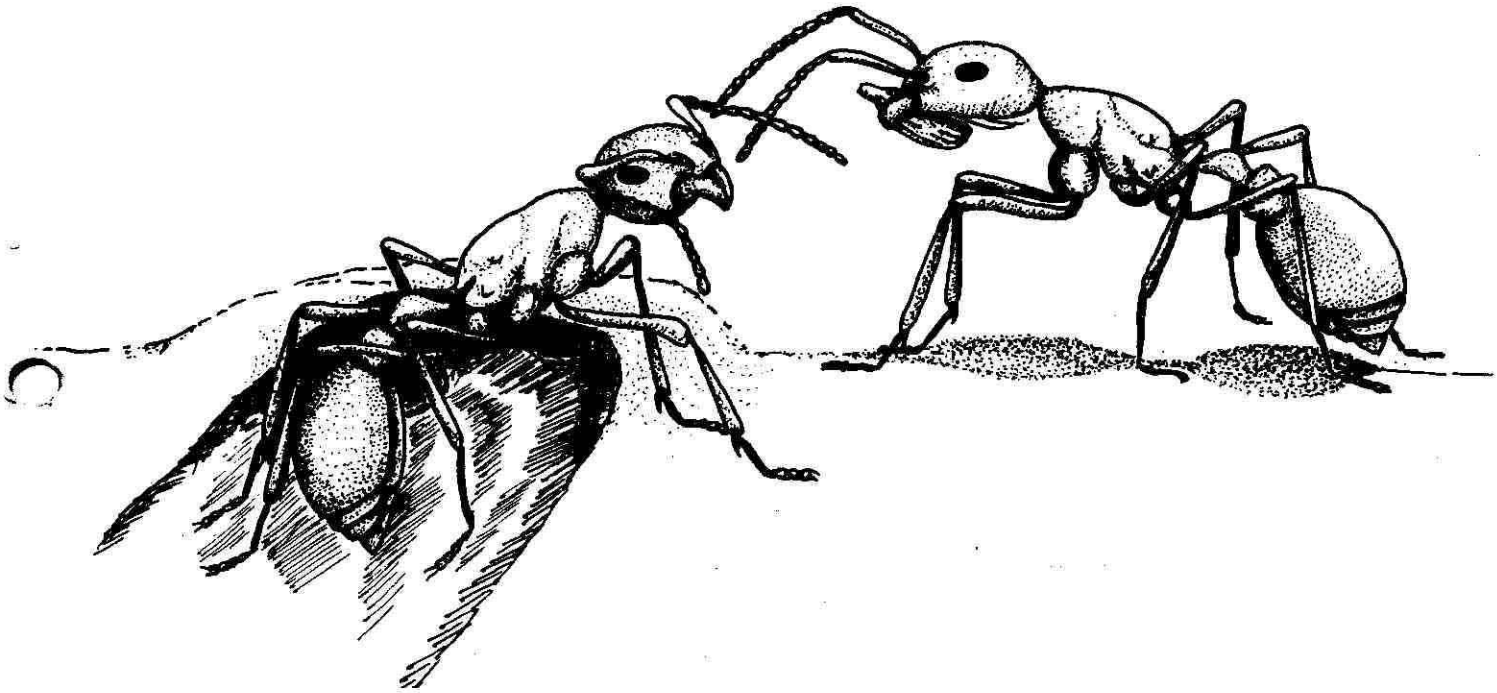
SRO-NERP-14

THE ANTS
(*Hymenoptera: Formicidae*)
OF THE
SAVANNAH RIVER PLANT, SOUTH CAROLINA



by
Arnold Van Pelt
and
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The Ants (Hymenoptera: Formicidae) of the Savannah River Plant, South Carolina

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INTRODUCTION

Few organisms living in terrestrial habitats, with the exception of bacteria and fungi, rival the ants in their impact on ecosystems. Ants are said to be at least as valuable as the earthworms in the enrichment and aeration of the soil. They can exert tremendous control over other insects, many which are harmful to man, by including them in their diets. It has been estimated that in an Italian forest which contained approximately one million ant colonies, 24,000 tons of insects were consumed by the ants during a 200-day summer season (Larson and Larson, 1965). For this reason, late in the nineteenth century, laws were put into effect in Europe which protected ants in forests. Such laws are still in force.

As a group, ants are very successful due to their vast numbers, wide geographical distribution, ability to live in a variety of nesting sites, and most important, their ability to take advantage of a multitude of food sources. As might be expected of such highly adaptable organisms, many taxa are very specific for certain habitats and are good indicators of changes in those habitats. Therefore, a set of baseline information on the kinds of ants one would expect in various natural habitats should be valuable to anyone concerned with contemplating research in these areas.

The data for this survey were collected during the summer of 1976 and 1977. The overall objective of the project was to collect and identify the ant species in the major habitats on the Savannah River

Plant (SRP). Each identified species is located in a reference collection at the Savannah River Ecology Laboratory located at the SRP site. The present report is concerned with ant species living in both upland (old field and scrub oak) and lowland (lowland forest, swamp forest and Carolina bay) habitats. Species were also collected in a pine forest and less intensively in a coal fly-ash storage area. Future surveys of ant species in severely impacted habitats (control burn areas, coal-fly ash storage areas, forest clear cuts, areas affected by thermal or chemical pollution, etc.) may be conducted and compared with the present survey of more natural habitats.

This report lists each ant species collected on the SRP by habitat and, where determined, the nesting site within a particular habitat. Through the use of baited traps, relative frequencies of foraging ants were determined and listed. A key to the subfamilies and genera of ants occurring on the SRP is included along with illustrations of species representative of the major genera. The illustrations are reproduced directly from Creighton (1950) with the permission of the Museum of Comparative Zoology, Harvard University, and are included in this report to represent the genera only; some of the species illustrated do not occur on the Plant, or in South Carolina.

HABITAT DESCRIPTION

The Savannah River Plant (SRP) occupies approximately 200,000 acres in Aiken and Barnwell Counties of South Carolina. Designated a National Environmental Research Park in 1972, the SRP provides a variety of protected ecosystems where long-range projects concerning man's impact on the environment can be conducted. The natural vegetational communities of the SRP are typical of the upper southeastern coastal plain. Among these habitats are abandoned old fields, sandhills dominated by a scrub oak-long-leaf pine association, lowland and upland hardwood forests, and swamp forests. Also typical of the coastal plain region are numerous Carolina bays. The general habitat locations in which collections were made are illustrated in Figure 1. Following are detailed descriptions of the habitats from which ants were collected (See Hillestad and Bennett, for additional descriptions).

Upland Community - Two of the major habitats in this community are the old field and sandhills scrub oak habitats. Collections were made at two old field sites. Field 3-412, Site 1, approximately 350 acres in area (Figure 2) has served as a site for ecological studies since 1953. From 1952, the first growing season following the cessation of agriculture, plant succession has proceeded to the present perennial grass sere dominated by panic grass (Panicum aciculare) and fall witch (Leptoloma cognatum). Broomsedge (Andropogon virginicus), dominant for the past several years, is still very common but is now more widely scattered in its distribution. Poverty grass (Aristida oligantha) and long-awned aristida (A. longispica) are also common and widely distributed grasses. Scattered about the field are localized areas dominated by sericea

lespedeza (Lespedeza cuneata) and camphor weed (Heterotheca subaxillaris). Two other forbs, daisy fleabane (Erigeron ramosus) and yellow aster (Haplopappus divaricatus), are rather uniformly distributed throughout. Trees, except for widely scattered pines (Pinus sp.), have not invaded the field to any significant degree.

The other old field, a nine-acre area previously used for small mammal population studies, is located in the northwest corner of the University of Georgia Old Laboratory Site, Site 2 (Figure 3). The vegetation is similar to that of Field 3-412, Site 1 with the exception of scattered patches of beggar's ticks (Desmodium sp.) and greenbriar (Smilax sp.). Plant succession in this smaller field has been more rapid with trees rapidly moving in. All invading trees were removed about four years ago. By 1976 there was a re-invasion of trees (1-3m) including longleaf and loblolly pine (Pinus palustris and taeda, respectively), water oak (Quercus nigra) and black cherry (Prunus serotina). Several of the taller hardwood trees have been extensively invaded by climbing vines (Smilax sp.).

The sandhills scrub oak area, designated Sandhills, Site 3 (Figure 4), is a subclimax forest dominated by turkey oak (Q. laevis) and longleaf pine. Collections were made in the 67-acre reserve area and similar habitat running north along power line C-1. The habitat is characterized by scattered open areas containing grasses and forbs similar to the old field sites. Dead limbs, logs and stumps provide additional nesting sites for ants. Since the soil associated with both the old field community and the scrub oak association is so sandy, conditions are extremely dry during periods of low rainfall.

Lowland Community - Included in the lowland community are lowland forest, swamp forest and Carolina bay habitats. The type of lowland forest used in our survey consists of large coves or ravines within the watershed systems of large streams, such as Upper Three Runs Creek (Figure 1). Extensive collections were made in the Beech Hardwood Forest, Site 6 (Figure 5), a large cove on the eastern slope of Upper Three Runs Creek. Additional and less extensive collections were made in a similar cove along Upper Three Runs Creek approximately 3.7 miles north of Site 6. Further collections were made at a cove site, Oak-Hickory Forest, Site 5 (Figure 6). The cove is near Mill Creek, a small stream emptying into Tinker Creek which in turn flows into Upper Three Runs Creek. Collections were made within a 5.7 hectare area used as a small mammal trapping grid. The lowland hardwood sites surveyed were similar in habitat and are adequately characterized by the following description. Small streams, intermittent in some cases, may meander along the cove bottom or floodplain and eventually empty into the larger stream. Surrounding the cove floodplain is a dry slope, quite steep in some areas, dominated by upland oaks (Quercus sp.), hickory (Carya sp.) and beech (Fagus grandiflora). The understory is dominated by American holly (Ilex opaca), flowering dogwood (Cornus florida) and young beech trees. Large, and widely scattered loblolly pines (P. taeda) may occur. The most mesic floodplain is dominated by lowland oaks (Quercus sp.), yellow poplar (Liriodendron tulipifera), sweet gum (Liquidambar styraciflua) and beech (F. grandiflora). Black gum (Nyssa sylvatica) and a dense floor cover of ferns and mosses appear in the damper areas. The understory, as on the slopes, consists of holly, dogwood and young beech trees. Dog hobble (Leucothoe axillaris) forms a dense tangle

along extensive sections of the floodplain stream. Switch cane, or bamboo, forms thick patches in small seepage areas. Grape (Vitis sp.) and greenbriar (Smilax sp.) vines form dense tangles along the trunks and among the limbs of understory and dominant trees, especially in the cove floodplain. Dead limbs, logs and stumps are common and provide abundant nesting sites for ants.

An extensive swamp forest system is associated with the Savannah River and the lower parts of streams which empty into the river. Collections were made at one site near the junction of Water Gap Road (SRP Road A-17) and Tom Roberson Road. This habitat type was surveyed less extensively than the others, and thus, should probably receive further attention in the future. The swamp forest is dominated by swamp gum (Nyssa aquatica) and bald cypress (Taxodium distichum). During the growing season (late spring to early autumn) the herbaceous understory consists of woolgrass (Scirpus cyperinus), arrowhead (Sagittaria latifolia) and, in some open water areas, water lily (Nymphaea adorata); various swamp forbs and grasses occupy the less wet sites. The substrate is composed of organically enriched mud (silt), fortified near the surface with the roots of herbaceous plants and trees. Such a substrate, continually saturated with water, cannot support the ground nests of ants. This makes the common occurrence of dead trees, dead stems of a few herbaceous plants, stumps and fallen logs very important to the ant community. The majority of these nesting sites are not available during the winter and early spring when the water levels in the swamp may rise as much as 3 meters. The dynamics of ant populations in such a severe and rapidly changing environment would make an interesting ecological study.

Carolina Bay - Carolina bays are small grassy marshes found throughout the coastal plain regions of North and South Carolina. They are common on the SRP. Those surveyed for ants were Ellenton Bay, located in the southeast portion of Field 3-412, Site 1 (Figure 2), Steel Creek Bay, Site 8 (Figure 7) and Dry Bay, located on the right (east) of Road A approximately one quarter mile north of Road A and its crossing of Upper Three Runs Creek. Although varying in size, all Carolina bays are egg-shaped with the narrow end pointing in a northwesterly direction. For further description and details of the origin of Carolina bays see Johnson (1942) and Wells and Boyce (1953). The bays are usually covered with a dense stand of panic grass (Panicum hemitomum), particularly near the border. Pool areas, occupying the lowest portions of the bay, are covered with water lily (N. adorata) when water is present. Scattered widely about the bay, but more common near the border, are young black willow (Salix nigra) and button bush (Cephalanthus occidentalis). Also present are the dead stumps and snags of these two species. Scattered about the edge are small patches of woolgrass (Scirpus cyperinus), common rush (Juncus effusus), cattail (Typha latifolia), and giant plumegrass (Erianthus giganteus). Carolina bays have no external inlet or outlet and are therefore subject to groundwater fluctuations. The bays may go from almost dry (only small pools of water remaining) to completely full of water. However, the fluctuations do not appear to be seasonal as in the swamp forest. For example, 10-12 years may pass during which the bay will go from dry to full to dry again. Soil conditions in the bays are not conducive to the nesting of ants. Therefore most ant species are found in association with trees, their stumps and snags and the dead stems of woolgrass and giant plumegrass.

COLLECTING AND PRESERVING METHODS

Collections were made with forceps and aspirator during searches in soil, under surface litter, in logs and stumps, under the bark of logs, trees and stumps, and in the hollow stems of dead grasses or reeds. Collections were made of surface foragers by forceps from baited traps. Initially traps consisted of 40-dram plastic vials, sunk into the ground, and containing a sugar-water or peanut butter-water mixture. A bacon grease mixture was also tried but proved less effective than peanut butter. The baited traps were very effective, attracting large numbers of foragers and drowning them in the baited solutions. The one disadvantage of this technique is the amount of time required to separate the ants from the baited solution. Also, in the case of the peanut butter (or grease) solutions, the ants become heavily coated with oil and must be washed before they can be identified. Not only is this time consuming but it tends to damage many of the specimens.

In 1977, to simplify the baited collections, a new technique was inaugurated. Empty containers (lower half of one-gallon plastic milk cans, 11-ounce soup cans, 5-ounce Vienna sausage cans and similar containers) were smeared on the inside with a thin coat of peanut butter. Bacon grease was also tried but was no more effective than peanut butter and was discontinued. The baited containers were placed at stations along a line running through various portions of the habitat to be sampled. Twenty-four hours later, early the following morning, the baited containers were emptied. The ants were placed into a larger container (a white enamel specimen pan works well), aspirated and placed in alcohol for subsequent separation and identification.

Baited traps and containers proved effective in collecting those species which forage on the surface and are attracted by the particular bait used. Those not so attracted have to be collected by hand. A technique was devised to effectively collect foraging ants in habitats with large amounts of surface litter, such as the lowland forest. Litter, placed in a large white enamel specimen pan, was thoroughly shaken and agitated by hand. Immediate removal of the litter leaves the ants exposed on the bottom of the pan from which they are aspirated and placed in alcohol. Several species not readily attracted to baits were collected in this manner.

