining areas being Chihuahuan Desert. Map courtesy Vidal Davila, National Park Service

Big Bend National Park offers diversified habitats from high forests in the Chisos Mountains (Figure 2) descending to pine-juniper associations to grasslands, and then to distinct desert habitats (Figure 3), with the Rio Grande and its associated riparian areas (Figure 4) forming the southern boundary of the park with Mexico. This variety of habitats produces an opportunity for a diversity of ant species, and for the organisms that live with them. About 4500 species of insects have been cataloged in the park (including 108 taxa of ants) since its inception (Van Pelt 2007).



Figure 2. Chisos Mountains habitat in the center of Big Bend National Park, Texas. These are a dominant feature in the park.



Figure 3. Chihuahuan Desert habitat is abundant in Big Bend National Park, Texas. The desert surrounds the Chisos Mountains.



Figure 4. Rio Grande River habitat forms the southern boundary of Big Bend National Park, Texas with that of Mexico.

We use the word myrmecophile (a commensal or parasite in ant nests) to include the word myrmecophil (ant guest). These take the form of a variety of invertebrate groups in Big Bend National Park (Table 1). The relationships between these guests and the host ants are varied and in many cases unknown.

Table 1. Selected myrmecophiles collected at Big Bend National Park, Texas. Most of these were Diptera and Coleoptera. Several different ant species were hosts.

MYRMECOPHILES (ANT GUESTS) AND HOST ANTS, BIG BEND NATIONAL PARK, TEXAS				
Ant Guest				Ant Hosts
Class	Order	Family	Genus, Species	Ant Species
Arachnida	Acarina	Laelapidae	<i>Laelaspis</i> sp.	<i>Monomorium minimum</i> (Buckley)
Arachnida	Arameae	Various	Many	Many
Insecta	Thysanura	Lepismatidae	unknown	<i>Pogonomyrmex</i> , <i>Pheidole</i> , & others
Insecta	Heteroptera	Reduviidae	<i>Melanolestes</i> sp.	<i>Aphaenogaster texana</i> Wheeler
Insecta	Diptera	Unknown	unknown	<i>Monomorium minimum</i> (Buckley)
Insecta	Diptera	Anthomyiidae	unknown	<i>Monomorium minimum</i> (Buckley)
Insecta	Diptera	Syrphidae	<i>Microdon baliopterus</i>	<i>Monomorium minimum</i> (Buckley)
Insecta	Orthoptera	Myrmecophilidae	<i>Myrmecophila</i> sp.	<i>Pogonomyrmex rugosus</i> Emery
Insecta	Hymenoptera	Eucharitidae	<i>Orasema wheeleri</i> Wheeler	<i>Pheidole sciophia</i> Wheeler
Insecta	Hymenoptera	Braconidae	Undescribed genus	unknown
Insecta	Coleoptera	Staphylinidae	<i>Dinardilla mexicana</i>	<i>Liometopum apiculatum</i> Mayr
Insecta	Coleoptera	Staphylinidae	<i>Sceptobius dispar</i>	<i>Liometopum apiculatum</i> Mayr
Insecta	Coleoptera	Scarabaeidae	<i>Cremastocheilus</i> sp.	<i>Aphaenogaster cockerelli</i> André
Insecta	Coleoptera	Tenebrionidae	<i>Argoporis rufipes nitida</i>	<i>Solenopsis xyloni</i> McCook
Insecta	Coleoptera	Tenebrionidae	<i>Araeoschizus</i> sp.	<i>Pogonomyrmex rugosus</i> Emery
Insecta	Coleoptera	Histeridae	<i>Hister militaris</i>	unknown

The study of myrmecophiles in Big Bend National park is important because the National Park Service is interested in an inventory of the biodiversity of the park. The work is also important because it has not been done for the park and so many of the specific relationships between ants and their guests are unknown. Our objectives for this study are to determine what myrmecophiles are found in Big Bend National Park, to determine which ants host which guests, and to determine more about the relationships between host ants and their guests. Many of these distributional records and relationships between the various taxa included are new to science.

MATERIALS AND METHODS

Field methods included a general reconnaissance for ants in all available habitats, epigeal habitats being the most common. Collections were made manually (usually with hand or mouth operated aspirators) from nests with visible external entrances or found under rocks, wood, or debris. Nests may also be found arboreally in twigs. Cover boards (Clark and Blom 2007) were placed around certain ant nests and later examined underneath for ant guests. Collections were placed into vials of 70% ETOH with labels containing the collection event data. Voucher specimens have been or will be placed in the collections at Big Bend National Park, Texas and the Orma J. Smith Museum of Natural History, Albertson College of Idaho, Caldwell.

Field work was conducted under permits (to Van Pelt and Clark) with the National Park Service.

RESULTS AND DISCUSSION

At least 16 groups of myrmecophiles have been found in Big Bend National Park, Texas (Table 1). Many species will be represented once all the materials are identified. Relationships between these the guests and host ants will be better known after additional field work is conducted.

Many species of spiders and mites have been found near or in ant nests in the park, and some lay their eggs in the nests. These arachnids may also be found running along the emigration or foraging trails of several ant species.

