

ANTS OF THE ARCHBOLD BIOLOGICAL STATION,
HIGHLANDS COUNTY, FLORIDA
(HYMENOPTERA: FORMICIDAE)

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ABSTRACT

The 102 species of ants known to occur on the Archbold Biological Station in Highlands Co., Florida are listed with annotations on their habitat and microhabitat preferences and timing of nuptial flights. The diversity of the fauna results from the confluence of several biogeographic groups of ants. Several species are endemic to the xeric scrub of central Florida, which was an insular refugium during Pleistocene or Pliocene flooding. About 20 species are exotic, of which 6 have invaded scrub habitats. The invasibility of south Florida to exotic ants and the biogeographic affinities of native ants are discussed.

RESUMEN

Se registran las 102 especies de hormigas ya conocidas de la Estación Biológica Archbold en el condado Highlands en la Florida. Se presentan informaciones sobre el habitat y el microhabitat preferidos y sobre la sazón del vuelo nupcial. La diversidad de esa fauna resulta de la confluencia de varios grupos biogeográficos de hormigas. Algunas especies son endemias del matorral xérico de la Florida central, que era un refugio insular durante inundaciones de la Pleistoceno o Plioceno. Aproximadamente 20 especies de esta fauna son exóticas, de las cuales 6 han colonizado el matorral xérico. Se trata de la invasibilidad de la Florida meridional por hormigas exóticas y de las afinidades des biogeográficas de las hormigas nativas.

INTRODUCTION

The Archbold Biological Station (ABS) is a permanent ecological reserve located at the south end of the Lake Wales Ridge in Highlands County, Florida. The main property consists of about 4,377 acres, including an 80-acre lake; there is also a 8-acre tract (Price Memorial Tract) on the north side of Lake Placid.

The ant fauna of the ABS is of special interest for several reasons, one of which is the biogeography of the region. The Lake Wales Ridge is a series of former islands isolated during the Pleistocene or Pliocene flooding of peninsular Florida (Laessle 1968). The ridge is presently characterized by excessively drained sandy soil. Both the history and soil conditions of the area contribute to a relatively high proportion of endemism among species and subspecies of certain groups of plants and animals (Hubbell 1961). The presence or absence of endemic forms of ants is therefore of interest with respect to the biogeography of the region and the biogeography of ants. A second reason for the study is the apparent ecological importance of ants at the ABS. Preliminary obser-

vations suggested that ants are both diverse and abundant in most habitats. An understanding of the ant fauna is a useful step toward the long-term goal of a better understanding of the invertebrate ecology of the ABS. Finally, we regard the ants of the ABS as an important research resource. Our list informs the scientific community about the ants available for study at the ABS.

There have been no intensive surveys of ants in any part of southern Florida; this study provides baseline information that will be useful in documenting the invasion of exotic species and shifts in the ranges of native species.

Several workers have previously studied ants at the ABS or specimens from the ABS. These projects dealt with species of *Formica* (Schneirla 1944), *Conomyrma* (Smith 1944), *Pheidole* (Naves 1985), *Solenopsis* (*Diplorhoptrum*) (Thompson 1980), *Camponotus* (Walker 1983), and *Paratrechina* (Trager 1984). Current projects include studies of the genera *Pseudomyrmex* (R. Klein) and *Conomyrma* (Trager, in preparation). There have been no previous attempts to compile a complete list of ants of the ABS.

MATERIALS AND METHODS

The ant survey began in December 1980, and continued through the summer of 1984. Four kinds of traps were used. The first was a series of small vials with perforated tops that permit entry to small ants. These vials were baited with commercial canned tunafish, buried, and left overnight. The second type of trap consisted of small plastic cups baited with canned pet food, set out, and retrieved as soon as they were invaded by ants. Two small malaise traps in a sand pine scrub area were used continuously from June 1983 through 1984 to trap alates. An ultraviolet light was used to trap alates at night. Tullgren extraction was used to obtain ants and associated arthropods from about 300 samples of litter of various types. Ants were also found by searching for entrances in soil and by breaking open logs and twigs. Rocks do not naturally occur at the Archbold Biological Station, and the small number of imported rocks present were not important collection sites.

The vegetation types of the ABS have been classified and mapped by Abrahamson, et al. (1984). The following classification is taken from a vegetation map prepared in 1983 by these authors. The categories SP, NS and MOrr are original.

RS: Southern Ridge Sandhill. Open woodland of south Florida slash pine (*Pinus elliottii* var *densa* Little and Dorman), xerophytic oaks (*Quercus laevis* Walter, *Q. myrtifolia* Willdenow, *Q. chapmanii* Sargent, *Q. geminata* Small), and scrub hickory (*Carya floridana* Sargent). Understory composed of wire grass (*Aristida stricta* Michaux), scrub palmetto (*Sabal etonia* Swingle), and herbs. On well-drained upland soil.

RSt: Southern Ridge Sandhill with turkey oak (*Quercus laevis*).

RSh: Southern Ridge Sandhill with scrub hickory (*Carya floridana*).

SS: Sand Pine Scrub. Dense to widely-scattered stands of sand pine (*Pinus clausa* Chapman) with understory dominated by xerophytic oak and other shrub species or rosemary (*Ceratiola ericoides* Michaux). On well-drained deep sandy soil.

SSr: Sand Pine Scrub with rosemary (*Ceratiola ericoides*).

SSo: Sand Pine Scrub with oak (*Quercus* spp.)

SF: Scrubby Flatwoods. Low shrubby growth of xerophytic oaks (*Quercus inopina* Ashe, *Q. chapmanii*, *Q. geminata*) and palmettos (*Sereinoa repens* Bartram and *Sabal etonia*) typically with widely-scattered south Florida slash pines and often sand pines. On well-drained sandy soil.

SFi: Scrubby Flatwoods with inopina oak (*Quercus inopina*).

SFl: Scrubby Flatwoods with sand live oak (*Quercus geminata*).

FL: Flatwoods. Open stands of south Florida slash pine of extremely low to moderate densities. Understory and ground cover of varying combination of grasses, herbs, saw palmetto (*Serenoa repens*), and shrubs (*Lyonia* spp., *Vaccinium* spp., *Befaria racemosa* Ventnat, *Ilex glabra* Linnaeus). On soils with organic hardpan restricting drainage.

FLw: Flatwoods with wiregrass (*Aristida stricta*).

FLc: Flatwoods with cutthroat grass (*Panicum abscissum* Swallen).

FLg: Flatwoods with gallberry (*Ilex glabra*) and fetterbush (*Lyonia lucida* Lamarck).

FLp: Flatwoods with saw palmetto (*Serenoa repens*).

BH: Bayhead. Dense forests of broadleaved evergreen trees (*Gordonia lasianthus* Linnaeus, *Persea borbonia* Linnaeus, *Magnolia virginiana* Linnaeus) on muck soil subject to periodic flooding. Undergrowth of shrubs, including wax myrtle (*Myrica cerifera* Linnaeus), dahoon holly (*Ilex cassine* Linnaeus), highbush blueberry (*Vaccinium corymbosum* Linnaeus), and abundant ferns (*Osmunda* spp.).

SP: Seasonal Pond. Open seasonally flooded depressions, usually with distinctly zoned vegetation dominated by grasses or shrubby *Hypericum edisonianum* Small and often bordered by a dense band of saw palmettos. Soils ranging from sandy to highly organic.

SPb: Seasonal Pond with broomsedge (*Andropogon brachystachys*).

SPc: Seasonal Pond with cutthroat grass (*Panicum abscissum*).

SPh: Seasonal Pond with *Hypericum edisonianum*.

MO: Man-modified.

MOl: Man-modified, landscaped, park-like.

MOr: Man-modified, roadside.

MOrr: Man-modified, railroad.

NS: *Nyssa biflora* Walter swamp.

All records listed below have associated pinned and labelled voucher specimens. These specimens have been divided between the reference collection of the Archbold Biological Station and the Florida State Collection of Arthropods, Gainesville.

ANNOTATED LIST OF SPECIES

The species listed below are arranged according to their order in the Formicidae part of Catalog of Hymenoptera in America North of Mexico (Smith 1979). We have refrained as much as possible from innovations in nomenclatural usage. A number of species have manuscript names that have not been published; in some cases the names were presented in theses that may not be published in the near future. In such cases we do not list the unpublished name, but give the appropriate unpublished name in the annotations. Subspecific names are used primarily when there is reason to believe that the subspecies will eventually be given specific rank. Abbreviations of vegetation type are explained above. Unless otherwise indicated, malaise trap records are from the SSo habitat. Habitat information is presented in Table 1.