All collections, identified to species, were placed in 75% ethyl alcohol. All vials, arranged by genus, are deposited in the SREL collection. Each vial contains a locality as well as a determination label.

It was the interest of this survey to have species represented on the SRP determined by a taxonomic authority. Dr. D. R. Smith kindly made many of the identifications for this project.

RESULTS AND CONCLUSIONS

Ant species from 1065 collections are listed by habitat in Table 1. Sixty species were collected from the upland (old field--29 and scrub oak--51) communities; 54 species were obtained from the lowland (lowland forest--39, swamp forest--11, Carolina bay--23) community. Pine forests (plantations) and an old field-scrub community supported by a coal fly-ash substrate yielded 45 species. A total of 89 species, representing 30 genera, were collected on the Savannah River Plant. A total of 503 alcohol-preserved specimens representing these genera and species have been deposited in the SREL Insect Collection. In addition, there are 150 pinned specimens, representing 30 species and 19 genera, available in the SREL collection.

The subgenus Diplorhoptrum of the genus Solenopsis, and the genus Paratrechina are taxonomically difficult. It may be appropriate to consider each of these taxa as subject to future modifications.

Data obtained from the traps baited with either sugar or peanut butter (or grease) are shown as frequency (%) in Table 2. Frequency is defined as the percentage of traps to which a species is attracted in each community. These data give an indication of the colony density within a community. They are, of course, relative mathematically only to the same type of bait within the same community, but they can be used to compare the ecological importance of a species across all habitats.

ACKNOWLEDGEMENTS

We are grateful to Jean B. Coleman for designing and drawing the cover and for drawing the maps, and to Janell Gregory and Dr. I. L. Brisbin for their editorial comments and expertise. We wish to thank the Museum of Comparative Zoology, Harvard University for allowing us to directly reproduce the illustrations and modify the key of Creighton's 1950 publication. We are indebted to Dr. D. R. Smith of the Systematic Entomology Laboratory, SEA, U. S. Department of Agriculture, Washington, D. C., for making many ant identifications for this project. Thanks are also due to Susan Fuller for helping with the field collections. Support for A. Van Pelt was provided by the National Environmental Research Park program of the Savannah River Plant Operations Office (U.S. - DOE). Additional support for J. B. Gentry and for typing of the first draft of the manuscript was aided by Contract DE-AC09-76SR00-819 between the U. S. Department of Energy and the University of Georgia. Greensboro College provided support for typing the final drafts.

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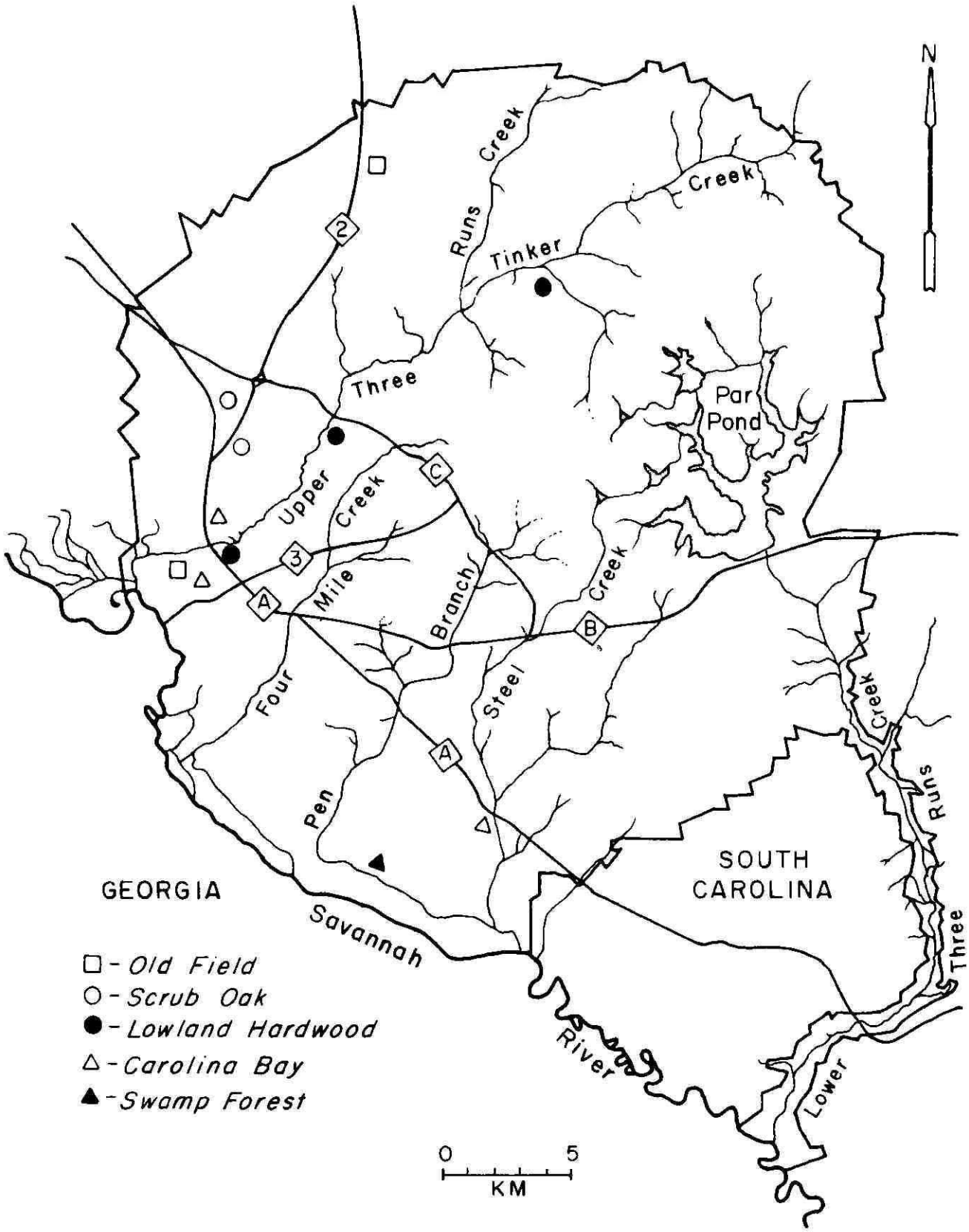

Figure 1. Map of Savannah River Plant showing general location of habitats surveyed for ant species.

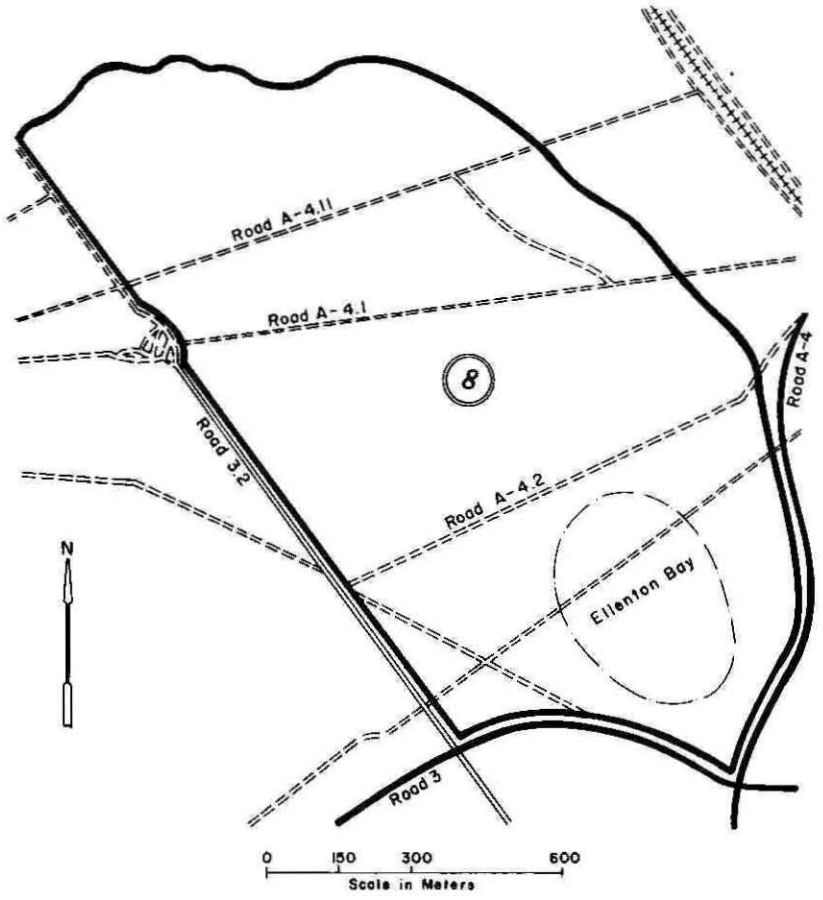

Figure 2. Field 3-412, Site 1 (Reserve Area No. 8) (350 acres): Large old fields (abandoned in 1951), located in the vicinity of the 400-D area, and left unplanted in pines in 1957 for use as an SREL study area. The area is bounded on the southwest by Road 3-2, on the south by Road 3, on the east by Road A-4 and on the north by the Upper Three Runs swamp. Ellenton Bay, a large Carolina bay, is located in the southeastern portion and within the boundaries of the reserve area.

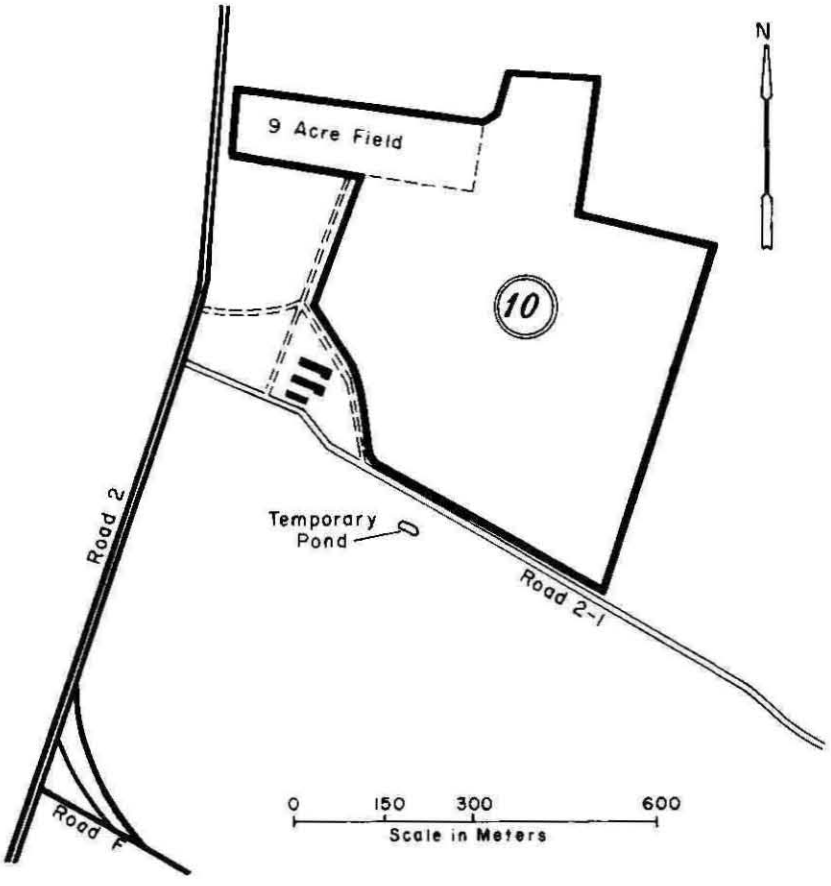

Figure 3. University of Georgia Old Laboratory, Site 2 (Reserve Area No. 10) (100 acres): This area is located directly northeast of the Forest Service headquarters. The ant survey was restricted to the 9-acre field section. The area is bounded on the west by Road 2 and the dirt road which runs behind the Forest Service headquarters. It is bounded on the south by Road 2-1, on the north by woods roads and a line running almost north from Road 2-1 to connect with the woods roads along the east boundary.

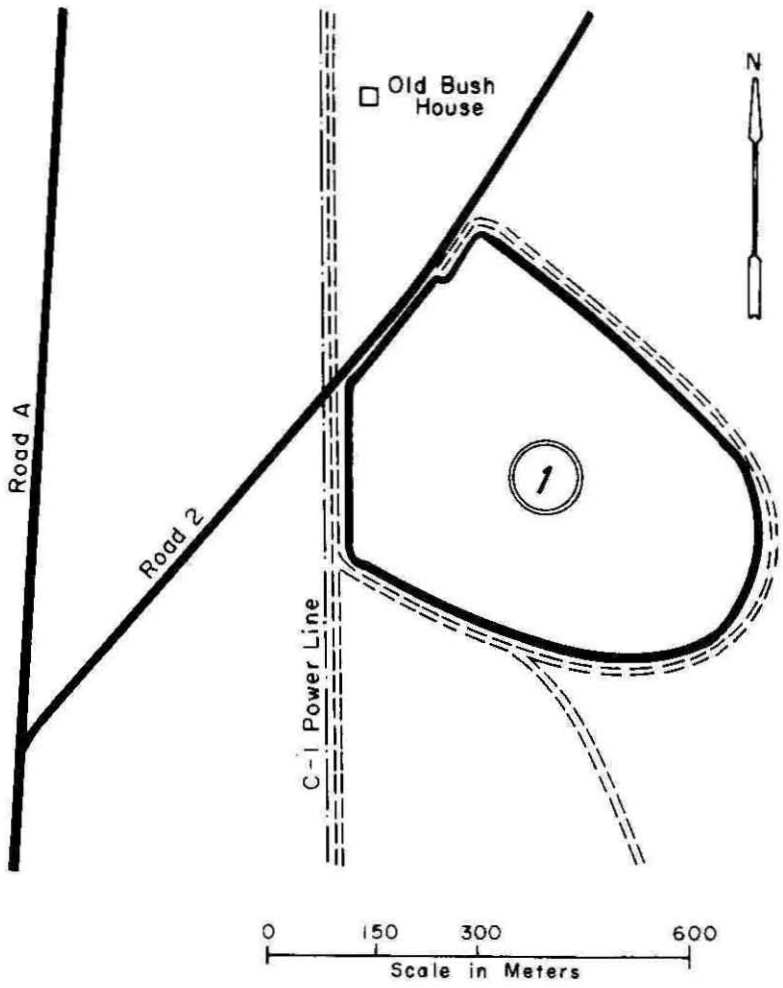

Figure 4. Sandhills, Site 3 (Reserve Area No. 1) (67 acres): Located directly south of the old "Bush House" site, the area is bounded on the northwest by Road 2, on the west by power line road C-1 and on the south, east and northeast by woods roads.