We have found the ant cricket, *Myrmecophila* (Orthoptera) in harvester ant, *Pogonomyrmex*, nests. Kistner et al. (2007) give a summary of the relationships between *Myrmecophila* and its ant hosts.

Silverfish (Thysanura) are one of the most common and abundant ant guests in the desert areas as determined by our field observations (Figure 5). This association has not been adequately described in the literature. Hundreds can be found in some large harvester ant (*Pogonomyrmex*) nests. These seem to be detritivores in the nest feeding on the plant materials the ants have stored in the nests.



Figure 5. Example of myrmecophiles, silverfish (*Thysanura*), under a cover board placed over part of a *Pogonomyrmex rugosus* nest. Portions of the attachment of a large ant chamber can be seen on the underside of the wood board, at Castolon, Big Bend National Park, Texas, January 2007. Vanessa Meredith photo.

In the Diptera, syrphid fly adults of some species (e.g., *Microdon baliopterus*) lay their eggs on or near the host nest, and the larvae crawl down to the host larval chambers and feed on the host larvae (Van Pelt and Van Pelt (1972). In the Hymenoptera, several eucharitid genera, including *Orasema*, produce larvae which are endoparasitic on the host brood.

In the Coleoptera, staphylinidae beetles are common in ant nests of various species, and act as social parasites eliciting regurgitation from host workers. Staphylinid beetles are common ant guests (Kistner 1982). Two beetles (Tenebrionidae, *Araeoschizus* sp.) and (Scarabaeidae, *Cremastocheilus* sp.)(Figure 6) represent new records for these genera in Big Bend National Park (Van Pelt 1999). *Cremastocheilus* is a known ant guest (Kistner 1979). *Araeoschizus* is known to be associated with various

ants (Clark and Blom 1988) but little is known about these relationships. These beetles have not been collected frequently in the Park; however they may be more common than collections indicate, as they can be very cryptic.



Figure 6. Example of myrmecophile, Coleoptera, *Cremastocheilus* found associated with the ant *Aphaenogaster cockerelli* at Burro Mesa Pouroff, Big Bend National Park, Texas , July 2000.

ACKNOWLEDGMENTS

Julia T. Sankey and Mary H. Clark assisted with field logistics. Raymond Skiles, Vidal Davila, Jeffery Bennett, Scarlett Wirt, and Don Corrick provided assistance with National Park Service permits and logistics and provided additional assistance. Vanessa Meredith provided Figure 5.

LITERATURE CITED

- Clark, W.H. 2005. Biodiversity of desert ants (Hymenoptera: Formicidae) at Big Bend National Park, Brewster Co., Texas, a preliminary assessment. *Journal of the Idaho Academy of Science* 41(1):36.
- Clark, W.H. 2006. Biodiversity of desert ants (Hymenoptera: Formicidae) at Big Bend National Park, Brewster County, Texas, a progress report. *Journal of the Idaho Academy of Science* 42(1):48.
- Clark, W.H. and P.E. Blom. 1988. Observations on the relationship between ants (Hymenoptera: Formicidae: Myrmicinae, Dorylinae) and *Araeoschizus* (Coleoptera: Tenebrionidae). *Journal of the Idaho Academy of Science* 24(1/2):34-37.
- Clark, W.H. and P.E. Blom. 2007. Annotated checklist of the ants on the Idaho National Laboratory (Hymenoptera: Formicidae). *Sociobiology* 49(2):1-117.
- Clark, W.H., and A. Van Pelt. 2007. Myrmecophiles in ant nests, Big Bend National Park, Texas. *Journal of the Idaho Academy of Science* 43(1):39-40.
- Clark, W.H., A. Van Pelt, and R. Skiles. 2007. The red imported fire ant, *Solenopsis invicta*, in Big Bend National Park, Brewster County, Texas. *Southwestern Entomologist*. 32(1):67-68.
- Kistner, D.H. 1979. Social and evolutionary significance of social insect symbionts, pp. 339-413, *IN: Hermann, H.R. (ed.), Social Insects Volume I, Academic Press, Inc., New York.*
- Kistner, D.H. 1982. The social insects' bestiary, pp. 1-244, *IN: Hermann, H.R. (ed.), Social Insects Volume III, Academic Press, Inc., New York.*

- Kistner, D.H., K.-F. Chong, and C.-Y. Lee. 2007. A new Malaysian myrmecophilous cricket (Orthoptera: Myrmecophilidae). *Sociobiology* 50(1):173-182.
- Van Pelt, A. 1983. Ants of the Chisos Mountains, Texas (Hymenoptera: Formicidae). *Southwestern Naturalist* 28:137-142.
- Van Pelt, A. F. 2007. Inventory of Insects from Big Bend National Park, Texas. Report to the Park. Submitted to Big Bend Natural History Association, Big Bend National Park, Texas.
- Van Pelt, A., and S.A. Van Pelt. 1972. *Microdon* (Diptera: Syrphidae) in nests of *Monomorium* (Hymenoptera: Formicidae) in Texas. *Annals of the Entomological Society of America* 65(4):977-979.