Neivamyrmex Borgmeier

Of the three species of *Neivamyrmex* found in Florida only *N. opacithorax* is known from southern Florida (Watkins 1976). Army ants escaped notice at the Archbold Biological Station until 1983, and workers have never been seen in the open. Possibly, the desert-like conditions of upland areas of southern Florida forces army ants to become nocturnal or exclusively subterranean; Creighton (1950) speculates that arid conditions explain the cryptic nature of army ants in the southwestern United States. Flightless

queens restrict the dispersal of army ants; water barriers may have prevented the other two species of army ants from reaching southern Florida. We collected *N. texanus* Watkins on the Lake Wales Ridge in Avon Park, about 54 miles north of the Archbold Biological Station.

opacithorax (Emery). Workers in nest of *Paratrechina phantasma* in firelane. Males were collected in malaise traps; the flight period was concentrated in September and October both years. Total individuals in 1983-4 were grouped as follows: Aug.:3; Sept.:25; Oct.:24; Nov.:3.

Amblyopone Erichson

Smith (1979) does not include Florida in the range of either of the two eastern species of *Amblyopone*, but *A. pallipes* has been reported from Welaka (Van Pelt 1958) and Dunedin (M. R. Smith 1930).

pallipes (Haldeman). At base of dead and live pines; *Quercus myrtifolia* litter; *Q. geminata* litter; *Q. laevis* stump; hickory litter. Males were collected in malaise traps. In 1983, out of 39 males, 22 were captured in Aug. and Sept., but there was no late summer increase in captures in 1984.

Platythyrea Roger

punctata (Smith). At the base of live magnolia; under bark of suspended dead branch; on rotten stump. Males in malaise traps in Sept.-Nov.

Proceratium Roger

croceum (Roger). In rotten pine log. Males in malaise traps in June-Aug. Not previously reported south of Putnam Co. (Van Pelt, 1958).

Discothyrea Roger

testacea (Roger). In deep pine litter; at base of live pine; in dead palmetto trunk; in *Andropogon* tussock.

Pachycondyla Smith

stigma (Fabricius). In rotten pine wood; under bark of dead pine; under bark of dead *Gordonia*, in rotten *Gordonia*, in litter at base of *Lyonia ferruginea*. Alates from nests in Sept., Dec. Males in malaise traps in SFi in June.

Hypoponera Santschi

inexorata (Wheeler). In pine litter, hickory litter, *Quercus chapmanii* litter, turkey oak litter; rosemary litter; litter of *Befaria racemosa* leaves.

opaciceps (Mayr). Under railroad ties; in lawn thatch; pine litter, in *Melaleuca* log; in *Quercus laevis* litter. Alates in flight in June, Sept.-Feb. From the continuously monitored malaise traps 20 specimens (out of a total of 24) are from the months Oct.-Dec., suggesting a late fall flight season.

opacior (Forel). In pine litter; rotten pine; *Quercus geminata* litter; rotten oak; oak litter; hickory litter; cutthroat tussock; under dead *Serenoa repens*; *Quercus chapmanii* litter; pine-sweetbay litter; magnolia litter; wire grass litter; broomsedge tussock; *Quercus myrtifolia* litter; flying squirrel nest box; grape-oak litter. Alates in flight June-July, Oct.-Dec. Not previously reported south of Putnam Co. (Van Pelt 1958); we have collected specimens from several sites south of the Archbold Biological Station, including Key Largo.

punctatissima (Roger). In cutthroat tussock, broomsedge tussock, base of dead pine; base of live pine; base of *Nyssa biflora*; under dead branch on ground; tree hole in *Quercus laurifolia*; in rotten pine; in rotten *Melaleuca*; under fallen post.

Leptogenys Roger

elongata manni Wheeler. No workers seen from ABS. Males in malaise trap July-Dec. In both 1983 and 1984 the majority of specimens (29 out of 45) were collected in Oct. Taxonomic note: Trager (in preparation) will show that the Florida *Leptogenys*, long considered a subspecies of the Texas species, *L. elongata*, is in fact a distinct species.

Odontomachus Latreille

There are apparently three species of *Odontomachus* in Florida. The taxonomy of these species will be discussed in a separate paper. We use the name *O. brunneus* somewhat differently than Brown in his 1976 revision of the genus, in that we consider *O. ruginodis* (found in Dade and Monroe counties to the south of ABS) a distinct species.

brunneus (Patton). At base of live pine, in cutthroat tussock, under dead pine; nest in rotten pine log, base of *Nyssa biflora*, in broomsedge tussock, under dead palmetto. Alates in nest in Sept.; alates at light May, June, Dec.

clarus Roger. In broomsedge tussock; at base of oak; in *Befaria racemosa* litter; under log; in stomach of armadillo. Males in malaise traps: this species was the most abundant ant in malaise trap samples. More than 2,000 specimens were collected during the summer and fall of 1983. The general flight pattern is several large flights from late July through November.

ruginodis Wheeler. We have not seen *ruginodis* at ABS, but a male captured in September 1979 is deposited in the Florida State Collection of Arthropods in Gainesville.

Pseudomyrmex Lund

There are six species of this genus living on the Archbold Biological Station, according to Ward's 1985 revision of the genus. Three are similar-appearing yellow species whose coexistence in Florida was not recognized by Creighton (1950) or Smith (1979).

cubaensis Forel. In twig of *Callicarpa americana* MOI; on picnic table MOI; alates Nov., Dec., and Jan. Ward (1985) has shown that this species is distinct from *elongatus* and is more widely distributed in Florida.

ejectus (F. Smith). On *Quercus laurifolia*; on *Myrica cerifera*; nest in dead grape vine; nest in dead weed stalk; nest in twig of *Callicarpa americana* in flying squirrel nest box. Alates in nest in Mar., at ultraviolet light in Oct., Mar., June.

elongatus (Mayr). On *Myrica cerifera*; nest in dead grape vine.

mexicanus (Roger). On trunk of pine; on flower of *Ilex cassine*; making hole and robbing nectar from flower of *Vaccinium corymbosum*; at tuna bait on pine; nest in *Sambucus* twig; nest in stem of *Callicarpa americana*; nest in pine twig; nest in dead grape vine. Alates in nest Oct., alates in flight in May-July, Oct.

pallidus (Smith). Several nests in broomsedge culms; in stem of *Lacnantes caroliniana*; in stem of *Smilax*. Alates in flight Oct.-Dec.

seminole Ward. Nests in broomsedge culms; on flower of *Ilex cassine*; in stem of *Lacnantes caroliniana* (Lamarck). Alates in nest in Jan., Feb., Nov. This species may be distinguished from *P. delicatulus* and *P. pallidus* by the following characters: head of worker in profile with distance between eye and upper edge of head about equal to the malar space; worker with a pair of faint black spots on the first gastral tergite; queen more than 6 mm in length; male genitalia not triangular in profile.

simpler (F. Smith). On twig of pine; on trunk of dying pine; on twig of *Persea humilis*; on *Myrica cerifera*; nest in culm of broomsedge. Alate in flight in Oct.

Pogonomyrmex Mayr

badius (Latreille). On bare sand in open areas. Alates in flight in June-July. At the Archbold Biological Station males of this species are entirely reddish brown, not bicolored (blackish brown with light brown gaster) as they are elsewhere. Mating between

sibs at the nest entrance may be the rule in this population.

Aphaenogaster Mayr

ashmeadi (Emery). In deep pine litter; at pet food bait; at base of pine stump. Not previously collected south of Pasco Co. (Carroll 1975).

flemingi (Smith). In dry cutthroat seasonal pond; nest in opening, under grass clump, near Lake Placid; in stomach of armadillo. Vegetation types: SPc (3), MO (2), SSo (1). Not previously collected south of Alachua Co. and Putnam Co. (Carroll 1975).

floridana (Smith). Nests at edge of sand road. Not previously reported south of Alachua Co. (Carroll 1975).

texana (Emery). At base of pine; at base of *Gordonia lasianthus*; at pet food baits; nest in rotten pine log; nest in rotten *Melaleuca* log. Carroll (1975) recognizes this species as *A. carolinensis* Wheeler, elevating Wheeler's varietal name to species rank. We use the name *texana* because Carroll's work has not yet been published.

tratae (Forel). Under *Quercus inopina*; nest under *Q. inopina*. Not previously reported south of Polk Co. (Carroll 1975).