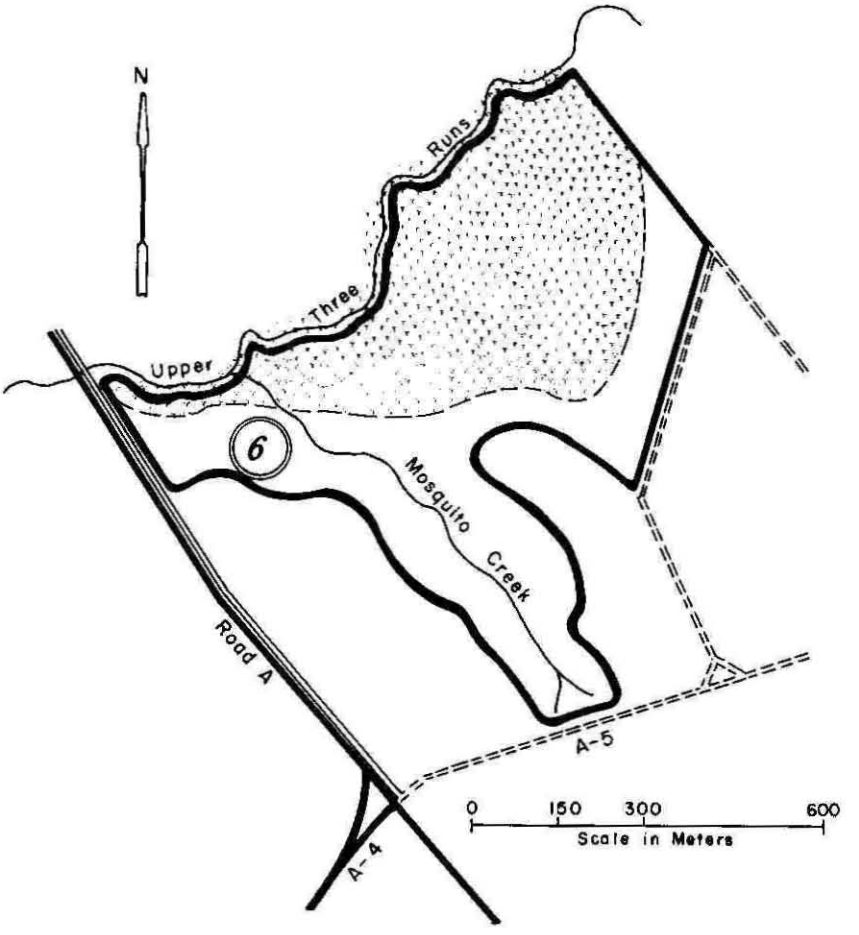

Figure 5. Beech Hardwood Forest, Site 6 (Reserve Area No. 6) (118 acres): The area adjoins Upper Three Runs Creek which forms the northeast boundary. The northeast is bounded by a power line, the south by Road A-5 and the southwest by Road A and pine plantation. The majority of the ant collections were from the coves and floodplain of the Mosquito Creek drainage.

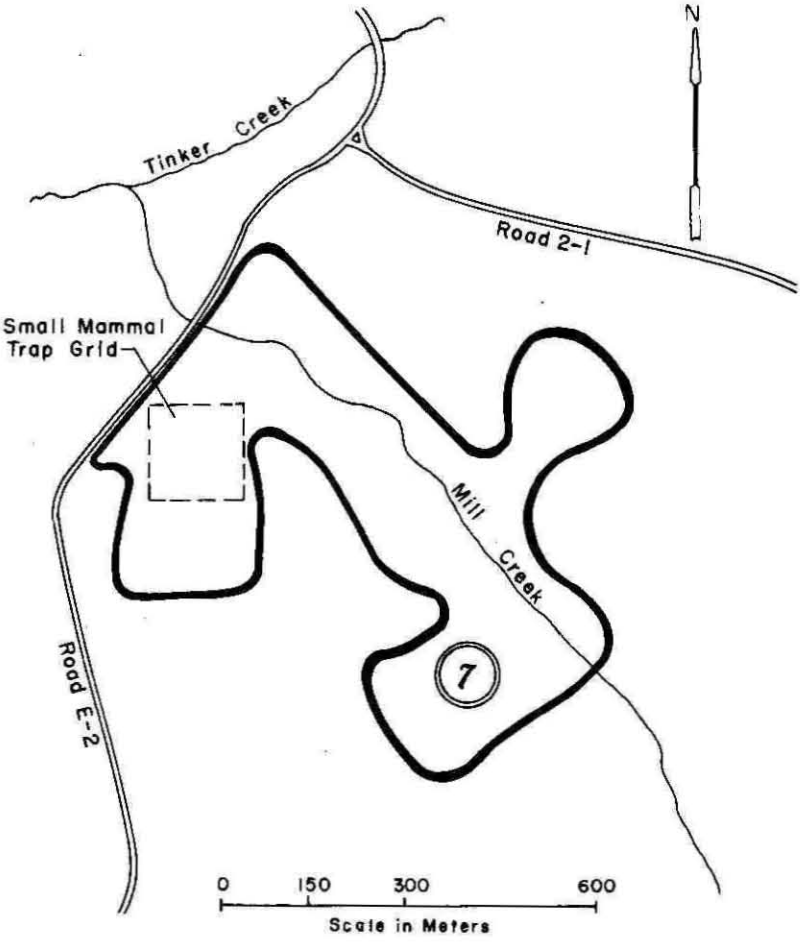

Figure 6. Oak-Hickory Forest, Site 5 (Reserve Area No. 7) (83 acres): Area is located near the junction of Mill Creek and Tinker Creek. It adjoins and is bounded on the northwest by Road E-2, on the northeast by Road 2-1 and pine plantations and on the south by pine plantations. Ant collections were from the site of the small mammal trap grid.

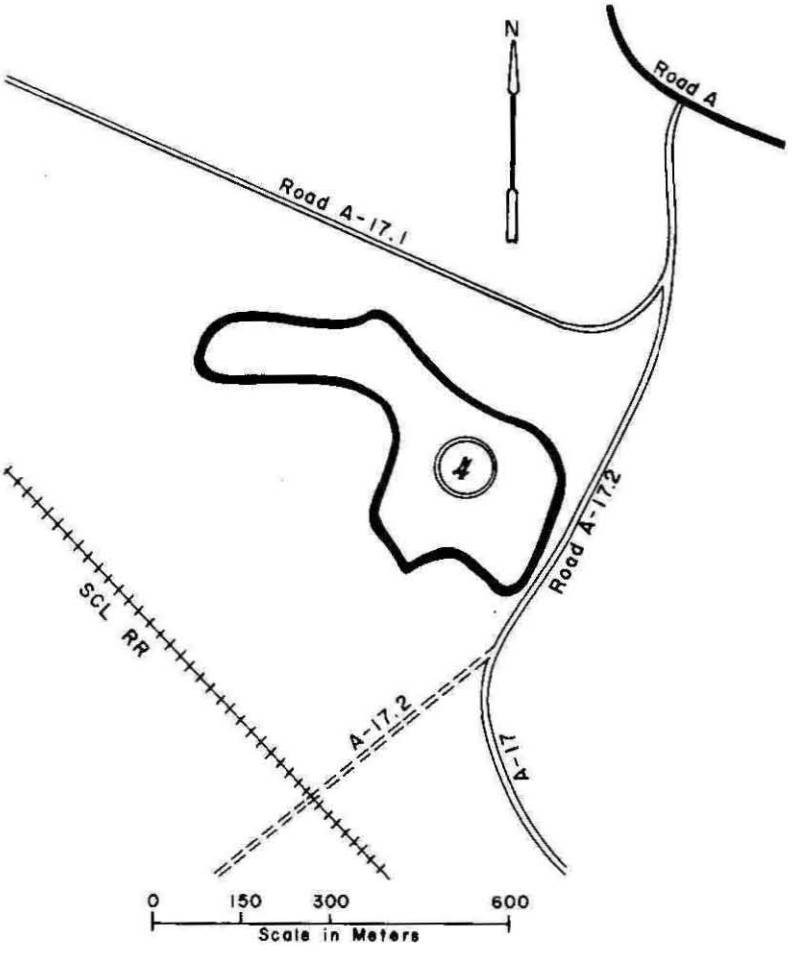

Figure 7. Steel Creek Bay, Site 8 (Reserve Area No. 4) (29 acres): A marsh (Carolina bay), known as Steel Creek Bay, adjacent to and northwest of Road A-17-2, southwest of Road A-17-1 and northeast of the south branch of the Seaboard Coastline Railroad track. The bay has lost its characteristic elliptic profile due to an encroaching forest.

Table 1. Distribution and nesting information for ants of the Savannah River Plant. See end of Table 1 for explanation of symbols which describe nesting information.

Ant Species	Old Field	Scrub Oak	Pine Forest	Lowland Forest	Swamp Forest	Carolina Bay
Neivamyrmex carolinensis (Emery)	f					
*N. nigrescens (Cresson)	f					
*Amblyopone pallipes (Haldeman)				l		
Proceratium croceum (Roger)		ub,l				
P. pergandei (Emery)		f				
P. silaceum Roger		ub				
*Cryptopone gilva (Roger)				x		
*Ponera pennsylvanica Buckley		x	x			
*Hypoponera opacior (Forel)		l	x	l		
Pseudomyrmex brunneus (F. Smith)		x				x
*P. pallidus (F. Smith)	f					a
*Myrmica punctiventris Roger				x		
Pogonomyrmex badius (Latrielle)	s	s				
*Aphaenogaster ashmeadi (Emery)		l	f	x		
*A. flemingi M.R. Smith		l				
*A. floridana M.R. Smith	s	x	x			
*A. fulva Roger		l	x	ub	x	
A. lamellidens Mayr			x	x	x	
*A. mariae Forel				x	x	
A. miamiana Wheeler					x	

Table 1. Continued.

Ant Species	Old Field	Scrub Oak	Pine Forest	Lowland Forest	Swamp Forest	Carolina Bay
Aphaenogaster rudis (Emery)				x	x	
*A. tennesseensis (Mayr)		1	x			
*A. texana (Emery)	x	x	x	1		
A. treatae Forel	x	1	f			
*Pheidole bicarinata vinelandica Forel	s					
*P. crassicornis (Emery)		x				
*P. davisi Wheeler	x	x				
*P. dentata Mayr		s,ur,ub	f	l,il,a		x
P. dentigula M.R. Smith		l	x	x		
P. metallescens metallescens Emery		l		x		
P. morrisi morrisi Forel	s	s	x			x
*P. pilifera pilifera (Roger)	s					
*P. tysoni Forel	f		x			
*Crematogaster minutissima minutissima Mayr	s	s,l	x	l		
C. ashmeadi Mayr		a		x		x
C. atkinsoni Wheeler			x			l,a
C. cerasi (Fitch)		s,l	x			
*C. clara Mayr	x	l	x		x	x
*C. lineolata (Say)		s,l	x	l		
C. punctulata Emery	f	f	f			
Monomorium minimum (Buckley)			x			

Table 1. Continued.

Ant Species	Old Field	Scrub Oak	Pine Forest	Lowland Forest	Swamp Forest	Carolina Bay
*Solenopsis invicta Buren	fly ash island----		f			
S. globularia littoralis Creighton		s	s			
S. molesta (Say)	s	l	x	ul		
*S. pergandei Forel		s				
S. picta Emery		a	x	x	x	
*S. texana texana Emery		s,ub	f	x		
*Leptothorax curvispinosus Mayr		a	x			a
*L. schaumi Roger					x	x
L. texanus davisi Wheeler			x			
*L. pergandei floridanus Emery	s	s,l	f			
*Myrmecina americana Emery		s	x	x		
Strumigenys louisianae Roger			x	x		
*Smithistruma bunki Brown		f				
S. creightoni (M.R. Smith)				x		
S. dietrichi (M.R. Smith)				x		
S. pulchella (Emery)		f				
S. rostrata (Emery)		ub	x	x		
*S. talpa (Weber)				x		
Trichoscapa membranifera (Emery)		f				
*Trachymyrmex septentrionalis(McCook)	s	s	s			
*Dolichoderus mariae Forel		s,ul	x	x		x
D. pustulatus Mayr			x			a

Table 1. Continued.

Ant Species	Old Field	Scrub Oak	Pine Forest	Lowland Forest	Swamp Forest	Carolina Bay
Dolichoderus taschenbergi (Mayr)						x
*Iridomyrmex pruinosus pruinosus (Roger)	s	s	s			
Conomyrma flavopecta (M.R. Smith)	s	s				
C. insana (Buckley)	s	s	s			
Tapinoma sessile (Say)			x			x
Brachymyrmex depilis Emery	s	s,ul	x			
*Camponotus castaneus (Latrielle)			x	l		
C. ferrugineus (Fabricius)	x	l	x	x		x
C. pennsylvanicus (DeGeer)				x		
C. socius Roger		s		x		
C. abdominalis (Fabricius)		l				
C. nearcticus Emery				x	x	x
*C. sayi Emery		a			x	a
*C. impressus (Roger)					x	a
*C. pylartes fraxinicola M.R. Smith				x		a
*Lasius alienus (Foerster)			x	x		x
*L. neoniger Emery	s	s	x			x
L. flavus (Fabricius)				x		
L. umbratus (Nylander)				x		
Paratrechina melanderi arenivaga (Wheeler)	s	s,l	f	il,l		x

Table 1. Continued.

Ant Species	Old Field	Scrub Oak	Pine Forest	Lowland Forest	Swamp Forest	Carolina Bay
P. parvula (Mayr)	s	s,l				
Prenolepis imparis imparis (Say)				x		
*Formica pallidefulva (Latrielle)	s		x	x		x
*F. schaufussi dolosa Wheeler	s		x			x
*F. subsericea Say				x		
*F. difficilis Emery	f					

Nest Sites:

a=arboreal s=in soil ub=under bark l=in log or in stump
f=foraging; no nest site located il=in litter ur=under rock x=collected by trap; no nesting site information

*Identified by D. R. Smith, Beltsville Agricultural Research Center

Table 2. Frequencies (number of times a species is collected in traps divided by the number of traps) of foraging ants in upland and lowland communities attracted to traps in the SRP. Data for sugar traps are underlined; data for peanut butter or grease traps are not.

	Old Field	Scrub Oak		Lowland Forest		Swamp Forest	Carolina Bay	
No. Traps:	40	30	11	87	99	20	16	8
Pseudomyrmex brunneus							6	0
P. pallidus		3	0				13	0
Myrmica punctiventris				1	1			
Pogonomyrmex badius	10	3	0					
Aphaenogaster ashmeadi		10	0	0	1			
A. flemingi	5							
A. floridana	20							
A. fulva				10	9	40		
A. lamellidens				0	1	20		
A. mariae				1	0	5		
A. miamiana						5		
A. rudis				6	2	10		
A. texana	8			25	38			
A. treatae		27	9					
Pheidole crassicornis		17	0					
P. davisi		3	0					
P. dentata	3	20	9	20	45			
P. dentigula				0	3			
P. metallescens		0	9					

Table 2. Continued.

	Old Field	Scrub Oak	Lowland Forest	Swamp Forest	Carolina Bay
P. morrisi		10 0			
Crematogaster minutissima minutissima			5 29		
C. ashmeadi			7 7		
C. clara					69 63
C. lineolata		7 0	2 4	25	
C. punctulata	55	33 27	2 1		
Solenopsis molesta	10	17 27	5 7		
S. picta			0 2	10	
S. texana	8	27 0	5 7		
Myrmecina americana		10 9	1 5		
Leptothorax pergandei floridanus		7 9			
L. curvispinosus			5 11		
L. schaumi				20	6 0
Smithistruma bunki		3 0			
S. creightoni			2 0		
S. dietrichi			0 1		
S. rostrata			0 1		
S. talpa			0 3		
Trachymyrmex septentrionalis		0 9			
Dolichoderus pustulatus					6 13
Iridomyrmex pruinosus	53	7 18			

Table 2. Continued.

	Old Field	Scrub Oak	Lowland Forest	Swamp Forest	Carolina Bay
Conomyrma flavopectus	15				
C. insana	5	3 9			
Brachymyrmex depilis	8				
Camponotus ferrugineus			6 1		0 13
C. pennsylvanicus			3 0		
C. castaneus			9 2		
C. socius		23 9	14 1		
C. sayi				35	13 0
C. impressus					25 0
Paratrechina parvula	43	33 0			
P. melanderi arenivaga	8	0 18	67 75		6 13
Prenolepis imparis			2 0		
Lasius alienus			0 2		6 25
L. neoniger	10				
Formica difficilis	3				
F. pallidefulva	3		0 1		0 13
F. schaufussi dolosa	23	3 0			

KEYS TO THE WORKER ANTS OF THE SAVANNAH RIVER PLANT*

Key to the Subfamilies

1. Gaster with a distinct constriction between the first and second segments ..... PONERINAE

   Gaster without such a constriction 2

2. Abdominal pedicel consisting of two segments (Plate 1-1, 2-A)..... 3

   Abdominal pedicel consisting of one segment (Plate 1-2, 2-B) 5

3. Frontal carinae narrow and not expanded laterally so that the antennal insertions are fully exposed when the head is viewed from above (Plate 1-3) 4

   Frontal carinae expanded laterally so that they partially or wholly cover the antennal insertions when the head is viewed from above (Plate 1-4) ..... MYRMICINAE

4. Eyes very large, suboval or reniform and consisting of several hundred fine ommatidia ..... PSEUDOMYRMECINAE

   Eyes vestigial or absent; if present, consisting of a single ocellus-like structure ..... DORYLINAE

5. Cloacal orifice distinctly circular and usually surrounded by a fringe of hairs (Plate 1-5) ..... FORMICINAE

   Cloacal orifice slit-like; the hairs, when present, not forming an encircling fringe (Plate 1-6) ..... DOLICHODERINAE

*Keys modified from Creighton (1950), with permission of the Museum of Comparative Zoology, Harvard University.

See references at end of paper (p. 48) for key to species and additional references.

KEYS TO THE GENERA

Ponerinae

1. Anterior border of the clypeus denticulate; mandibles with a row of coarse bidenticulate teeth ..... Amblyopone

   Anterior border of the clypeus variously shaped but never denticulate; mandibular teeth, when present, single 2

2. Thoracic dorsum without sutures, at most a shallow impression at the point at which the suture should be; abdomen distinctly curved downward at its apex (Plate 3) ..... Proceratium

   Thoracic dorsum with at least the promesonotal suture present, and usually the mesoepinotal suture present as well 3

3. Tibia of the middle and hind legs with a single spur 5

   Tibia of the middle and hind legs with two spurs, the smallest, lateral spur often obscure 4

4. Mesonotum surrounded by a distinctly impressed suture, its dorsum blister-like and rather sharply set off from the pronotum; tibia of the middle legs long and without stiff hairs on their extensor surfaces; eyes of moderate size, their facets distinct (may occur on SRP).....Brachyponera

   Mesonotum surrounded by a suture which is only moderately impressed, the dorsum of the mesonotum not strongly convex and not sharply set off from the pronotum; tibia of the middle legs short and bearing stiff hairs on their exterior surfaces; eyes small, their facets indistinct ..... Cryptopone

5. Petiole rectangular; head covered with coarse pock-marks .... Ponera

   Petiole not rectangular in side view; head covered with smaller depressions (Plate 4) ..... Hypoponera

Dorylinae

Single genus Neivamyrmex

Pseudomyrmecinae

Single genus Pseudomyrmex (Plate 5)

Myrmicinae

1. Antennae with six segments 2

   Antennae with more than six segments 4

2. Mandibles long and slender, armed with two teeth at the apex, one set behind the other; the remainder of the inner border of the mandible unarmed except for a single, small, subapical tooth (Plate 14) ..... Strumigenys

   Mandibles shorter; inner border armed with several teeth along the distal half and with a single, large triangular tooth at the base..... 3

3. Prothorax flattened and laterally margined; head largely destitute of hairs ..... Trichoscapa

   Prothorax not flattened or, if flattened, not margined; head with numerous hairs ..... Smithistruma

4. Postpetiole attached to the dorsal surface of the first gastric segment, the gaster flattened dorsally and convex ventrally, acutely pointed behind (Plate 10) ..... Crematogaster

   Postpetiole attached to the anterior end of the first gastric segment, the gaster about equally convex above and below, and not notably pointed behind 5

5. Antennae with ten segments, the last two forming a distinct club (Plate 11) ..... Solenopsis

   Antennae with more than ten segments; the club, if present, rarely with two segments 6

6. Antennae with eleven segments 7

   Antennae with twelve segments 8

7. Dorsum of the pronotum, mesonotum and epinotum with spines or teeth present (Plate 15) ..... Trachymyrmex

   Dorsum of the pronotum and mesonotum without spines and teeth; spines and teeth, when present, confined to the epinotum .... Leptothorax (part)

8. Middle and hind tibial spurs very finely pectinate 9

   Middle and hind tibial spurs simple or absent 10

9. Thoracic dorsum with sutures obsolescent or absent; thorax not impressed between the mesonotum and epinotum; psammophore present (Plate 7) ..... Pogonomyrmex

   At least the mesoepinotal suture present and distinct; psammophore absent (Plate 6) ..... Myrmica

10. Petiole subcylindrical, without a distinct node above; two pairs of spines on epinotum (Plate 12) ..... Myrmecina

    Petiole with a distinct node, the anterior peduncle distinct; one pair of spines on epinotum 11

11. The lateral portion of the clypeus raised behind into a narrow ridge or carina which forms an abrupt, semicircular boundary at the front of the antennal fossa (may occur on the SRP)..... Tetramorium

    The lateral portions of the clypeus not raised in a semicircular ridge behind; the antennal fossae open onto the clypeus without a boundary 12

12. Epinotum unarmed, the basal face at the same level as the dorsum of the mesonotum ..... Monomorium

    Epinotum usually armed with spines or teeth, but, if unarmed, the basal face is distinctly below the level of the dorsum of the mesonotum 13

13. Worker caste dimorphic with the head of the major worker disproportionately large (Plate 9) ..... Pheidole

    Worker caste monomorphic, or if polymorphic, the head of the major is not disproportionately large 14

14. Epinotum depressed well below the level of the pronotum; in profile, the mesonotum forming a sloping declivity between them; antennal club indistinct, of 4-5 segments (Plate 8) ..... Aphaenogaster

    Epinotum in profile as high as the promesonotum, the thoracic dorsum usually forming an unbroken plane, or with the epinotum separated from the mesonotum by a deep impression; antennal club of 3 segments (Plate 13) ..... Leptothorax (part)

Dolichoderinae

1. Declivious face of the epinotum very strongly concave; integument stiff and brittle; epinotum and often much of the remainder of the thorax, heavily sculptured (Plate 16) ..... Dolichoderus

    Declivious face of the epinotum straight or nearly so; integument thin and flexible; sculpture everywhere fine 2

2. The epinotum with a prominent, sharp, tooth-like protuberance projecting vertically at the junction of the basal and declivious faces; third segment of the maxillary palp very long, as long or longer than the three succeeding segments taken together (Plate 18) ..... Conomyrma

    The junction between the basal and declivious faces of the epinotum unarmed, rounded or angular; third segment of the maxillary palp not unusually long and notably shorter than the three succeeding segments taken together 3

3. Scale of the petiole vestigial (Plate 19) ..... Tapinoma

   Scale of the petiole present, but small (Plate 17) ..... Iridomyrmex

Formicinae

1. Antennae with nine segments (Plate 20) ..... Brachymyrmex

   Antennae with twelve segments 2

2. Thoracic dorsum, in profile, evenly convex, the epinotum not depressed below the level of the promesonotum, the mesoepinotal suture not impressed or only slightly impressed; mesothoracic spiracles borne on the sides of the thorax at a level well below the basal face of the epinotum; the antennal scapes usually inserted well behind the posterior edge of the clypeus (Plate 21) .... Camponotus

   Thoracic dorsum, in profile, with the epinotum distinctly depressed below the level of the promesonotum; the impression at the mesoepinotal suture always distinct and often profound, mesonotal spiracles usually occurring in this impression on or close to the dorsal surface of the thorax; antennal scapes inserted at or near the posterior border of the clypeus 3

3. Frontal carinae prominent, their lateral margins slightly reflected upward; ocelli very distinct (Plate 25) ..... Formica

   Frontal carinae poorly marked, their lateral margins flat; ocelli indistinct or absent 4

4. Antennal scapes surpassing the occipital margin by at least one-third their length, usually much longer; erect body hairs coarse, long and usually brown or black in color 5

   Antennal scapes never surpassing the occipital margin by more than the length of the first funicular joint, often much shorter; erect body hairs not coarse; short and golden (Plate 24) ..... Lasius

5. Thorax seen from above with the mesonotum very strongly constricted (Plate 23) ..... Prenolepis

   Thorax seen from above with the mesonotum only slightly constricted (Plate 22) ..... Paratrechina

References to keys to the species are listed in the Catalogue of the Hymenoptera of North America (See Krombein, et al. in Literature Cited).

Plates 3-25 from Creighton (1950), with permission of the Harvard University Museum of Comparative Zoology, included to illustrate the generic characteristics of ants collected on the Savannah River Plant site. It should be noted, however, that some of the illustrations are of western ants and that therefore the specific characteristics do not always apply.