Pheidole Westwood

Pheidole adrianoi Naves. At tuna bait; at pet food bait; at cookie crumbs; in open sand; under *Quercus inopina*; under *Ximenia americana* Linnaeus; under *Licania michauxii* Prance; at edge of drive; prey of *Brachynemurus* sp. Alates at ultraviolet light in June.

dentata (Mayr). At pet food baits; base of pine; on palmetto leaf; on cement walk; under *Quercus chapmanii*, in pine litter; base of *Gordonia lasianthus*; under bovine dung; *Quercus myrtifolia* litter, *Carya floridana* litter; at base of *Nyssa biflora*; in stomach of armadillo. Alates at light in June.

dentigula Smith. At base of live pine; in dead pine; *Lyonia* litter; oak-pine litter; hickory litter; *Quercus myrtifolia* litter; *Q. chapmanii* litter; *Q. laevis* litter; palmetto-pine litter; pine litter, *Ligustrum* litter; hollow in live pine; base of *Gordonia lasianthus*. Alates at light in June.

floridana Emery. In hickory litter; *Quercus geminata* litter; *Q. myrtifolia* litter; at tuna bait; at pet food bait; under bark of dead pine; at base of live pine; cutthroat tussock; broomsedge tussock; in lawn; in rotten log; palmetto-pine litter; pine litter; *Ceratiola* litter; *Gordonia* litter; *Magnolia* litter; *Nyssa biflora* litter; in dead palmetto trunk. Alates at ultraviolet light in June.

metallescens Emery. In hickory litter; *Quercus chapmanii* litter, *Lyonia* litter; wire grass litter; at tuna bait; at pet food bait; at rolled oats bait. Alates in malaise trap in July.

moerens Wheeler. On pavement by ABS building; in *Andropogon* tussock by Lake Placid.

morrisi Forel. At tuna bait; at pet food bait; at base of live *Pinus elliottii*; in *Andropogon brachystachys* tussock; nest in open gravel along railroad; in sandy firelanes; taking nectar from *Euthamia minor* (Michaux).

littoralis Cole. Nests (12 seen) in open sand of fire lanes; only one nest seen in vegetation (SSr). Taxonomic note: Naves (1985) in his monograph on Florida *Pheidole* gives this form specific rank.

Cardiocondyla Emery

emeryi Forel. At pet food bait; on live pine; in lawn litter; dead specimen on back of chrysopterid larva; at edge of lake; in bay twig; in pine twig.

nuda (Mayr). At pet food bait; in lawn. Alates in flight in July, Oct., Dec.

venustula Wheeler. Lake edge; edge of lawn.
wroughtonii (Forel). Lake edge.

Crematogaster Lund

ashmeadi Mayr. In dead twig of *Rhus copallina*; in dead branch of *Pinus clausa*; in dead twig of hickory; in *Eupatorium* stem; in dead *Quercus laevis*; in dead *Lyonia ferruginea*; in dead leaves of large *Tillandsia*. Alates in flight in Apr., June-Aug., Oct., Dec.; alates in nest in Oct.

clara Mayr. In dead *Hypericum edisonianum*; in rotten log; on flower of *Opuntia compressa*; on grasses; in grass stem; in dead twig of *Pinus elliottii*.

minutissima Mayr. In rotten *Melaleuca* log; litter at base of *Nyssa biflora*. Alates at ultraviolet light in June.

Crematogaster sp. An undescribed species resembling *C. ashmeadi* in the following characters: small size; short, thick propodeal spines; a single erect hair on each thoracic humerus; short appressed pubescence on the head. Unlike *C. ashmeadi*, this species has clear reddish-yellow head and thorax, contrasting sharply with the blackish gaster. All colonies found to date were in pine trees, in contrast with *C. ashmeadi*, which nests in a variety of situations.

Monomorium Mayr

floricola (Jerdon). On *Morus rubra*; on *Clerodendrum*; in twig of *Callicarpa americana*.

pharaonis (Linnaeus). Abundant in Archbold Biological Station buildings.

viridum Brown. At pet food bait; in open sand of fire lane; in gravel along railroad; tending aphids on *Palafoxia*; on *Opuntia compressa*; on *Clerodendrum* flowers. Alates at ultraviolet light in June.

Xenomyrmex Forel

floridanus Emery. In *Sambucus* twig; in hickory twig; in *Pinus clausa* twig; in malaise traps; on table under *Quercus laurifolia*. Alates in malaise trap in Oct. and Dec.

Solenopsis Westwood

carolinensis Forel. Under log by railroad; in nest of *Monomorium viridum* by roadside.

geminata (Fabricius). In wet sand near seasonal pond; in gravel along railroad; along edge of lake. Alates at ultraviolet light in Apr., May, Oct.; alates in nest in July. This species occurs in red and black color phases. Only the red form was found on the main Archbold Biological Station property, but the black form occurs in moist situations near the edge of the *Nyssa* swamp on the Lake Placid property.

globularia (Smith). At pet food bait; in rotten pine log; in dead palmetto stump in fire lane.

invicta Buren. At pet food bait; along roadside; in stomach contents of armadillo. Alates in malaise traps in Jan., Feb., May-Sept., Dec.; alate in stomach of armadillo in Jan.

nickersoni Thompson. In rotten pine log; at base of large slash pine; *Andropogon* tussock; sand pine litter; cutthroat tussock; *Quercus laevis* litter; hickory litter; pine and palmetto litter; *Ceratiola* litter. This is a recently described species (Thompson 1982) not included in the Hymenoptera catalog.

pergandei Forel. Under fence post; under rock; in nest of *Monomorium viridum*; in nest of *Aphaenogaster floridana*; in gravel along railroad. Alates in nest in Sept.

picta Emery. In dead branch of *Pinus elliottii*; in dead branch in crown of *Pinus clausa*; in nest box of flying squirrel; in "trash pile" on back of chrysopterid larva.

tennesseensis Smith. In pine litter; in palmetto and pine litter; in hickory and pine

litter; at base of dead pine; in *Quercus geminata* litter; in *Q. virginiana* litter; in *Q. myrtifolia* litter; in *Q. laevis* litter; in rotten pine log; in hickory litter; in dead palmetto stem; *Lyonia ferruginea* litter; cutthroat tussock; *Vaccinium* sp. litter; *Schinus* litter; magnolia litter; wire grass litter; *Ceratiola* litter.

Solenopsis sp. In cutthroat tussock; in palmetto litter; *Lyonia ferruginea* litter; wire grass litter; pine litter; *Ceratiola* litter; palmetto and pine litter; in rotten pine log; in pine stump; magnolia litter; loose bark at base of pine; *Quercus laevis* litter; *Q. myrtifolia* litter; *Q. geminata* litter; *Befaria racemosa* litter; under log near railroad; hickory litter. This small yellow *Diplocephtrum* resembles *S. carolinensis*, but has short sparse hair on the vertex and a conspicuous glabrous midline on the front of the head. This species may prove to be a southern variant of *S. texana* Emery.

Leptothorax Mayr

pergandei floridanus Emery. At pet food bait; in hickory litter; in oak litter; in pine litter; nest in buried dead *Lyonia* stem; nest in buried hickory nut. Alates at ultraviolet light in May.

texanus Wheeler. At tuna bait; at pet food bait.

wheeleri Smith. On dead *Pinus elliottii*.

Myrmecina Curtis

americana Emery. In rotten pine log.

Tetramorium Mayr

bicarinatum (Fabricius). On flowers of *Erechtites*; nest in stump of bay tree. Taxonomic note: This species was long known as *T. guineense*. Bolton (1977) has shown that the type of *guineense* is in fact a *Pheidole* and that *bicarinatum* is the next available name.

simillimum (Smith). At pet food bait; on fallen orange; at base of *Pinus clausa*; at base of *Pinus elliottii*; on *Morus rubra*; in lawn; at base of *Quercus laurifolia*, under fence post; in "trash pile" on back of chrysopterid larva; at edge of lake.

Ochetomyrmex Mayr

auropunctatus (Roger). Under raccoon feces; under fence post; at lake edge. Alates in flight in June-Aug., Oct.-Dec.

Strumigenys Smith

The distribution of species of *Strumigenys* in Florida is discussed by Deyrup and Trager (1984).

eggersi Emery. *Pinus elliottii* litter; *P. clausa* litter, base of standing dead pine; pine and hickory litter; hickory litter; *Ligustrum* litter; *Schinus* litter; *Quercus laevis* litter; *Q. laevis* stump; *Q. geminata* litter; *Q. laurifolia* litter; *Q. myrtifolia* litter; *Q. virginiana* litter; *Nyssa biflora* litter; *Ceratiola ericoides* litter; dead palmetto stem; base of live palmetto.

louisianae Roger. In *Quercus geminata* litter; in *Pinus clausa* litter.

rogeri Emery. In litter at base of *Pinus elliottii*; under rotten pine; pine and hickory litter; *Quercus chapmanii* litter; magnolia and *Gordonia* litter; at base of dead magnolia.