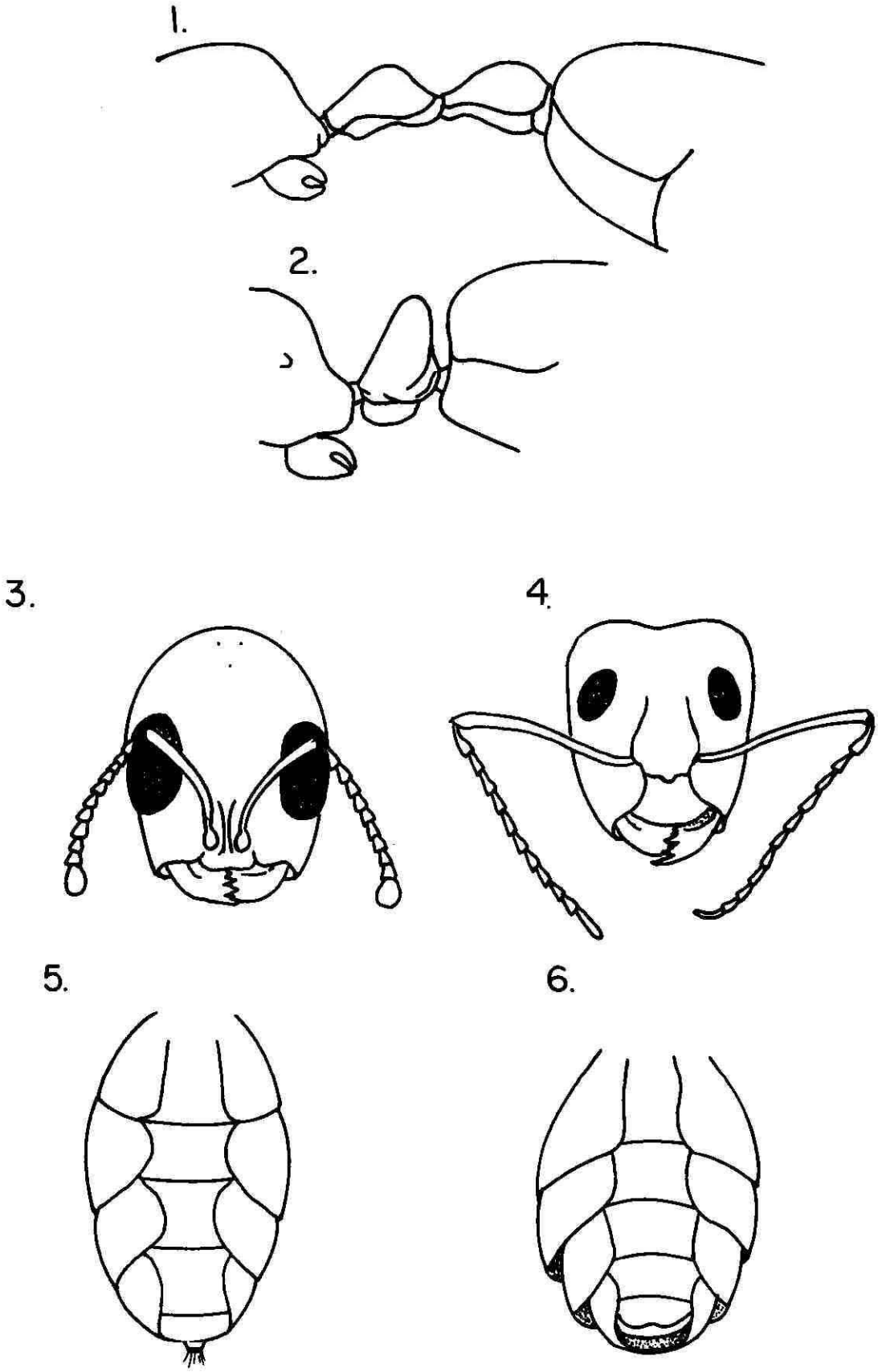

PLATE 1. Diagnostic features of worker ants for Key to Subfamilies

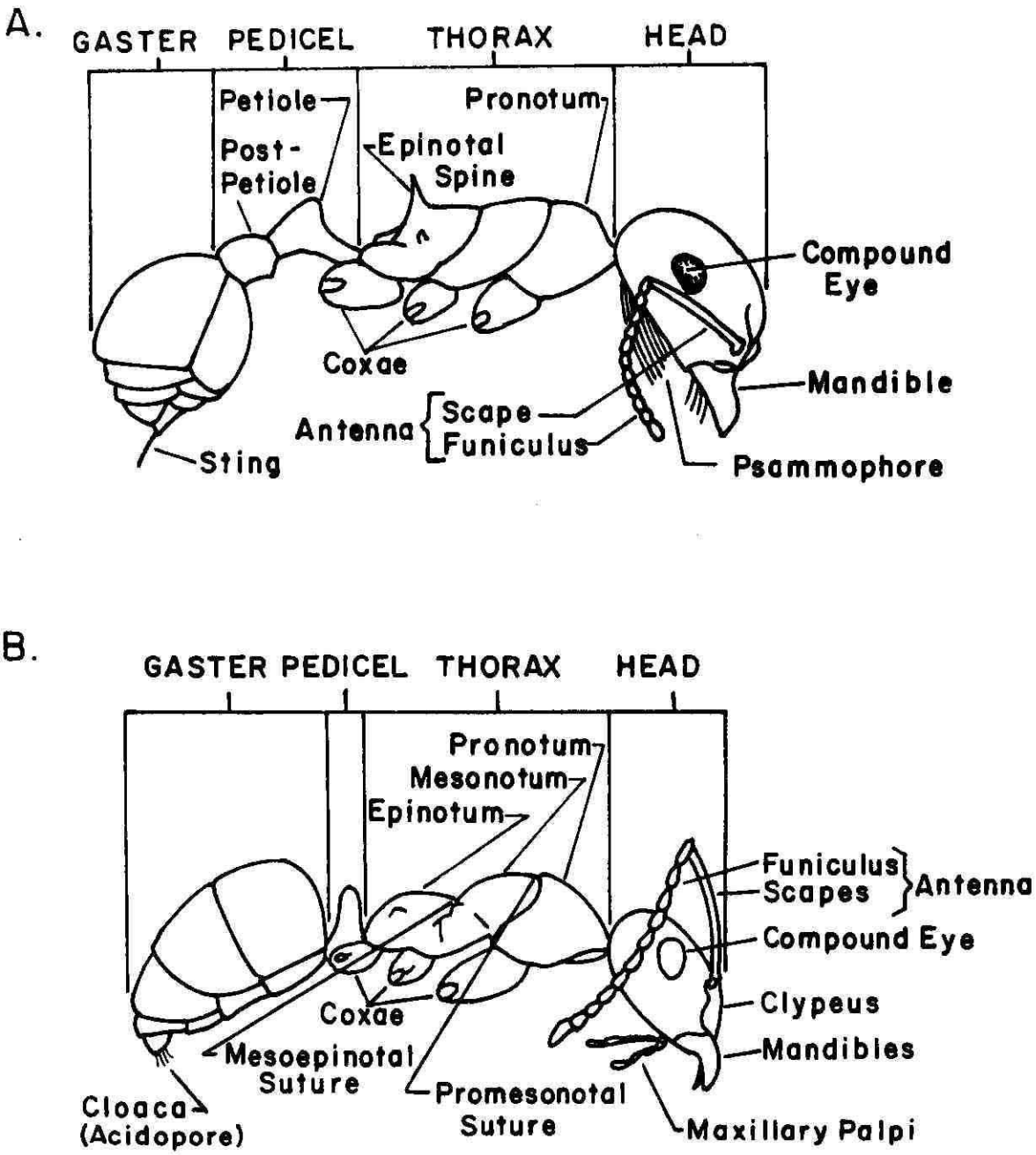

PLATE 2. Diagnostic features of worker ants for Key to Subfamilies

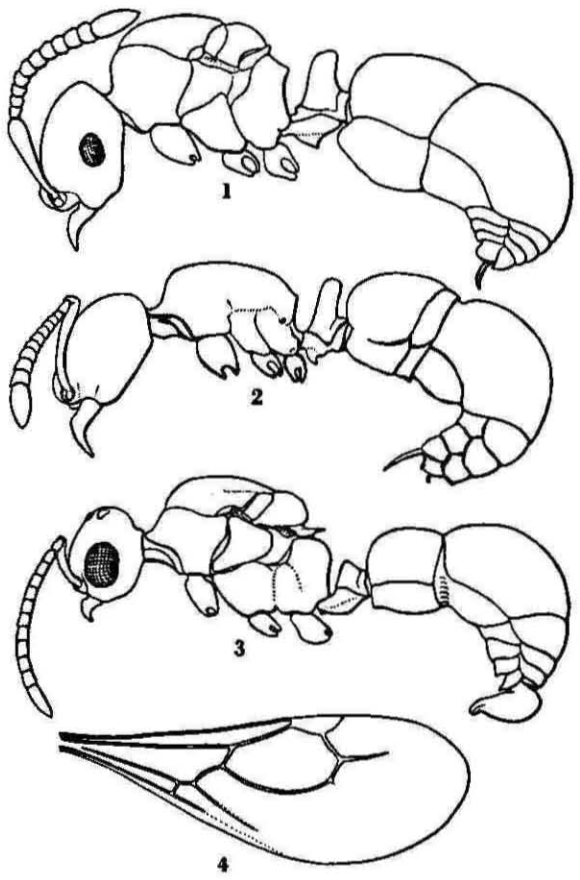

PLATE 3

Proceratium silaceum Roger

1. Female
2. Worker
3. Male
4. Wing

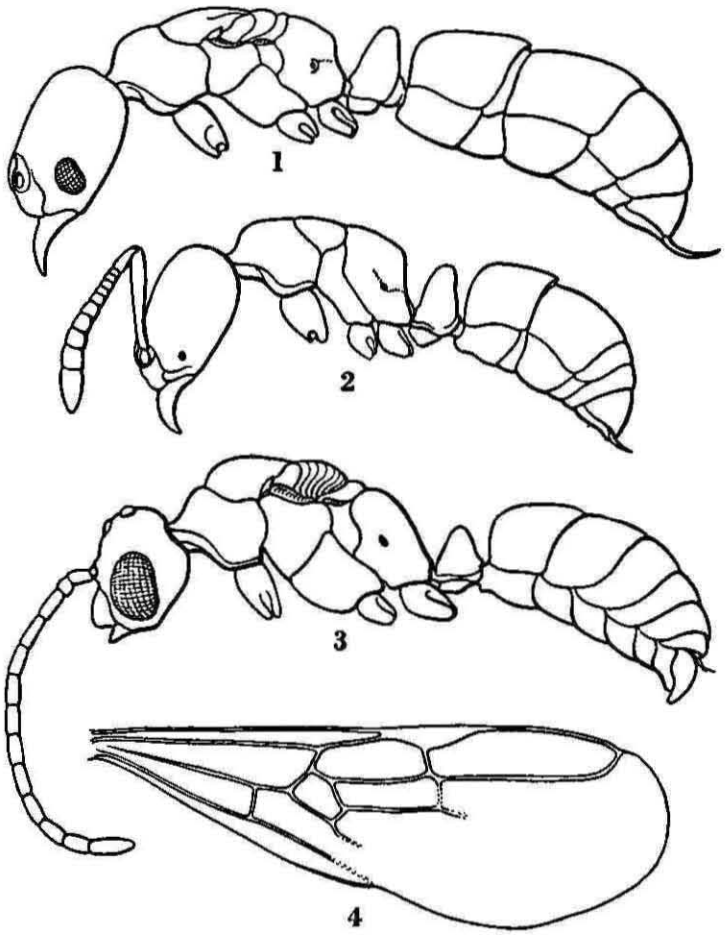

PLATE 4

Hypoponera opacior (Forel)

1. Female
2. Worker
3. Male
4. Wing

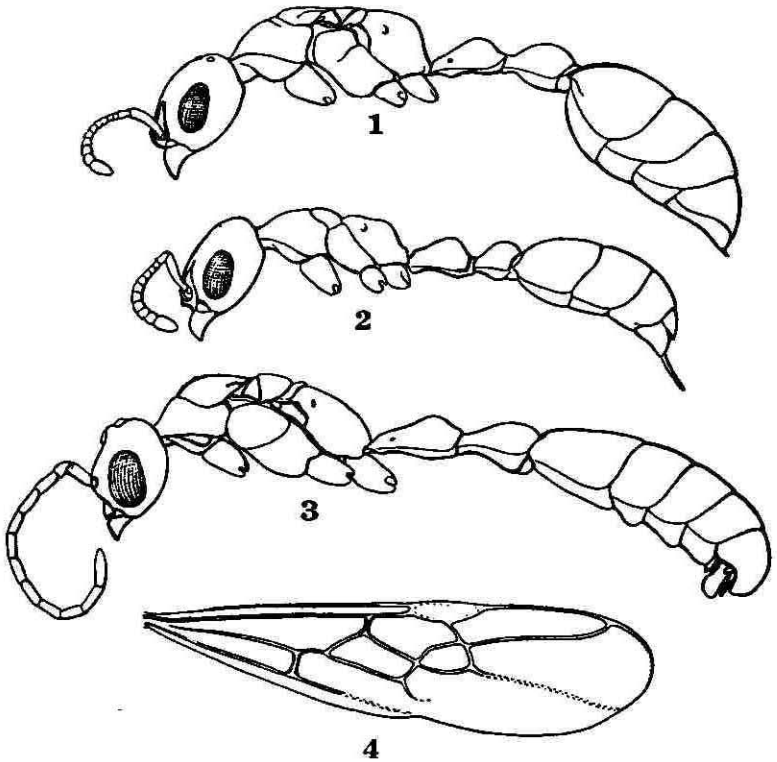

PLATE 5

Pseudomyrmex pallidus (F. Smith)

1. Female 2. Worker
3. Male 4. Wing

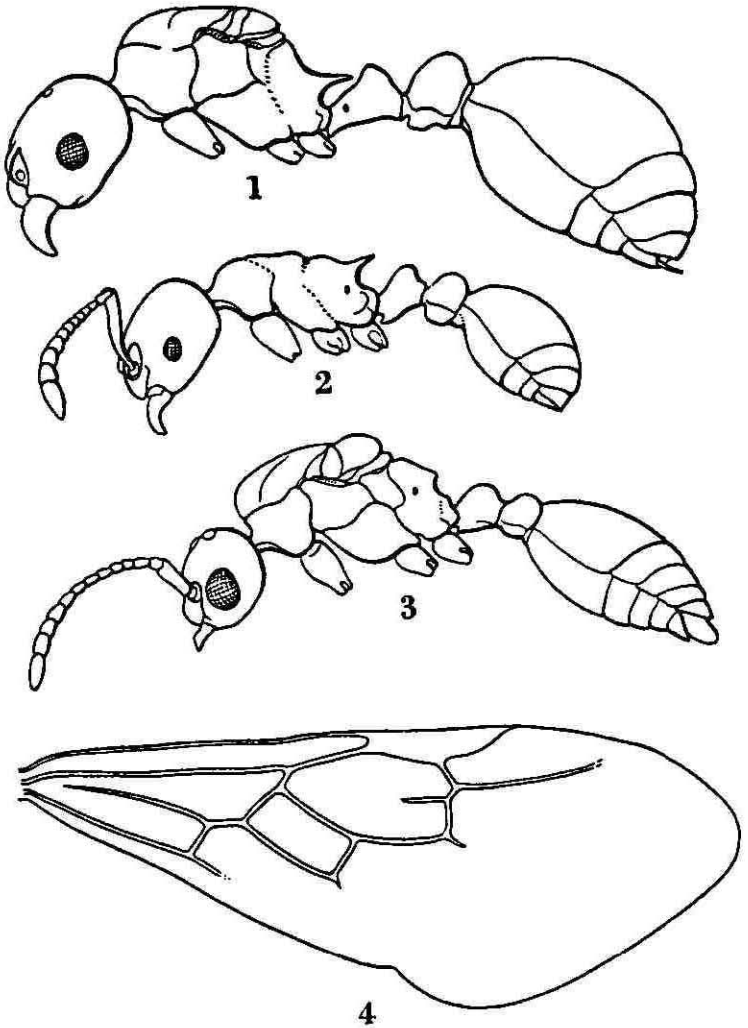

PLATE 6

Myrmica brevinodis Emery

1. Female 2. Worker
3. Male 4. Wing

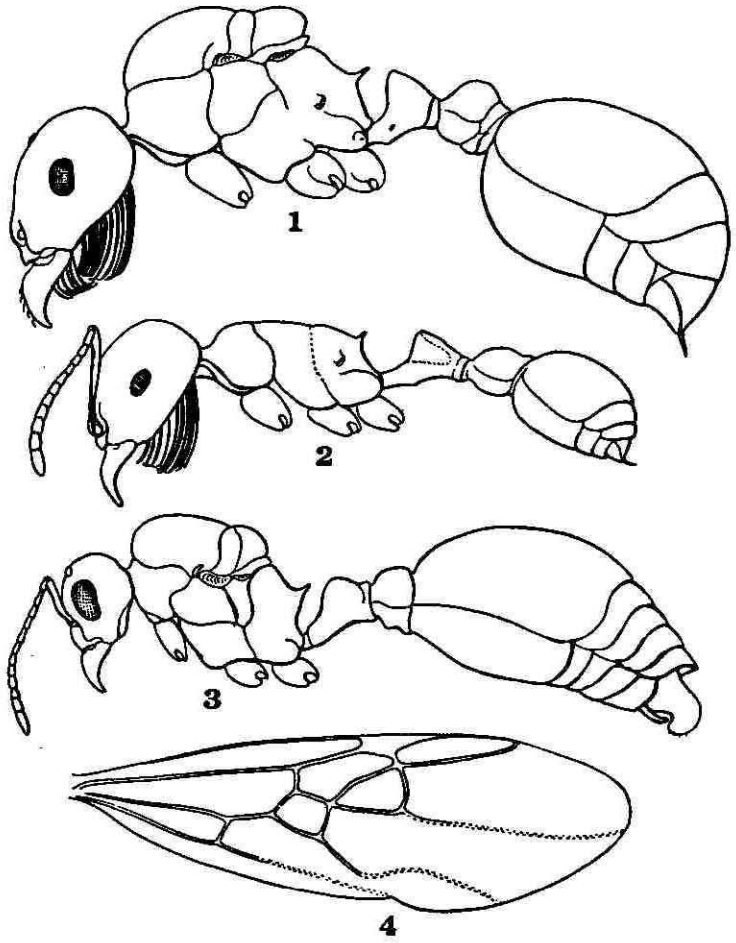

PLATE 7

Pogonomyrmex comanche Wheeler

1. Female 2. Worker
3. Male 4. Wing

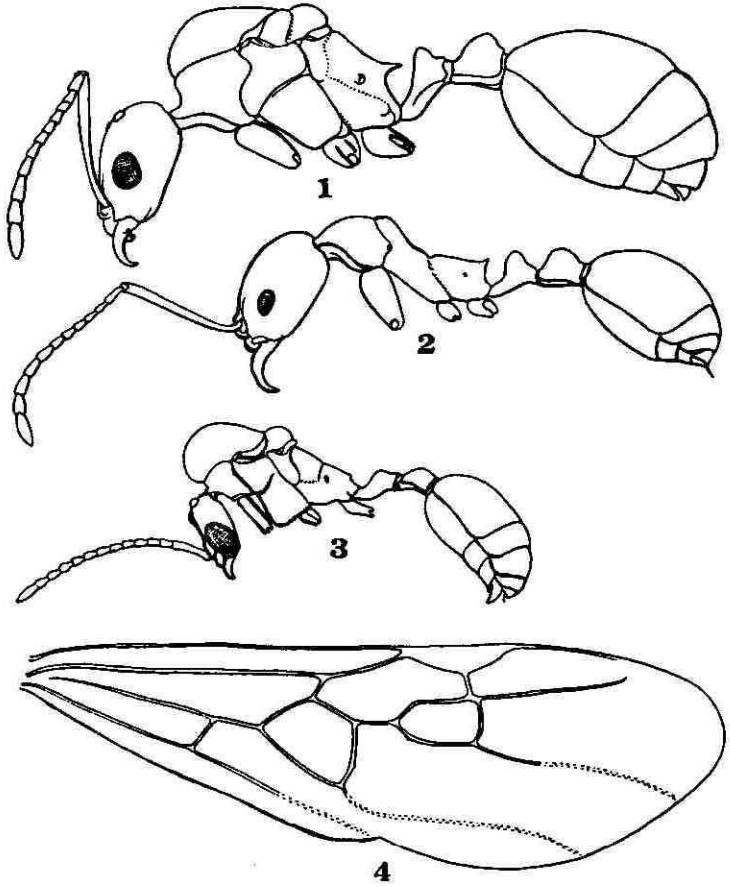

PLATE 8

Aphaenogaster texana Emery

1. Female 2. Worker
3. Male 4. Wing

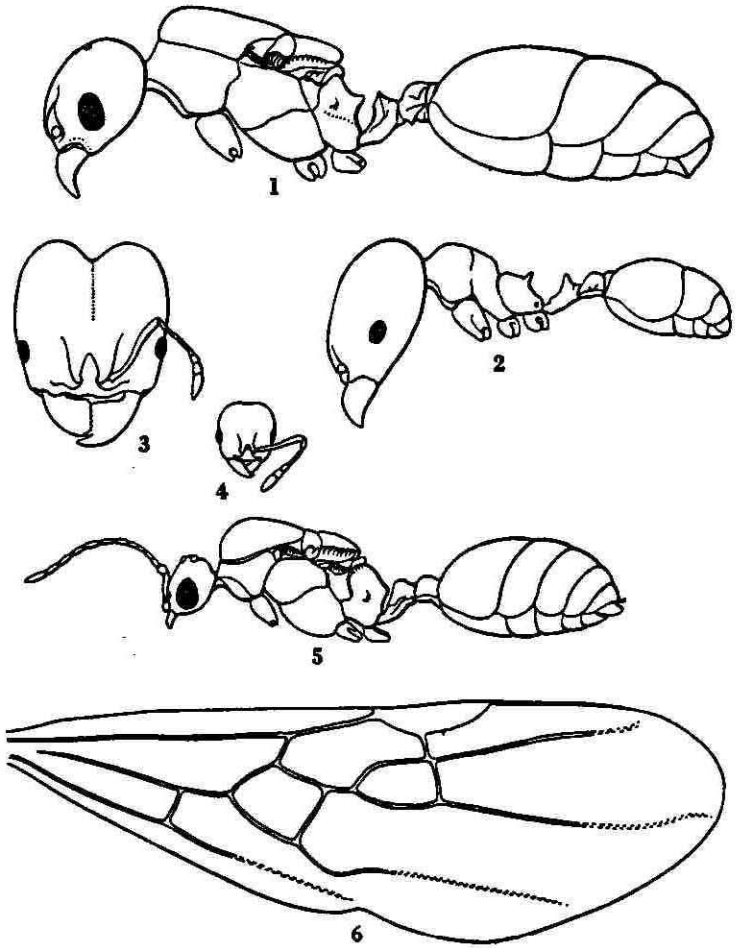

PLATE 9

Pheidole pilifera pacifica Wheeler

1. Female
2. Worker
3. Head of major
4. Head of minor
5. Male
6. Wing

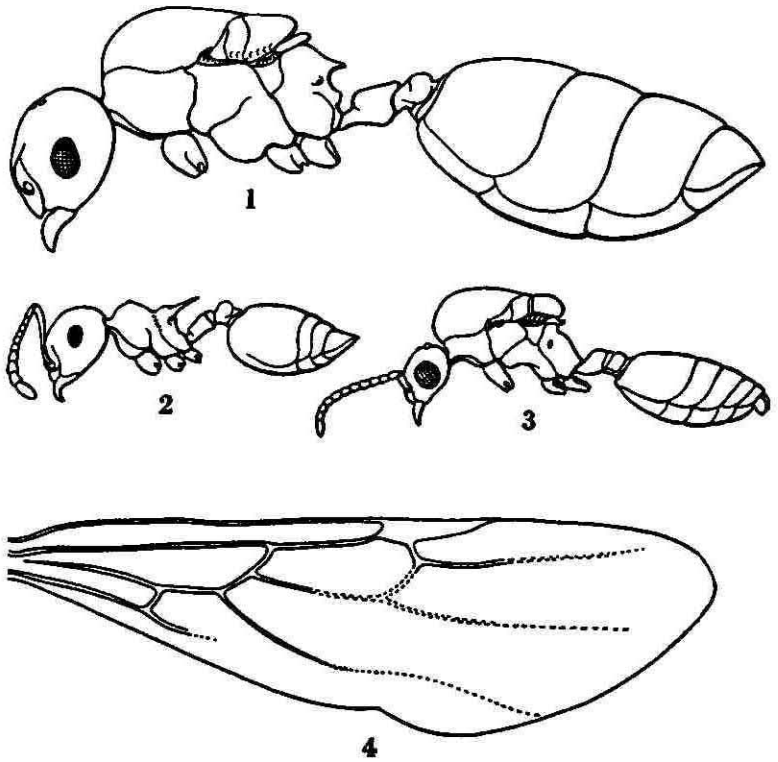

PLATE 10

Crematogaster atkinsoni Wheeler

1. Female
2. Worker
3. Male
4. Wing

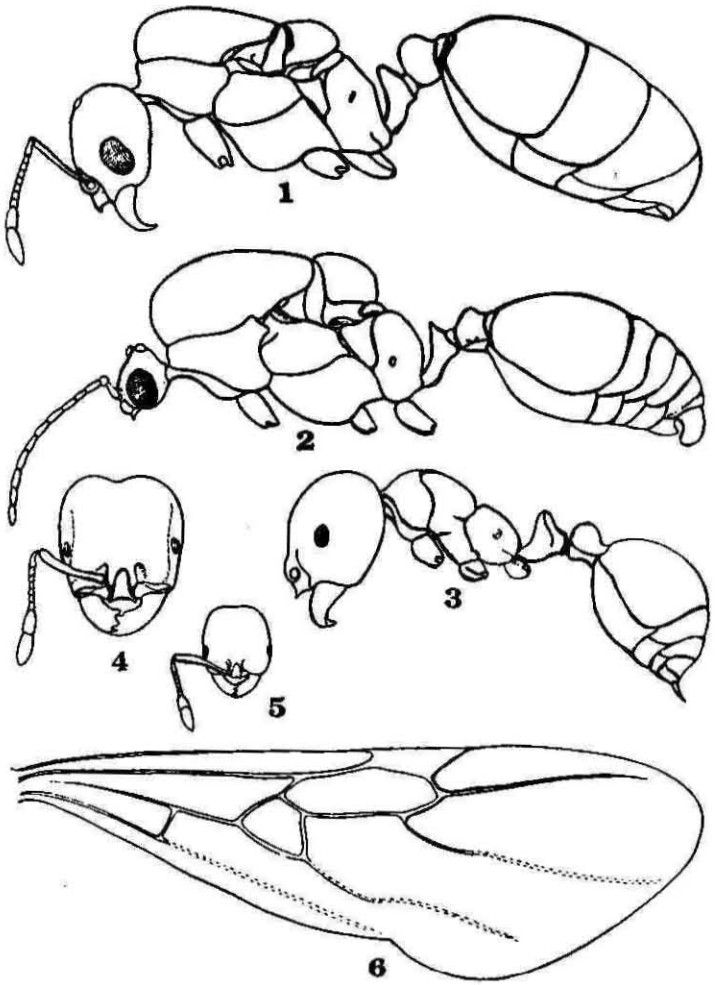

PLATE 11

Solenopsis aurea Wheeler

1. Female
2. Male
3. Worker
4. Head of major
5. Head of minor
6. Wing

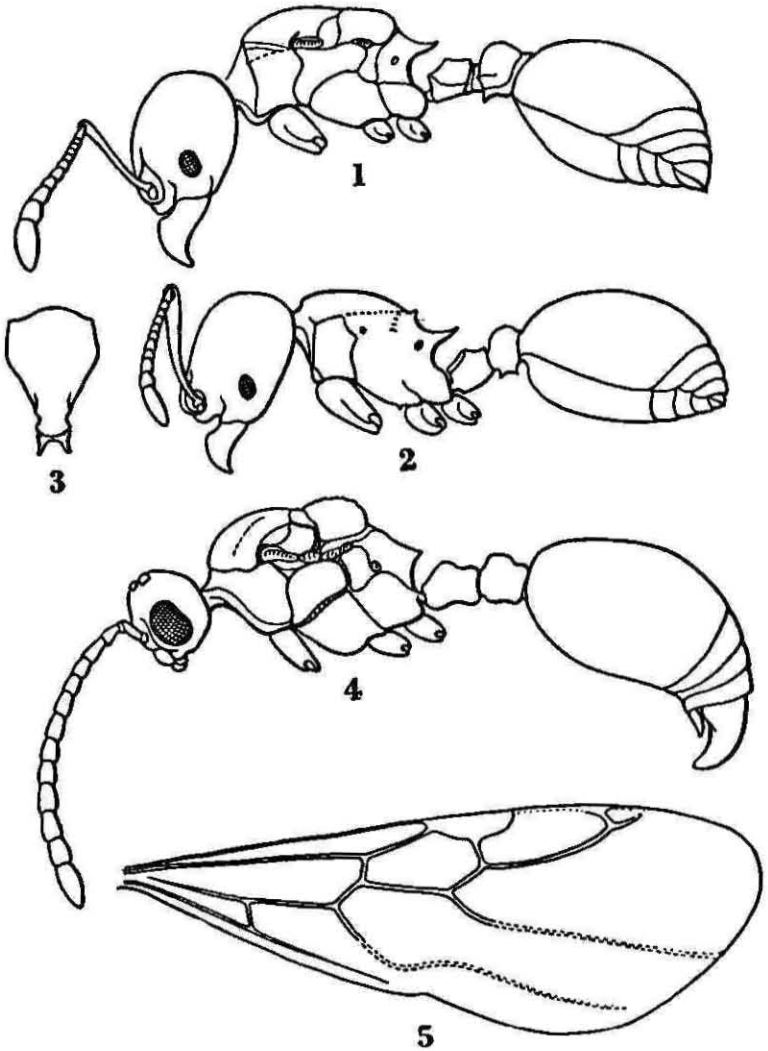

PLATE 12

Myrmecina americana Emery

1. Female