Smithistruma Brown

All species of *Smithistruma* are scarce at the Archbold Biological Station, and apparently confined to the more mature areas of a hickory ridge. Mature sand pine scrub areas, which are more mesic than the hickory ridge and have more pockets of deep litter, did not provide any specimens of *Smithistruma*.

clypeata (Roger). Oak-hickory litter. This not previously reported south of Putnam Co. (Van Pelt 1958).

creightoni (Smith). In *Quercus geminata* litter; in *Pinus clausa* litter. Not previously reported south of Putnam Co. (Van Pelt 1985).

dietrichi (Smith). In hickory litter. Not previously reported south of Putnam Co. (Van Pelt 1958); we have collected specimens in Dade Co.

talpa (Weber). In *Quercus geminata* litter; in hickory litter; in *Vaccinium myrsinites* litter; in oak and hickory litter. Not previously reported south of Putnam Co. (Van Pelt 1958).

Trichoscapa Emery

membranifera (Emery). In moist disturbed area; in *Nyssa sylvatica* litter.

Quadristruma Brown

emmae (Emery). In *Pinus elliottii* litter; in *P. clausa* litter; under dead *P. elliottii*, in *Quercus geminata* litter; in *Q. chapmanii* litter; in *Q. laevis* stump; in *Q. myrtifolia* litter; in *Q. laevis* litter; in cutthroat tussock; in *Andropogon* tussock; in dead palmetto stem; in *Ligustrum* litter; in hickory litter; in wire grass litter; in *Gordonia* litter; under *Melaleuca* log; in *Nyssa sylvatica* litter. The single published U. S. record of this species is from Homestead (Smith 1979). *Q. emmae* is well established in several sites we have visited in Dade Co. and Monroe Co.; we have not collected it north of the Archbold Biological Station.

Eurhopalothrix Brown and Kempf

floridana Brown and Kempf. In dead palmetto stem. Previously known only from Highlands Hammock State Park (Brown & Kempf 1960). In addition to a collection from the Archbold Biological Station, we have collected this species in Dade Co. (Matheson Hammock), Monroe Co. (Key Largo), Marion Co. (Ocala National Forest), and Alachua Co. (Gainesville). This species is possibly a tropical exotic (Brown & Kempf 1960). Specimens have also been collected in Tamaulipas, Mexico (W. L. Brown, personal communication).

Cyphomyrmex Mayr

The *rimosus* group of this genus is currently undergoing revision by Snelling, who provided the names used here.

fuscus Emery. In rotten log; along lake shore, on mud; in abandoned fire ant mound; under board. Alates in flight in May, June, Oct.-Dec. This species has long been confused with *C. minutus*, but is clearly distinguished by larger size, darker color, sharp and prominent thoracic protuberances. This species is known from southern South America, and has not previously been reported from the United States, though we have found it to be common throughout Florida.

minutus Mayr. In hickory litter; at base of dying *Pinus clausa*; in *Nyssa biflora* litter; in grass tussock on lake shore; in fern litter; under fence post; in *Ligustrum* litter; under palmetto stump. Alates in flight in June, Oct.; alates in nest under fallen fence post in Jan. This species is not found in northern Florida.

Trachymyrmex Forel

septentrionalis (McCook). In hickory leaf litter; nest in open fire lane; at base of dying *Pinus clausa*; under *Lyonia ferruginea*; at pet food bait; in lawn. Alate in malaise trap in June, Nov.; aggregation of males (on scrub oak) being eaten by scrub jays in July.

Iridomyrmex Mayr

There is widespread verbal agreement that the species below (*I. pruinosus*) should be transferred to *Forelius*.

pruinus (Roger). At pet food bait; nests in open sand. Alates at ultraviolet light in June.

Conomyrma Forel

The genus *Conomyrma* presents special taxonomic problems for our study: of the five species at the Archbold Biological Station three are undescribed and the names of the other two have not been applied consistently. There are descriptions of the undescribed species in an unfinished manuscript by Trager. We will not refer to the manuscript names here because of the possibility of creating further taxonomic tangles should other names be chosen for these species.

flavopecta (Smith). Nests in open sand. Alates in nest: 11-VII-84. This species may be recognized by its striking coloration: the head and gaster are black, the thorax bright orange. The name *flavopecta* has been applied incorrectly to the more widely distributed *Conomyrma* sp. 2.

smithi Cole. Sharing nest with *Conomyrma* sp. 2. Vegetation types: SPb (2), RSt (1). *C. smithi* is a varietal name (Cole 1936), appearing in the 1979 catalog as a synonym of *C. insana* (Buckley): *Dorymyrmex pyramicus* var. *smithi*. We cannot follow our conservative policy and refer to this species as a form of either *insana* or *pyramicus*, because neither name refers correctly to any species found in our area. *C. smithi* is recognized by its solid dark-brown color. The antennal scapes are relatively short and the head relatively broad compared with other *Conomyrma* species in south Florida. This species is a temporary nest parasite of *Conomyrma* sp. 2.

Conomyrma sp. 1. Nests in open sand; at pet food bait. This yellow species is unusually elongate and slender. No published names have been applied to this species, which is known only from the Archbold Biological Station.

Conomyrma sp. 2. Nests in sand around grasses, especially in man-modified habitats; at pet food bait; on *Euthamia minor*, in lawn; on flower of *Ilex cassine*. Alates at ultraviolet light in Sept.-Nov., May. Alates in nest in July. There is some variation in color and in queen size, and we may be dealing with more than one species. Specimens in collections are usually labelled *C. pyramicus* or *C. flavopecta*.

Conomyrma sp. 3. Nests in paths in scrub; at pet food bait. Alates in malaise trap in June and July. This small species is easily identified by the pronounced dorsal angle of the mesonotum and the shining, hairless gaster. In the field this species bears a remarkable resemblance to *Pheidole morrisi* and light forms of *P. dentata*. No published names have been applied to this species.

Tapinoma Foerster

litorale Wheeler. In dead grape vine; in dead *Smilax* vine; in dead hickory twig.

melanocephalum (Fabricius). In base of palmetto; on *Clerodendrum* flowers; on *Baccharis*; on flower of *Ilex cassine*; in rotten log.

Brachymyrmex Mayr

depilis Emery. In rotten log; in *Pinus clausa* litter; in *P. elliotti* litter; in palmetto and pine litter; in *Quercus geminata* litter; in cutthroat tussock; in *Andropogon* tussock; in dead oak branch on ground; in *Lyonia ferruginea* litter; in *Befaria racemosa* litter; in pine stump; in dead palmetto stem; in hickory litter; under bear feces; in *Vaccinium* litter. Alates in flight in June-Aug., Dec.

obscurior Forel. On *Baccharis*; in grass along roadside.

Camponotus Mayr

abdominalis floridanus (Buckley). In hollow stick; under log; in dead palmetto trunk; under pieces of bark below standing dead pine; tending membracids on palmetto flower stalk; tending aphids on *Palafoxia*; on flowers of *Ilex cassine*; on extrafloral nectaries of *Crotolaria mucronata*; on *Erechtites* flower. Although this is the commonest *Camponotus* on the Archbold Biological Station, no flights of alates have been

observed. In other parts of Florida, the flights occur shortly after sunset during the summer rainy season.

castaneus (Latreille). In hickory litter; in *Pinus elliottii*; feeding on fallen tangerine; tending aphids on *Palafoxia*; on flower of *Erechtites*. Alates at ultraviolet light in Jan.-May, Dec. This species has nocturnal mating flights in late winter and early spring.

impressus (Roger). On flower of *Ilex cassine*; on large laurel oak; in hickory twig; in grape vine; in malaise trap. Alates at ultraviolet light in Apr.-June.

nearcticus Emery. On large *Pinus elliottii*; under bark of *P. elliottii*; in squirrel nest box on pine; on large *P. clausa*. Nests at the Archbold Biological Station and elsewhere in Florida are always in large pine trees.

pavidus Wheeler. This species is apparently the form described by Wheeler as *C. fallax rasilis* var. *pavidus*. The form is considered a distinct species (*C. pavidus*) by Blum (1981). This form differs in morphology and nest site from the sympatric *Campopnotus* sp. 1 and *C. sayi* (= *C. rasilis* Wheeler). In stump of *Quercus laevis*; on flower of *Erechtites*; in dead bay twig; in small branch of *Q. laurifolia*. Alate at ultraviolet light in Apr.

rasilis Emery. Alates at light in Jan. and Mar. This has been considered a form of *C. sayi* but is here considered a separate species. A recent study of mandibular gland compounds supports the separation of this form (Blum 1981), but the taxonomy of the complex has not been formally reviewed.

socius Roger. Specimens were collected in 1965 on the Archbold Biological Station, but this large, conspicuous, day-foraging ant was not seen during the present study. We conclude that this species is rare or extinct on the Archbold Biological Station. The reduction of open ground in the sandhill habitats of the Archbold Biological Station, due to the exclusion of fire, might have contributed to the disappearance of this species.

tortuganus Emery. In dead pine; under log; in dead saw palmetto; under bark of standing dead pine. Alates at ultraviolet light in Sept.-Nov.