2. Worker
3. Thorax of Worker from above
4. Male
5. Wing

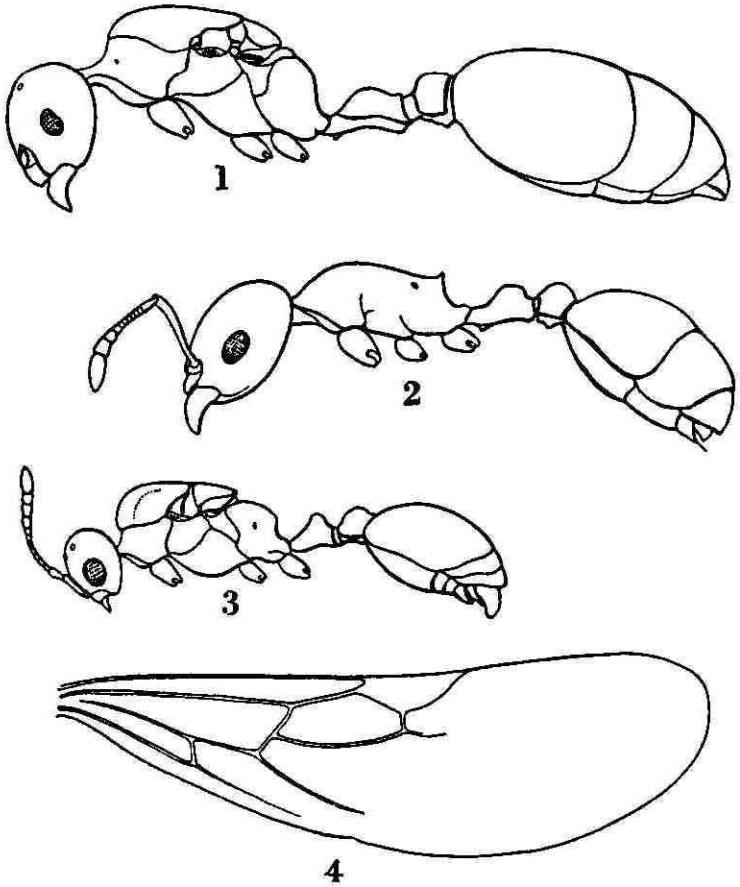

PLATE 13

Leptothorax obturata Wheeler

1. Female 2. Worker
3. Male 4. Wing

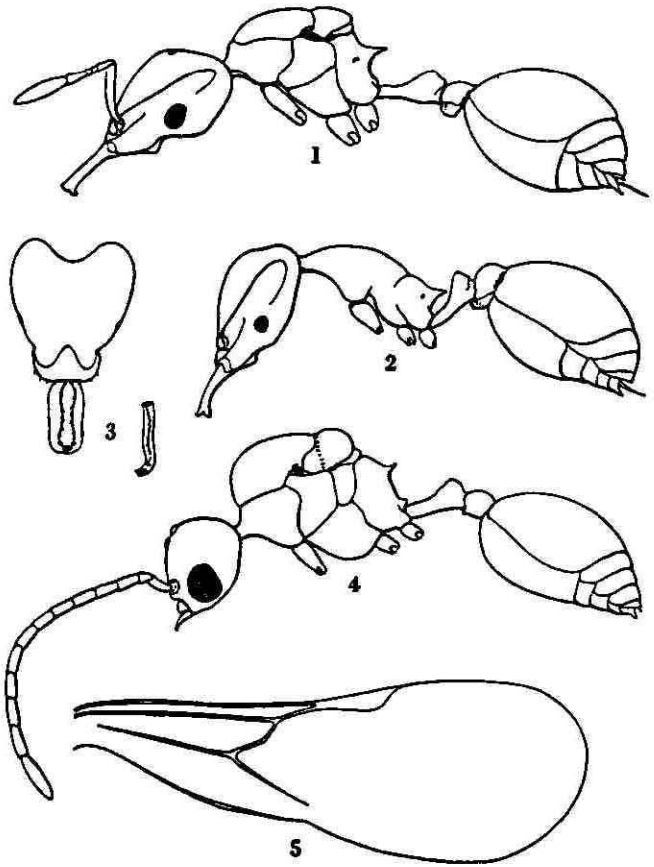

PLATE 14

Strumigenys louisianae Roger

1. Female 2. Worker
3. Head of worker from front, and mandible
4. Male 5. Wing

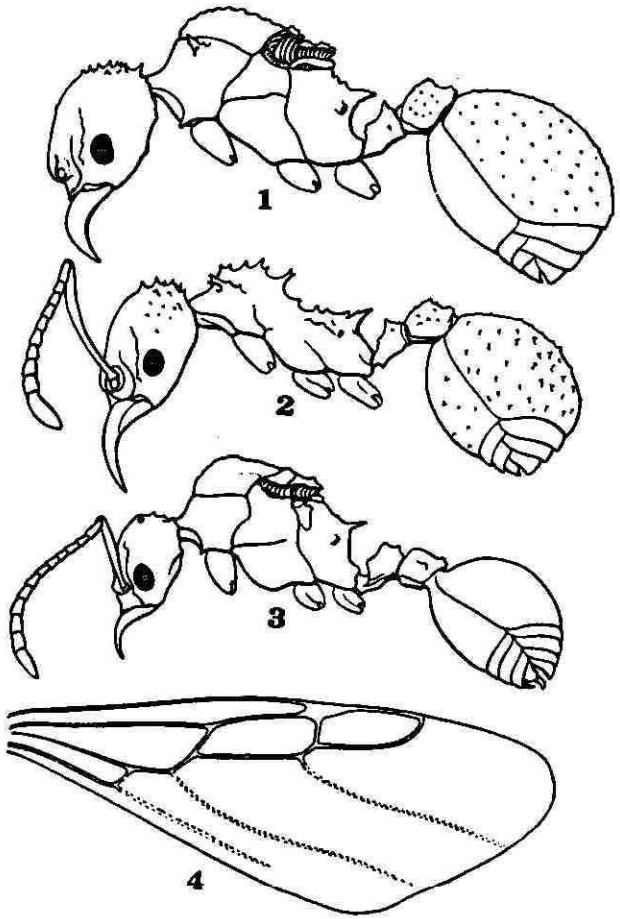

PLATE 15

Trachymyrmex septentrionalis Wheeler

1. Female 2. Worker
3. Male 4. Wing

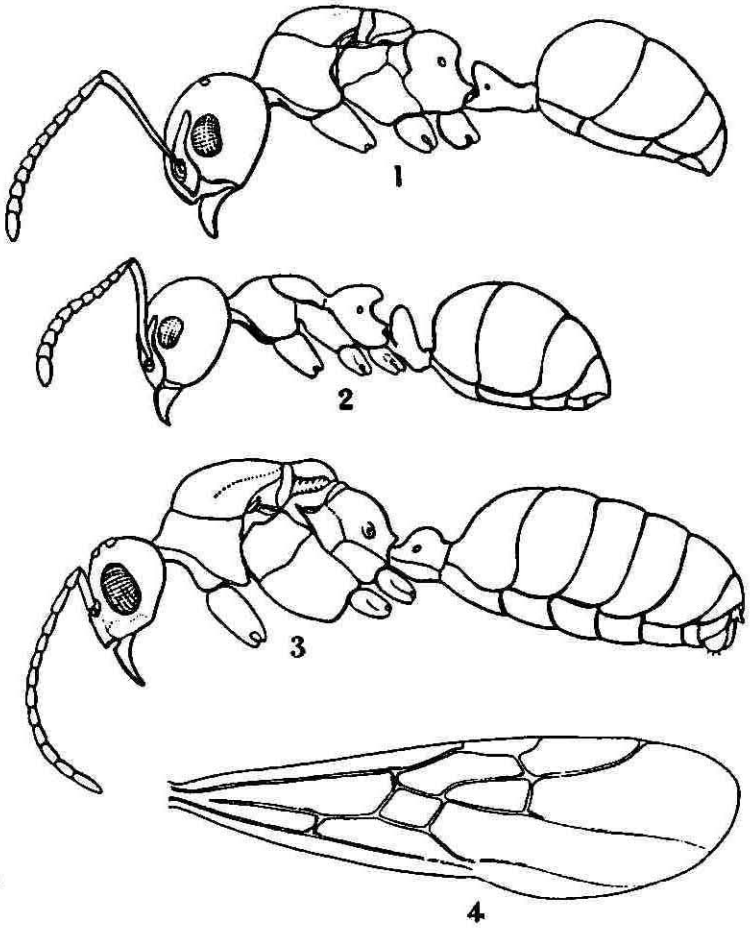

PLATE 16

Dolichoderus mariae Forel

1. Female 2. Worker
3. Male 4. Wing

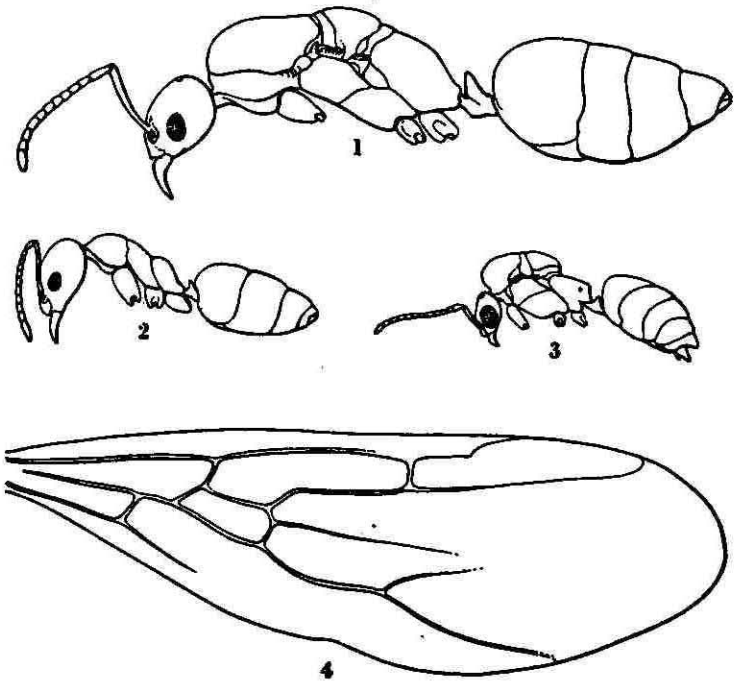

PLATE 17

Iridomyrmex pruinosus analis E. Andre'

1. Female 2. Worker
3. Male 4. Wing

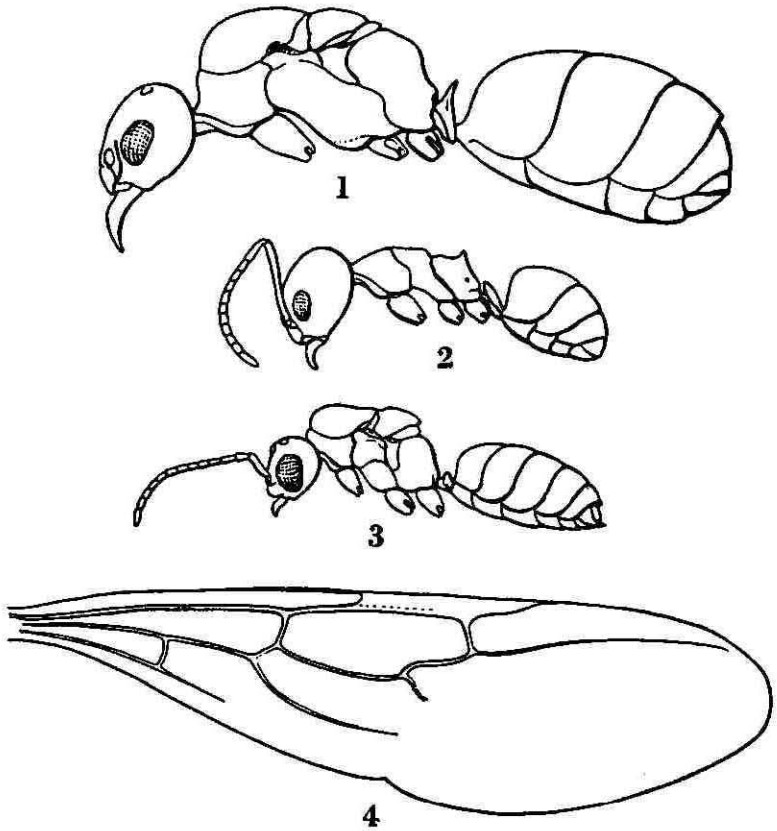

PLATE 18

Conomyrma insana (Buckley)

1. Female 2. Worker
3. Male 4. Wing

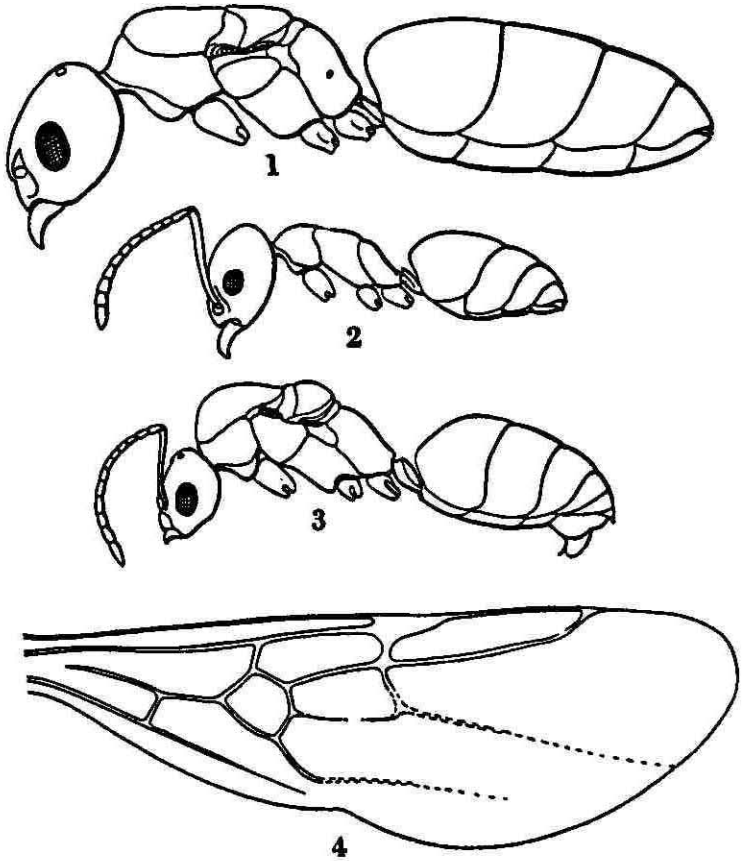

PLATE 19

Tapinoma sessile (Say)