Paratrechina Motschulsky

Trager (1984) recently described 5 new species from the United States, of which 3 occur at the Archbold Biological Station.

arenivaga (Wheeler). At pet food baits; nests in open fire lane in small clearings, and near seasonal ponds. Alates in nest in Oct., Dec., Jan.

bourbonica (Forel). On *Sida cordifolia*; in tree hole in *Quercus laurifolia*; under bark of dead bay tree. Alates in nest in Dec.; alates in flight Oct.-Dec.

concinna Trager. In rotten log in pond; under pine bark on ground. Alates in nest in Dec.

faisonensis (Forel). In *Pinus elliottii* litter; in magnolia litter; in magnolia-Gordonia litter; at pet food bait. This species, synonymized under *arenivaga* by Creighton (1950), was recently shown (Trager 1984) to differ from *arenivaga* in ecology, color, and male genital characters.

longicornis (Latreille). On pavement by buildings; under laurel oak.

phantasma Trager. Nests in open sand. Alates in nest Oct. and Dec. This species is most abundant in Highlands County, with only a few scattered populations to the north.

vividula (Nylander). Under *Melaleuca* log. Vegetation type: MO (1).

wojicki Trager. In *Andropogon* tussock; in cutthroat tussock; *Pinus elliottii* litter; in rotten log; in large fallen bromeliad; under *Cladonia* mat; in *Vaccinium* litter; in hickory litter; in *Quercus myrtifolia* litter; at pet food bait. Alates in nest Jan.-Mar., Sept.-Nov.

Formica Linnaeus

archboldi Smith. In cutthroat tussock; in *Andropogon* tussock. Alate in flight in May.
pallidefulva Latreille. At pet foot bait. Alates at light in June.

SUMMARY AND DISCUSSION

BIOGEOGRAPHY OF ARCHBOLD BIOLOGICAL STATION ANTS

With 102 species of ants, the Archbold Biological Station has, by a considerable margin, the most diverse known ant fauna from any single locality in the United States. One reason for the richness of the ant fauna is the great diversity of habitats occurring on the Archbold Biological Station. Another reason is a confluence of faunistic elements at the south end of the Lake Wales Ridge. A third reason is the susceptibility of the area to colonization by exotics. The biogeographic groups of ants that mingle at the Archbold Biological Station are described briefly below. Our analysis is relatively unsophisticated because there are no state-wide surveys of Florida ants and because there have been few studies of phylogenetic relationships between Florida species and those in other areas, such as the West Indies or Texas. The species we have assigned to the various groups are listed in Table 2. We have assigned species to faunal groupings on the basis of distribution data in the Catalog of Hymenoptera (Smith 1979), and our own observations.

The widespread eastern ant fauna, which includes some transcontinental and even circumpolar species groups, is chiefly composed of forest-dwelling species. Typical species ranges extend north to Canada and west to Illinois. In the Florida panhandle, where there is a southward extension of the southern mixed hardwood forest (Greller 1980), several northern ants occur, which are apparently absent from the rest of Florida. Examples of these ants are *Camponotus americanus* Mayr, *C. subbarbatus* Emery, *Leptothorax curvispinosus* Mayr, *L. schaumii* Roger (Bhatkar and Whitcomb, unpublished collection data), and *Formica subsericea* Say (Wilson & Francoeur 1974). A more dilute representation of the eastern ant fauna is found in north-central Florida, where there is a very broad transition zone between southern mixed hardwood forest and temperate broadleaved evergreen forest (Greller 1980). A finger of the transition zone extends down the Lake Wales Ridge to the northern border of Highlands County (Greller 1980). Somewhere between Alachua County and the south end of the Lake Wales Ridge the eastern ant fauna becomes even sparser; 13 widespread eastern species found in Alachua County and Putnam County (Van Pelt 1958) do not occur on the Archbold Biological Station. These species are *Aphaenogaster fulva* Roger, *A. lamellidens* Mayr, *Pheidole pilifera* (Roger), *Crematogaster lineolata* (Say), *Ponera pennsylvanica* Buckley, *Smithistruma ornata* (Mayr), *S. pulchella* (Emery), *Lasius alienus* (Foerster), *Lasius neoniger* Emery, *Prenolepis imparis* (Say), *Camponotus pennsylvanicus* (DeGeer), *Tapinoma sessile* (Say), and *Dolichoderus pustulatus* Mayr. An additional species in this group is *Polyergus lucidus* Mayr (Trager & Johnson 1984). About 10 widespread eastern ants occur at the Archbold Biological Station (Table 2). A number of these (*Amblyopone pallipes*, *Smithistruma clypeata*, *Formica pallidefulva*) are usually associated on the Archbold Biological Station with xeric hammock habitats, such as mature SSo and mature RSh. Since such habitats are rare south of the Lake Wales Ridge, this may be the southernmost limit of several ants.

The southeastern ant fauna is a varied group, including arenicolous species that occur as far north as New Jersey and Illinois, as well as pine woods inhabitants that are found inland as far north as Tennessee. Many of these ants appear to be of southwestern origin, as disjunct populations or closely related species often occur in Texas or even further west. Some of these species are restricted to scrub and sandhill habitats; such

TABLE 2. GEOGRAPHIC RANGES OF ANTS FOUND ON THE ARCHBOLD BIOLOGICAL STATION.

Eastern or Nearctic Species		
<i>Amblyopone pallipes</i>	<i>Formica pallidefulva</i>	<i>Pheidole morrisi</i>
<i>Aphaenogaster treatae</i>	<i>Iridomyrmex pruinosus</i>	<i>Solenopsis carolinensis</i>
<i>Brachymyrmex depilis</i>	<i>Myrmecina americana</i>	<i>Smithistruma clypeata</i>
<i>Camponotus castaneus</i>		
Southeastern Species		
<i>Aphaenogaster ashmeadi</i>	<i>Crematogaster</i> sp.	<i>P. dentigula</i>
<i>A. flemingi</i>	<i>Discothyrea testacea</i>	<i>P. floridana</i>
<i>A. floridana</i>	<i>Formica archboldi</i>	<i>P. metallescens</i>
<i>A. texana</i>	<i>Hypoponera inexorata</i>	<i>Pheidole adrianoi</i>
<i>Camponotus abdominalis</i>	<i>H. opaciceps</i>	<i>Pogonomyrmex badius</i>
<i>C. impressus</i>	<i>H. opacior</i>	<i>Proceratium croceum</i>
<i>C. rasilis</i>	<i>Leptogenys elongata manni</i>	<i>Pseudomyrmex brunneus</i>
<i>C. socius</i>	<i>Leptothorax pergandei</i>	<i>P. pallidus</i>
<i>C. tortuganus</i>	<i>L. texana</i>	<i>Solenopsis geminata</i>
<i>C. nearcticus</i>	<i>L. wheeleri</i>	<i>S. globularia</i>
<i>C. pavidus</i>	<i>Monomorium viridum</i>	<i>S. nickersoni</i>
<i>Conomyrma flavopecta</i>	<i>Neivamyrmex opacithorax</i>	<i>S. pergandei</i>
<i>C. smithi</i>	<i>Odontomachus brunneus</i>	<i>S. picta</i>
<i>Conomyrma</i> sp. 1	<i>Odontomachus clarus</i>	<i>S. tennesseensis</i>
<i>Conomyrma</i> sp. 2	<i>Paratrechina arenivaga</i>	<i>Solenopsis</i> sp.
<i>Conomyrma</i> sp. 3	<i>P. concinna</i>	<i>Smithistruma creightoni</i>
<i>Crematogaster ashmeadi</i>	<i>P. faisonensis</i>	<i>S. dietrichi</i>
<i>C. clara</i>	<i>P. phantasma</i>	<i>S. talpa</i>
<i>C. minutissima</i>	<i>P. wojciki</i>	<i>Strumigenys louisianae</i>
	<i>Pheidole dentata</i>	<i>Trachymyrmex septentrionalis</i>
West Indies and South Florida Species		
<i>Brachymyrmex obscurior</i>	<i>Pheidole litoralis</i>	<i>P. seminole</i>
<i>Cyphomyrmex minutus</i>	<i>Platythyrea punctata</i>	<i>Tapinoma litorale</i>
<i>Eurhopalothrix floridana</i>	<i>Pseudomyrmex elongatus</i>	<i>Xenomyrmex floridanus</i>
<i>Pachycondyla stigma</i>	<i>P. simplex</i>	
Exotic Species		
<i>Cardiocondyla emeryi</i>	<i>M. pharaonis</i>	<i>Quadristruma emmae</i>
<i>C. nuda</i>	<i>Ochetomyrmex</i>	<i>Solenopsis invicta</i>
<i>C. venustula</i>	<i>auropunctatus</i>	<i>Strumigenys eggersi</i>
<i>C. wroughtonii</i>	<i>Paratrechina bourbonica</i>	<i>S. rogeri</i>
<i>Cyphomyrmex fuscus</i>	<i>P. longicornis</i>	<i>Tapinoma melanocephalum</i>
<i>Hypoponera</i>	<i>P. vividula</i>	<i>Tetramorium bicarinatum</i>
<i>punctatissima</i>	<i>Pheidole moerens</i>	<i>T. simillimum</i>
<i>Monomorium floricola</i>	<i>Pseudomyrmex mexicanus</i>	<i>Trichoscapha membranifera</i>

species are discussed in more detail below. The southeastern ant fauna includes about 61 species found on the Archbold Biological Station. There is little decrease in numbers of species between north-central Florida and the Archbold Biological Station; the only species to drop out are *Neivamyrmex texanus* Watkins, *N. carolinensis* (Emery), *Cryptopone gilva* (Roger), *Leptothorax bradleyi* Wheeler, and *Crematogaster vermiculata*

Emery. The last species is restricted to bald cypress (Buren 1968), which does not occur on the Archbold Biological Station.

A distinctive fauna of apparently native ants is shared by southern Florida and the West Indies. Some species extend into northern areas of Florida. Of 9 species in this group at the Archbold Biological Station, 4 do not reach north-central Florida. Three species found in the Florida Keys, *Camponotus planatus* Roger, *Leptothorax allardycei* (Mann), and *Zacryptocerus varians* (Smith), do not occur at the Archbold Biological Station.

A group of about 22 exotic tropical ants includes representatives of all major tropical areas. Most species in this group are intolerant of severe cold, and are therefore confined in the United States to Florida, with the exception of the species that live indoors. These exotics are discussed in more detail below.

COMPARISON OF FAUNAL SURVEYS OF FLORIDA ANTS

A comprehensive comparison of the ant fauna of the Archbold Biological Station and that of other sites in Florida is hampered by a lack of comparable surveys. Van Pelt's survey (1958) of the ants of the Welaka Reserve (Putnam Co.) is the only other study of the ants of a single locality. There are two regional surveys, one a study of the ants of the Florida Keys (Wilson 1964), the other an unpublished survey by A. P. Bhatkar and W. H. Whitcomb of the ants of the Red Hills region in northern Leon County. Although all these surveys seem to have been intensive, there is reason to suspect that Berlese funnel sampling in the Archbold Biological Station and Welaka surveys was much more extensive than in the other two surveys. Taxonomic problems beset all the surveys: several important Florida genera, including *Conomyrma*, *Pheidole*, *Paratrechina*, *Camponotus*, and *Solenopsis*, were in need of revision at the time of the surveys. In recent years these taxonomic problems have been partially resolved. Another problem is invasions of certain exotics since the time of the earlier studies.

In spite of all these discrepancies among the Florida surveys, they seem similar enough to allow a simple analysis that is not very sensitive to the addition or subtraction of a few species in a particular fauna. Such a test is provided by Sorensen's coefficient of similarity (Southwood 1978): $C_s = 2j/(a+b)$, where "j" is the species common to both sites, "a" the total species at one site, "b" the total species at the other. The results are arranged in decreasing order of similarity.

$$\text{Welaka-Red Hills: } C_s = 2(55)/(76+84) = .69$$

$$\text{Welaka-ABS: } C_s = 2(59)/(76+102) = .66$$

$$\text{ABS-Red Hills: } C_s = 2(56)/(84+102) = .60$$

$$\text{ABS-Florida Keys: } C_s = 2(52)/(30+102) = .39$$

$$\text{Welaka-Florida Keys: } C_s = 2(18)/(76+30) = .34$$

$$\text{Red Hills-Florida Keys: } C_s = 2(17)/(84+30) = .30$$

These results are just as one might predict from the geographic locations of the four sites. Each fauna is most like that of its nearest neighbor along a north-south transect. The mainland sites are much more similar to each other than to the Florida Keys. The Keys differ from the mainland in the depauperate nature of their fauna. Wilson (1964) attributes this low diversity to large-scale perturbations, particularly hurricanes, which may eradicate most terrestrial ants.

The diversity of ant fauna at the Archbold Biological Station relative to that of Florida as a whole appears surprisingly high. We have compiled from various sources a checklist of Florida ants, including known undescribed species. This list includes 166 spp., so that the Archbold Biological Station includes 61% of the ants known from Florida. This contrasts with the situation in the herpetofauna: the Archbold Biological Station has 61 species of herps (J. N. Layne 1978, unpublished list) out of the Florida

fauna of 150 species (Ashton and Ashton 1974), or 41% of the fauna. This might be interpreted as an indication that herps tend to have more locally restricted species than ants, but it is more likely an indication that the ant fauna of the Archbold Biological Station is much better known than that of Florida in general. Several parts of the state that might be expected to have locally restricted populations, such as the Miami, Pensacola, Everglades, and Appalachicola areas, have not been surveyed.

ANTS OF SCRUB AND SANDHILL HABITATS

The species of scrub and sandhill environments are of special interest to us, as a principal mission of the Archbold Biological Station is the study of organisms found in these habitats. Several species of ants are apparently restricted to scrub and sandhill environments, and represent the only localized concentration of endemic ants in eastern North America. The following list summarizes our information on scrub and sandhill ants.

Species occurring in scrub and sandhill: 59

Species generally restricted to scrub and sandhill at ABS: 10

Exotic species in scrub and sandhill: 6

Exotic species restricted to scrub and sandhill: 0

Scrub and sandhill endemics: 4

The most striking feature of these numbers is the very large number of species that live in scrub and sandhill habitats compared to the number of species restricted to these habitats. We had expected that the harsh environment of scrub and sandhill, with heat, exposure, periodic droughts and fires, would have resulted in a small, tightly structured community of ants showing specific adaptations for a rigorous environment. We ascribe the large number of facultative scrub inhabitants to two factors. One factor is the importance of microhabitat. Even in open, recently burned scrub a dead log or a small accumulation of litter provides cooler and moister refugia for colonies of certain ants, some of which, such as *Camponotus abdominalis floridanus* and *C. tortuganus*, may be abundant and conspicuous scrub inhabitants. The other factor is successional change: after an area has escaped burning for a decade or more it becomes increasingly mesic and suitable for many ants not found in the early stages of the same plant community. A recently burned area, especially the "rosemary bald" (SSr), is dominated by scrub and sandhill obligates.

The species restricted to scrub and sandhill habitats vary in their geographic ranges. Three species, *Pogonomyrmex badius*, *Solenopsis globularia littoralis*, and *Leptothorax texanus davisii*, are widely distributed in sandy habitats through the eastern United States. One species, *Pheidole littoralis* is widespread in well-drained sandy areas in southern Florida, but absent from the rest of the United States. There are 5 species that are apparently endemic to Florida scrub and sandhill: *Conomyrma flavopecta*, *Conomyrma* spp. 1 and 3, *Odontomachus* sp., *Pheidole adrianoi*, *Paratrechina phantasma*. *Paratrechina wojciki* is endemic to central Florida, but found in a variety of habitats. These species might be analogous to some endemic reptiles, such as *Sceloporus woodi*, *Tantilla relicta*, *Stilosoma extenuatum*, *Rhineura floridana*, and *Neoseps reynoldsi*, whose ancestors probably came from western North America, or from Central America via western North America, before the Pleistocene an became isolated in the xeric uplands of central Florida (Auffenberg 1982). A number of additional species were probably once confined to these xeric upland refugia and spread to other parts of Florida and the southeastern United States in post-glacial times. Probable examples are *Pogonomyrmex badius*, *Solenopsis globularia littoralis*, *Leptothorax texanus davisii*, *Pheidole floridana*, *P. sitarches littoralis*, *Camponotus abdominalis floridanus*, *C. tortuganus*, *Aphaenogaster floridanus*, and *A. flemingi*. These species

may be historically analogous to the herps *Gopherus polyphemus*, *Ophisaurus compressus*, *Rana grylio*, and *Rhadinaea flavilata* (Boyles 1966).