1. Female 2. Worker
3. Male 4. Wing

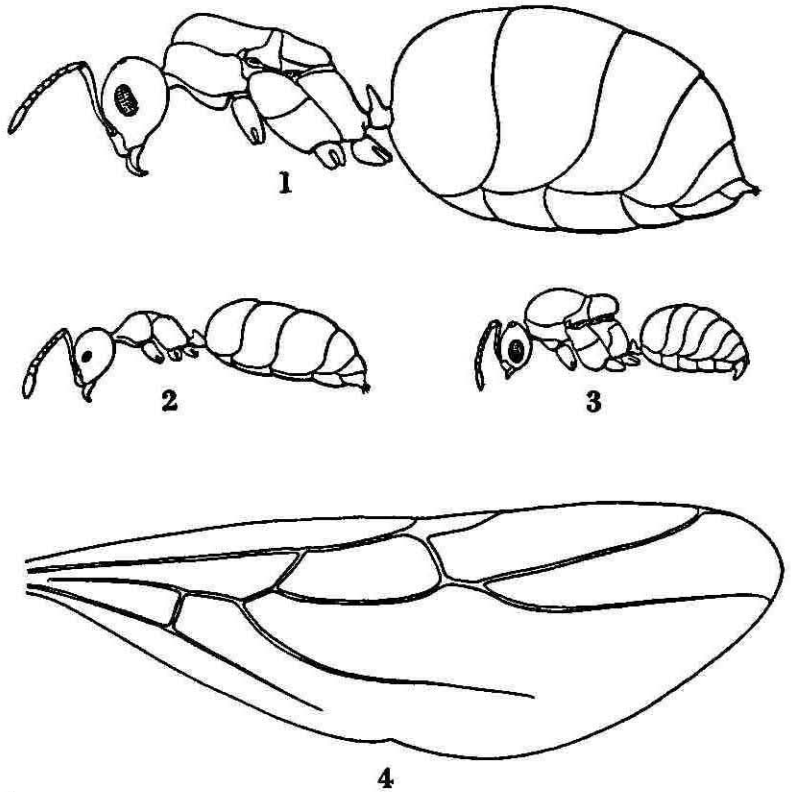

PLATE 20

Brachymyrmex depilis Emery

1. Female 2. Worker
3. Male 4. Wing

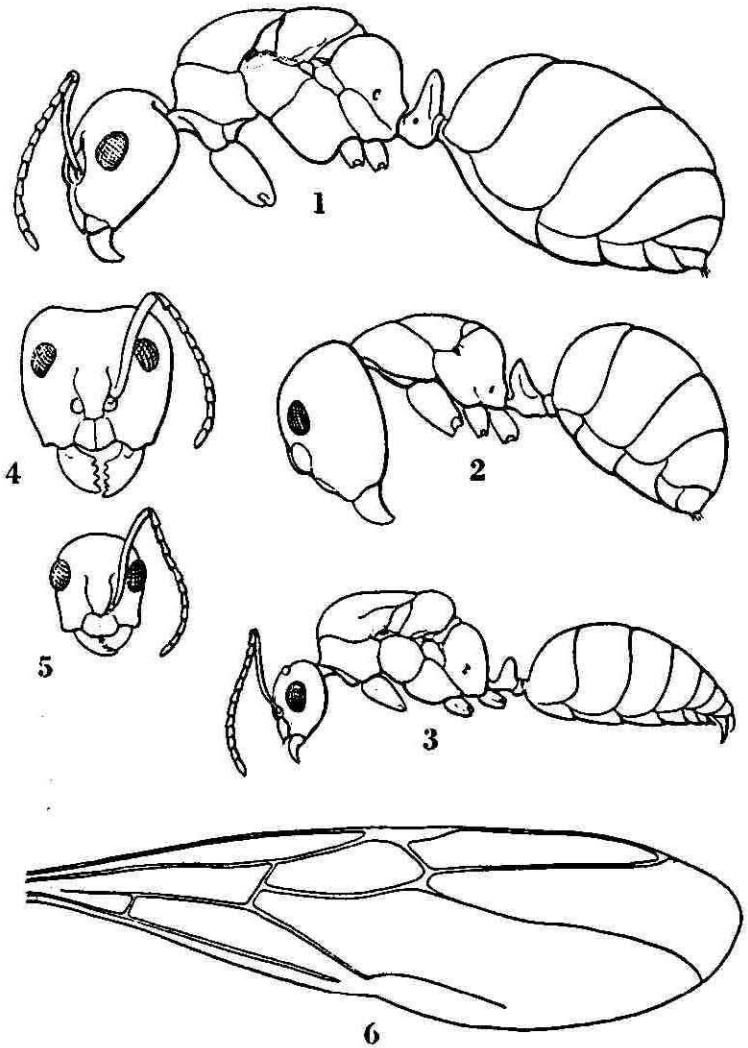

PLATE 21

Camponotus sansabeanus Buckley

1. Female 2. Worker 3. Male
4. Head of major, full face
5. Head of minor, full face
6. Wing

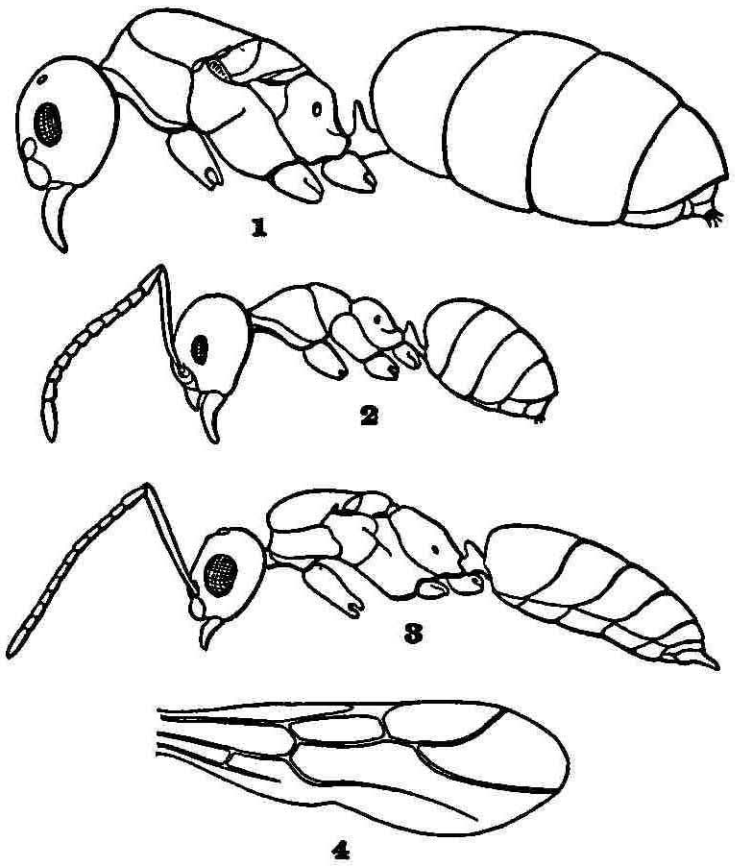

PLATE 22

Paratrechina bruesi Wheeler

1. Female 2. Worker
3. Male 4. Wing

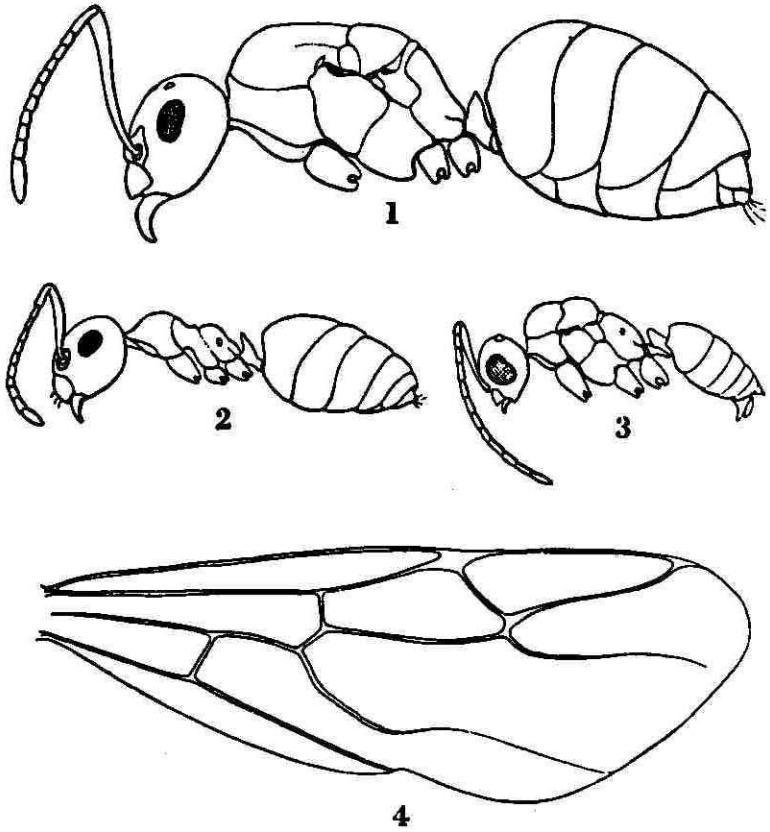

PLATE 23

Prenolepis imparis Say

1. Female 2. Worker
3. Male, subsp. californica Wheeler
4. Wing

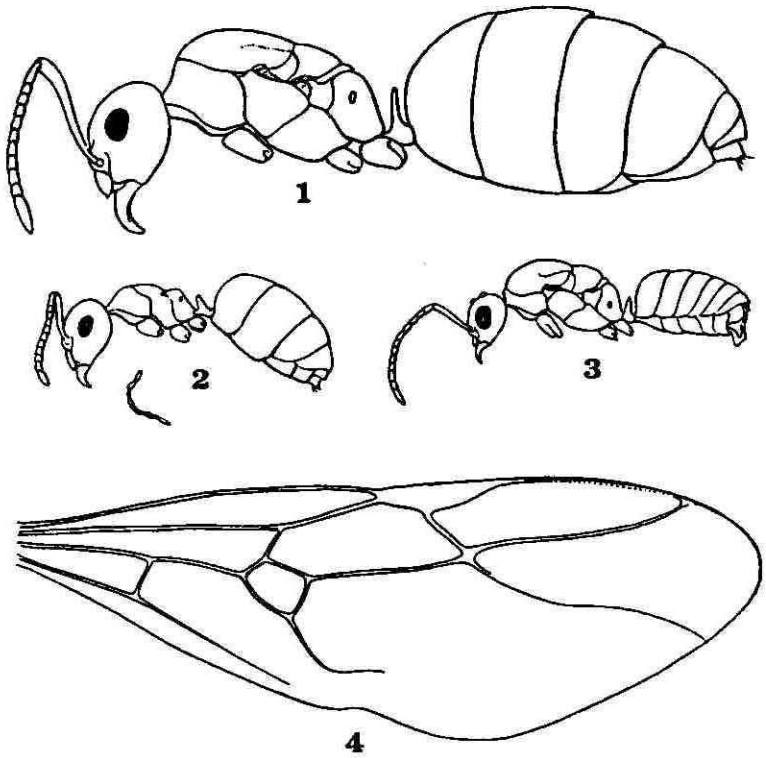

PLATE 24

Lasius alienus (Foerster)

1. Female
2. Worker and maxillary palp
3. Male 4. Wing

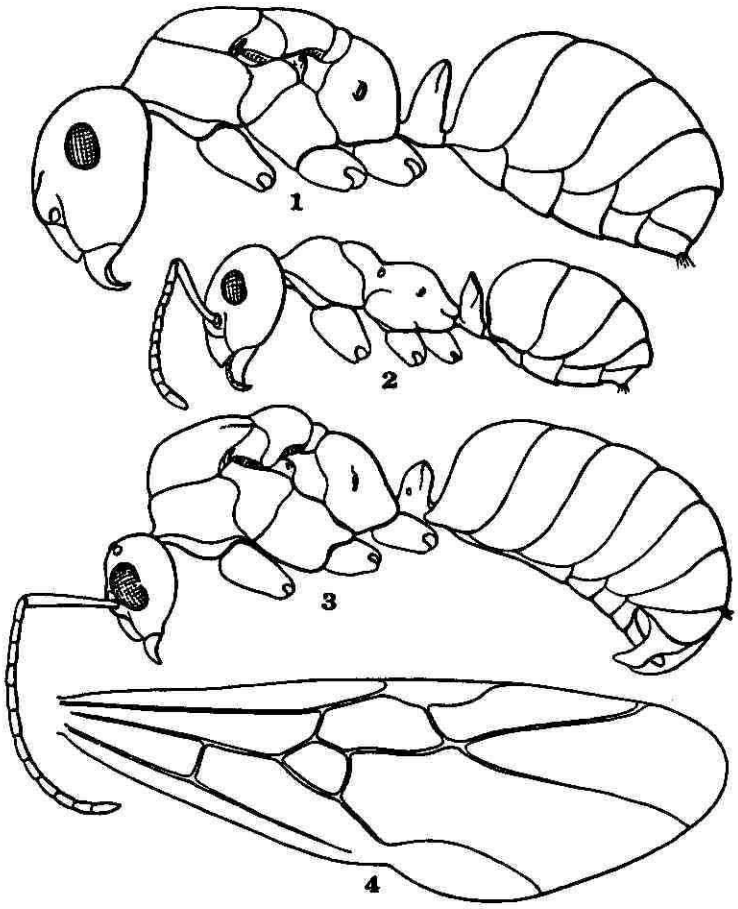

PLATE 25

Formica rubicundi Emery

1. Female
2. Worker
3. Male
4. Wing

References to Revisions and Keys to the Species of Ants on the Savannah River Plant*

Amblyopone: Creighton, W. S. 1940. A revision of the forms of Stigmatomma pallipes. Amer. Mus. Novitates 1079:1-8.

Proceratium: Snelling, R. R. 1967. Studies of California ants. 3. The taxonomic status of Proceratium californicum Cook. Los Angeles Co. Mus., Contrib. Sci. 124:1-10. (Key)

Brachyponera: single species in U.S., solitaria.

Crytopone: single species in U. S., gilva.

Ponera: Taylor, R. W. 1967. A monographic revision of the ant genus Ponera Latreille. Pacific Insects Monogr. 13:1-112. (world)

Hypoponera: Smith, M. R. 1936. Ants of the genus Ponera in America north of Mexico. Ann. Entomol. Soc. Amer. 29:420-430.

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*A majority of references in this list can be used to update the Keys to Species in Creighton (1950). The following two keys (with illustrations) to species can also be consulted:

Smith, M. R. 1965. House-infesting ants of the eastern United States. Technical Bulletin No. 1326, Agricultural Research Service, U. S. Dept. of Agriculture. 1-105 pp.

Van Pelt, A. F. 1948. A preliminary key to the worker ants of Alachua County, Florida. Fla. Ent. 30:57-67.

In addition, a list of North Carolina ants can be consulted:

Carter, W. G. 1962. Ant distribution in North Carolina. Jour. Elisha Mitchell Sci. Soc. 78:150-204.

See also Cole (1940), Smith (1943) and Smith (1947).

Hypoponera (Cont'd): Taylor, R. W. 1967. A monographic revision of the ant genus Ponera Latreille. Pacific Insects Monogr. 13:9-14.

Taylor, R. W. 1968. Nomenclature and synonomy of the North American ants of the genera Ponera and Hypoponera. Entomol. News 79:63-66.

Neivamyrmex: Smith, M. R. 1942. The legionary ants of the United States belonging to Eciton subgenus Neivamyrmex Borgmeier. Amer. Midl. Nat. 27:537-590.

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GLOSSARY*

(Refer to Plates 1 and 2)

ABDOMINAL PEDICEL: The one or two basal segments of the abdomen between the epinotum and gaster.

ANTENNA: The segmented, flexible appendage articulated to the head on the external side of the frontal carina and posterior to the clypeus.

ANTENNAL CLUB: The very much enlarged or clublike distal segments of the funiculus; may be composed of two or more segments, commonly two-or three segmented.

ANTENNAL FOSSA: The concavity or socket in the head in which the base of the antenna is articulated.

ANTENNAL INSERTION: Literally, the place where the base of each antenna is articulated to the head.

ANTERIOR BORDER OF CLYPEUS: The anterior margin of the clypeus above the mandibles and between the cheeks.

ARMED: Bearing a pair of spines, or toothlike projections.

CARINA (pl., carinae): An elevated ridge or keel of varying height and sharpness.

CLOACAL ORIFICE (terminal, circular, surrounded by a fringe of hairs): The cone-shaped structure with a circular opening surrounded by a fringe of hairs at the apex of the gaster.

CLOACAL ORIFICE (transverse, ventral, slit-shaped, without a fringe of hairs): This structure can be observed when the ventral surface of the gaster is exposed; it is then seen as a transverse slit without a fringe of hairs, which is located in front of the apex of the gaster.

* A majority of the definitions are taken from or modified from Smith (1965).

CLYPEUS: That portion of the head bounded anteriorly (below) by the labrum, posteriorly (above) by the frons, and laterally by the cheeks.

DECLIVIOUS FACE OF EPINOTUM: The posterior surface of the epinotum; the area which is in front of the petiolar node, usually inclined.

DECLIVITY: Gradual descent or slope.

DENTICULATE: Extremely small, often not clearly discernible, teeth on the masticatory border of the mandible; the same border may contain both teeth and denticulae.

DIMORPHIC: Literally two forms; the term applies to worker ants having two distinct sizes and shapes, a large major worker or soldier and a smaller, normal worker. The genus Pheidole is noted for its dimorphic workers.

DORSUM: The upper surface.

EPINOTUM: That part of the thorax behind the mesoepinotal suture; in worker ants the term is loosely applied, since the region morphologically is composed of two segments, an anterior metathorax and a posterior epinotum.

FACET: The external surface of an ommatidium; one of the seeing units composing the compound eye.

FRONTAL CARINA: The longitudinal ridge on the inner side of the insertion of the antenna.

FUNICULUS: All of the antenna excluding the scape.

GASTER: That portion of the abdomen behind the petiole in ants with a single-segmented petiole, and behind the postpetiole in ants with a two-segmented petiole.

MANDIBLE: One of the pair of biting jaws lying below or anterior to the clypeus, the masticatory border of which bears teeth.

MARGINED: With a sharp or keel-like lateral edge.

MAXILLARY PALPUS (or palp): One of the paired, segmented, feelerlike structures beneath the front portion of the head, anterior and lateral to the labial palpus; it is normally longer than the labial palpus.

MESOEPINOTAL SUTURE: The suture separating the mesonotum from the epinotum.

MESONOTUM: The dorsal surface of the mesothorax.

MESOTHORAX: The second segment of the thorax; the segment bearing the second pair of legs.

MONOMORPHIC: Of one form.

OCELLUS (pl., ocelli): A small, single-lens eye located on the vertex of the head, usually three in a triangle; ocelli are not present on worker ants of all species.

OCCIPITAL MARGIN: The hind margin of the head.

OMMATIDIUM: (pl., ommatidia). One of the visual units comprising a compound eye.

PETIOLAR NODE: The greatly enlarged portion of the petiole. The node may be of diverse sizes and shapes.

PETIOLAR SCALE: The node is narrow and upright or inclined.

PETIOLE: A pedicel composed of only one segment, or the first segment of a two-segmented pedicel.

POLYMORHPIC: Many forms. The term refers to those species of ants having minor, intermediate, and major workers; ants of the genus Camponotus are excellent examples.

POSTPETIOLE: The second or posterior segment of a two-segmented pedicel.

PROMESONOTAL SUTURE: The suture separating the pronotum from the mesonotum; it may be well developed or more or less obsolescent.

PROMESONOTUM: The combined pronotum and mesonotum.

PRONOTUM: The dorsal surface of the prothorax.

PSAMMOPHORE: Beard; referring to the long hairs beneath the head which are arranged in a comblike series.

SCAPE: The greatly elongated first segment of the antenna; it lies between the funiculus and the articulation of the antenna to the head.

SPIRACLE: An external opening of the respiratory system.

TIBIA: The fourth division of the leg; the slender segment between the femur and first tarsal segment.