There are no endemic genera of Florida ants. The closest approach to an endemic genus is *Pogonomyrmex badius*, included above in the list of species probably originating in central Florida uplands. *P. badius* belongs to a distinctive species group that differs from all southwestern *Pogonomyrmex* species in having polymorphic workers (Cole 1968). In contrast, there are 3 endemic Florida genera of herps, all restricted to xeric uplands (Auffenberg 1982). A glance at the representatives of these genera dispels any idea that this taxonomic contrast originates in a tendency of herpetologists to define genera more narrowly than do myrmecologists. The dispersal and colonization ability of ants, generally far superior to that of herps, are factors that would decrease the probability of the very protracted isolation required to protect an ancient relict or to permit radical morphological adjustment to better exploit an emergent ecological niche.

EXOTIC ANTS

Between 20 and 24 species of ants on the Archbold Biological Station are not native to Florida. The 4 species whose status is questionable are Neotropical species that may have been introduced before any surveys of Florida ants. The reasons for suspecting these 4 (out of 12 species with West-Indian-Neotropical distribution) are as follows. *Pachycondyla stigma* is a pantropical species (Smith 1979). In 1932 this species, which is very common today, was known only from Lake Worth in Palm Beach County (Wheeler 1932). *P. stigma* was reported from the Archbold Biological Station in 1943 (Schneirla 1944). *Brachymyrmex obscurior* is "possibly introduced" (Smith 1979); at the Archbold Biological Station it inhabits disturbed sites. *Pseudomyrmex simplex* has not been reported from Florida until 1985 (though it might have been confused with *P. pallidus*) and like *P. mexicanus*, may have been recently introduced. The speed with which *P. mexicanus* became completely naturalized throughout Florida at least as far north as Gainesville (Whitcomb et al. 1972), casts vague doubts on the native status of other Florida *Pseudomyrmex* species, especially *P. cubaensis* and *P. elongatus*. There is no good way to establish whether any Florida-Neotropical species are native. Suggestive evidence for exotic origin would be: documentation of rapid range expansion; infraspecific character states linking Florida populations with distant Neotropical populations; restriction to disturbed habitats; flightless queens. It is tempting, in view of the scarcity of West Indian elements in the native herpetofauna (Auffenberg 1982) and scarab fauna (Woodruff 1973), to assume that most Florida-West Indian ants are exotic, but the relatively good colonizing capacity of ants makes independent establishment plausible in most cases.

The 22 verified exotic ants on the Archbold Biological Station vary widely in the extent to which they are restricted to man-modified environments. There are 2 species, *Monomorium pharaonis* and *Paratrechina longicornis*, that are restricted to buildings and adjacent gardens. Species confined to man-modified environments are *Pheidole moerens*, *Cardiocondyla nuda*, *C. venustula*, *C. wroughtonii*, *Monomorium floricola*, *Tetramorium bicarinatum*, *Wasmannia auropunctata*, *Tapinoma melanocephalum*, *Trichoscapa membranifera*, *Paratrechina bourbonica*, *P. vividula*, and the suspected exotic *Brachymyrmex obscurior*. Species that regularly colonize natural habitats are *Pseudomyrmex mexicanus*, *Hypoponera punctatissima*, *Cardiocondyla emeryi*, *Solenopsis invicta*, *Tetramorium simillimum*, *Strumigenys eggersi*, *S. rogeri*, *Quadristruma emmae*, *Cyhomymyrmex fuscus* and the suspected exotics *Pachycondyla stigma* and *Pseudomyrmex simplex*.

The relatively large number of exotics in natural habitats can be attributed to several factors. The warmer parts of Florida, isolated as they are from mainland Neotropica,

are truly insular in nature, and the ant fauna is correspondingly depauperate and subject to invasion by tramps. The numerous sea ports with direct traffic between nearby tropical areas provide access to Florida. Finally, the natural habitats of the Archbold Biological Station and of much of southern Florida are subject to frequent natural disturbances in the form of fires and floods which may make these habitats more easily invaded by ants associated with man-made disturbances.

A series of 6 sites that we assume represents a gradient from insular or disturbed sites to mainland or undisturbed sites show a decreasing percentage of exotic ants.

Florida Keys (Wilson 1964): 30.0% exotics (9 spp.)

Archbold Biological Station: 19.6% exotics (20 spp.)

Welaka Reserve (Van Pelt 1958): 10% exotics (7 spp.)

Red Hills (Bhatkar and Whitcomb, unpublished): 9.5% exotics (8 spp.)

In an even more dramatic contrast to the situation in Florida, in a recent survey of the ants of Utah (Allred 1982) only 1 exotic was found among 169 species of ants. It is true that the Utah survey concentrated on rural areas, but the back roads of Florida are literally lined with the nests of exotic ants.

The number of exotic ant species at the Archbold Biological Station is not only large compared with other sites, but is also large relative to the number of exotics in some other groups of insects. Among the Archbold Biological Station butterflies, for example, there is only 1 exotic out of 65 species, among scarabs there are 6 exotics out of 76 species, among bees there is 1 exotic out of 52 species. One possible explanation is that alate female ants are relatively poor long-range dispersers relative to stronger-flying insects, so that subtropical Florida was not saturated with naturally immigrating ants from the Neotropics long before the arrival of humans. A complementary explanation is that ants, while poor dispersers, are excellent colonizers, hence species may frequently become established from a single introduction. Once a single fertile female establishes herself in a suitable habitat her chance of founding a breeding population is good because of the likelihood of mating among her offspring, of which large numbers are concentrated in one place over a period of at least a year. An analogous situation occurs in the beetles of the family Scolytidae. Almost all recently established Florida species are members of the tribe Xyleborini or in the genus *Hypothenemus*; in both these groups sib matings within the parental gallery are the rule (Wood 1977).

The same factors that permit the establishment of an exotic population normally ensure the eventual abundance of that species, but this may not hold throughout the new range of the species, and may change over time. Several exotics are rare at the Archbold Biological Station; these species are *Cardiocondyla venustula*, *C. wroughtonii*, *Paratrechina vividula*, *Pheidole moerens*, and *Trichoscapa membranifera*. *C. venustula* and *T. membranifera* are the only species we have not found in dense populations elsewhere in Florida.

MISSING ANTS

Several species of ants that might be expected to occur at the Archbold Biological Station have not been found. *Dolichoderus pustulatus* Mayr occurs in low flatwoods at Welaka (Van Pelt 1958) and in the Everglades (Wheeler 1932), but not at the Archbold Biological Station. *Prionopelta antillana* Forel is widespread in South America and in the West Indies; a population reported from Juniper Springs in Ocala State Forest (Smith 1979) was still thriving in 1985. The absence of this species from the Archbold Biological Station provides evidence that the Ocala population may be exotic. *Neivamyrmex texanus* Watkins was found at Lake Wales in 1983; this site is 54 miles north of

the Archbold Biological Station. *Aphaenogaster lamellidens* Mayr is reported from Highlands Co. (Carroll 1975).

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REFERENCES CITED

- ABRAHAMSON, W. G., A. F. JOHNSON, J. N. LAYNE, AND P. A. PERONI. 1984. Vegetation of the Archbold Biological Station: an example of the southern Lake Wales Ridge. *Florida Sci.* 47: 209-250.
- ALLRED, D. M. 1982. Ants of Utah. *Gt. Basin Natur.* 42: 415-511.
- ASHTON, R. E., JR. AND P. S. ASHTON. 1981. Handbook of reptiles and amphibians of Florida. Part One. The Snakes. Windward Publ. Inc., Miami. 176 pp.
- AUFFENBERG, W. 1982. Florida environments and their herpetofaunas. Part III. Herpetogeography. *Florida Herpetol.* 4: 1-36.
- BOLTON, B. 1977. The ant tribe Tetramorini (Hymenoptera: Formicidae). The genus *Tetramorium* Mayr in the Oriental and Indo-Australian regions, and in Australia. *Bull. British Mus. Nat. Hist. (Entomol.)* 36: 67-151.
- BLUM, M. S. 1981. Sex pheromones in social insects: Chemotaxonomic potential. Pp. 163-174 in P. E. Howse and J. L. Clement (Eds.) *Biosystematics of social insects*. Academic Press, London and New York. 436 pp.
- BOYLES, J. M. 1966. Zoogeography of the herpetofauna of central Florida. Unpublished Ph.D. dissertation, Univ. Alabama. 164 pp.
- BROWN, W. L. 1953. Revisionary studies in the ant tribe Dacetini. *American Midl. Natur.* 50: 1-137.
- BROWN, W. L. 1976. Contribution toward a reclassification of the Formicidae. Part VI. Ponerinae, tribe Ponerini, subtribe Odontomachiti. Section A. Introduction, subtribal characters. *Genus Odontomachus*. *Studia Entomol.* 19: 67-171.
- BROWN, W. L., AND W. W. KEMPF. 1960. A world revision of the ant tribe Basicerotini (Hym. Formicidae). *Studia Entomol.* 3: 161-249.
- BUREN, W. F. 1968. A review of the species of *Crematogaster sensu strictu*, in North America (Hymenoptera, Formicidae). Part II. Descriptions of new species. *J. Georgia Entomol. Soc.* 3: 91-121.
- CARROLL, J. F. 1975. Biology and ecology of ants of the genus *Aphaenogaster* in Florida. Unpublished Ph.D. Dissertation, Univ. Florida, Gainesville.
- COLE, A. C., JR. 1968. *Pogonomyrmex* harvester ants. Knoxville, Univ. Tennessee Press. 222 pp.
- CREIGHTON, W. S. 1950. The ants of North America. *Bull. Mus. Comp. Zool.* 104: 1-583.
- DEYRUP, M., AND J. TRAGER. 1984. *Strumigenys rogeri*, an African Dacetine ant new to the U. S. *Florida Entomol.* 67: 512-516.
- GRELLER, A. M. 1980. Correlation of some climate statistics with distribution of broadleaved forest zones in Florida, U.S.A. *Bull. Torrey Bot. Club* 107: 189-219.
- HUBBELL, T. H. 1961. Endemism and speciation in relation to Pleistocene changes in Florida and the southeastern coastal plain. *Eleventh Int. Congr. Entomol., Wien 1960*, 1: 466-469.
- LAESSELE, A. M. 1968. Relationship of sand pine scrub to former shore lines. *Q. J. Florida Acad. Sci.* 30: 269-286.

- NAVES, M. A. 1985. A monograph of the genus *Pheidole* in Florida (Hymenoptera: Formicidae). *Insecta Mundi* 1: 53-90.
- SCHNEIRLA, T. C. 1944. Results of the Archbold Expeditions. No. 51. Behavior and ecological notes on some ants from south-central Florida. *American Mus. Novit.* 1261: 1-5.
- SMITH, D. R. 1979. Superfamily Formicoidea. Pp. 1312-1467 in K. V. Krombein, P. D. Hurd, Jr., D. R. Smith, B. D. Burks (eds.) *Catalog of Hymenoptera in America north of Mexico*. Smithsonian Institution Press, Washington, D. C.
- SMITH, M. R. 1930. A list of Florida ants. *Florida Entomol.* 14: 1-6.
- SMITH, M. R. 1944. Additional ants recorded from Florida, with descriptions of two new subspecies. *Florida Entomol.* 27: 14-17.
- SOUTHWOOD, T. R. E. 1978. *Ecological methods*. New York, John Wiley and Sons. XXIV + 524 pp.
- THOMPSON, C. R. 1980. *Solenopsis (Diplorhoptrum)* of Florida. Unpublished Ph.D. dissertation, Univ. Florida, Gainesville.
- THOMPSON, C. R. 1982. A new *Solenopsis (Diplorhoptrum)* species from Florida. (Hymenoptera: Formicidae). *J. Kansas Entomol. Soc.* 55: 485-488.
- TRAGER, J. C. 1984. A revision of the genus *Paratrechina* (Hymenoptera: Formicidae) of the Continental United States. *Sociobiology* 9: 49-162.
- TRAGER, J. C. AND C. JOHNSON. 1984. A slave-making ant in Florida: *Polyergus lucidus* and its host, *Formica archboldi* (Hymenoptera: Formicidae). *Florida Entomol.* 68: 261-266.
- VAN PELT, A. F. 1958. The ecology of the ants of the Welaka Reserve, Florida (Hymenoptera: Formicidae). Part II. Annotated list. *American Midl. Natur.* 59: 1-57.
- WALKER, J. 1983. The soldier caste and colony structure in the ant *Camponotus (Colobopsis) impressus*. Unpublished Ph.D. dissertation, Univ. California, Davis.
- WARD, P. S. 1985. The Nearctic species of the genus *Pseudomyrmex*. *Quaest. Entomol.* 21: 209-246.
- WATKINS, J. F., II. 1976. The identification and distribution of New World army ants (Dorylinae: Formicidae). Baylor University Press. 102 pp.
- WILSON, E. O. AND A. FRANCOEUR. 1974. Ants of the *Formica fusca* group in Florida. *Florida Entomol.* 57: 115-116.
- WHITCOMB, W. H., H. A. DENMARK, W. F. BUREN, AND J. F. CARROL. 1972. Habits and present distribution in Florida of the exotic ant, *Pseudomyrmex mexicanus* (Hymenoptera: Formicidae). *Florida Entomol.* 55: 31-33.
- WILSON, E. O. 1964. The ants of the Florida Keys. *Breviora* 210: 1-14.
- WOOD, S. L. 1977. Introduced and exported American Scolytidae (Coleoptera) Gt. Basin Natur. 37: 67-74.
- WOODRUFF, R. C. 1973. Arthropods of Florida and neighboring land areas. 8. The scarab beetles of Florida. Gainesville, Florida Dept. Agric. Consum. Serv. Div. Plant Indust. iv + 220 pp.

DESCRIPTION OF THE MALE OF *ACROSTERNUM ISTUM*
(HEMIPTERA: PENTATOMIDAE)

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ABSTRACT

Figures and a description are given of the previously unknown male of *Acrosternum istum* Rolston. New locality records from Costa Rica and Panama are listed.

RESUMEN

Se dan figuras y una descripción de los machos anteriormente desconocidos de *Acrosternum istum* Rolston. Los nuevos records de localidad de Costa Rica y Panamá están listados.

In his revision of the New World species of *Acrosternum* Fieber, subgenus *Chinavia* Orian, Rolston (1983) described the species *A. istum* from a single female specimen from Panama. Since that time, a series of 13 males and 5 females from Panama and a single male from Costa Rica have been collected. To further characterize this species, a description of the male is given (numbers in parentheses represent measurements for females), and intraspecific variation is indicated.

Acrosternum (Chinavia) istum Rolston

(Fig. 1-5)

Acrosternum (Chinavia) istum Rolston, 1983: 121-122, fig. 49.

Description. Medium to dark green above; medium green below, usually pale mesially, abdominal spine and surrounding area of supporting abdominal segment often pale to dark brown. Lateral margins of juga, pronotum, connexiva, and bases of coria bordered dorsally and ventrally with yellow-orange. Dorsal punctation dark green, dense on head, less dense on pronotum, scutellum, and coria. Length 12.1-13.8 (13.7-16.2) mm.

Head narrowly rounded apically, jugal margins slightly concave before eyes, nowhere parallel (Fig. 1). Length of head 2.3-2.4 (2.4-2.7) mm, width across eyes 2.9-3.1 (3.0-3.4) mm. Each antenna green, distal one-third of segment 3, distal one-fourth of segment 4, and distal one-half of segment 5 pale fuscous to black; length of segments 1-5 about 0.5-0.6 (0.5-0.7), 1.2-1.4 (1.3-1.4), 1.4-1.7 (1.5-1.8), 1.9-2.2 (2.0-2.2), 1.9-2.1 (2.0-2.2) mm.

Pronotum 7.1-8.1 (7.8-9.5) mm wide at humeri, mesial length 2.4-2.9 (3.0-3.2) mm. Each humeral angle narrowly rounded, slightly produced beyond base of coria. Anterolateral margin of pronotum straight or slightly convex. Cicatrices not marked with black.

Scutellum 4.4-5.2 (5.0-6.0) mm wide at base, mesial length 4.9-5.9 (5.9-6.5) mm; base void of any pale or black markings. Coria rounded apically, reaching beyond middle of sixth (fifth visible) abdominal segment, rarely reaching seventh (sixth visible) abdominal segment. Connexiva with posterolateral angles black, with some black on posterolateral angle of laterotergites.