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# The Great Basin Naturalist

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## ANTS OF UTAH

Dorald M. Allred<sup>1</sup>

**ABSTRACT.**— Distribution records, including 26 maps of specific collection localities and counties are given for 169 species in 29 genera of ants known to occur in Utah. In some cases intraspecific and interspecific morphological variations and behavior are noted. Taxonomic keys are included for the identification of subfamilies, genera, and species.

Like others who have traversed and studied in the deserts of the western United States and seen the cleared areas around the mounds of harvester ants along roadways, or their patterns of occurrence from an aircraft, I have had a desire to learn more about them and their distribution in Utah. Little published information is existent about the ecological distribution of any species of ant in the state. In 1979 I traveled 4000 miles and in 1980 1300 miles along many of the roads of Utah collecting harvester ants (Map 27). My intent to study only the harvesters gave way to basic training as an entomologist to collect specimens wherever and whenever the opportunity arose. Thus, I collected other ants whenever possible. My intent to report only on the harvesters weakened when it became evident from the literature and a study of the specimens in the collections of the universities in Utah that an accumulation of the distributional data for all of the known species of the state would benefit scientists in a variety of disciplines. Together with Rees and Grundmann (1940), who listed 57 species of 18 genera, and Cole (1942), who listed 64 species of 21 genera, this is the third state-wide treatment of the ants of Utah. It treats

169 species in 29 genera. This should serve as a basis and stimulus for others to study these interesting arthropods in Utah, where a paucity of information exists concerning many species, particularly their natural history.

### REVIEW OF LITERATURE

Earliest reports of ants from Utah were made by Cresson (1874). Garrett (1910) listed some honey ants (*Myrmecocystus*) from the state. Grundmann (1939, 1958) studied the ants of Salt Lake County as part of an unpublished master's thesis and published an annotated list of ants of the Glen Canyon Reservoir area as part of archaeological and biological surveys of that region prior to its being filled with water. Rees and Grundmann (1940) published the first *Ants of Utah* based on specimens and data contained in collections of the Department of Biology at the University of Utah. Some of their records are of collections that date back as far as 1902. Cole (1942) published the second *Ants of Utah* based on collections he made, as well as ants sent to him from the University of Utah and Utah State University. Hayward (1945) listed ants taken in a study of the biotic com-

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munities of some mountains of Utah. Knowlton (1946, 1963, 1970, 1975) reported on birds feeding on ants, discussed harvester ant control, and published lists of ants collected in Curlew Valley in northern Box Elder County as part of the Desert Biome Studies of the International Biological Program. Knowlton and Nye (1946) reported on lizards feeding on ants. James (1949) made an ecological study of the ants of Red Butte Canyon in eastern Salt Lake County. Bohart and Knowlton (1953) studied the food habits of the western harvester ant. Ingham (1959, 1963) studied the ants of the Virgin River Basin in extreme southwestern Utah, encompassing primarily Washington County, the southern part of Iron County, and the western end of Kane County, and compared the ecological distribution of ants in 18 biotic communities of the Great Basin region in Iron County with the Mohave Desert in Washington County. Beck et al. (1967) published a record of predaceous-scavenger ants of Utah collected during 20 years of trapping rodents as part of a study on the parasitic arthropods of the state. Allred and Cole (1979) published on ants collected in southeastern Utah as part of an ecological study on the environmental impact of electric generating plants in that area. Allred (1980) published notes on the swarming activities of harvester ants as part of his observations contributing to this present paper. Other workers have published incidental records of Utah collections and dealt with species known to occur in the state. Notable among those who have published major works are Olsen (1934), Weber (1947), Creighton (1950), Wilson (1955), M. Smith (1957), Gregg (1963), Wheeler and Wheeler (1963), Buren (1968), Cole (1968), Wing (1968), Francoeur (1973), Snelling (1973, 1976), and D. Smith (1979).

#### METHODS

Utah demonstrates a tremendous variety of ecological habitats, from barren clay hills to sand dunes, from Lower Sonoran desert to montane forests and alpine situations. Within any ecological zone the variety of plant habitats varies extensively, frequently within a short distance.

Most of my collecting was done in desert and low elevation habitats that were acceptable to harvester ants. Little time was spent in cultivated areas, in cities, around domestic dwellings, or in mesic habitats other than some montane forests. In the latter case, relatively little collecting was done in coniferous forests except alongside roads that were connecting links enroute to other harvester ant habitats. Most collections were made adjacent to roads, some of which were major highways, others essentially "cow trails." Specific collecting stops were made approximately every 10 miles when plant communities appeared to be generally uniform over long distances. In areas of frequent vegetative change, or where a distribution borderline was suspected to occur, stops were made every 5 miles. Within these distance guidelines in harvester ant areas, the criterion for a specific site stop was the presence of a harvester mound alongside the road. Otherwise, distance stops were rather strictly held to, and a search was made for any ant colony or single individuals at that particular mileage point. Mileages related to a city were measured from the "entering 'city'" sign at the city limits. Where colonies (nests) could be located, little attention was given to single individuals apart from a nest unless they appeared to be of a different species.

Where possible, a large series of workers (20 or more) was taken, as well as winged males and females and immature stages that were present. Large series are desirable because intraspecific variation in workers of some species is significant, and having all sizes of workers is important for identification. When a sizable series was taken, some were mounted on pins (usually indirectly on paper tips) and others preserved in 70 percent ethyl alcohol. If only a few were taken, then all were stored in alcohol. Manipulation of mandibles, antennae, and legs is necessary for observation of some taxonomic characters in many instances, and dried, pinned specimens are too brittle for such manipulation without significant damage to the specimen.

Mounds or burrows were shallowly excavated only sufficient to collect representative samples, or in the case of the harvesters to

determine the presence of winged and immature forms. Relatively few excavations were made under rocks or logs where colonies were exposed by removal of that protective cover.

Most ants were retrieved with an aspirator with a large rubber bulb as the vacuum source, an especially useful tool for collecting most of the species. Blowing air from the bulb into the entrance of the nest of some harvesters usually resulted in a "boiling" of the workers from the entrance, and collection of a series required less than a minute. Other species were not so affected, and some, especially in the genus *Formica*, clung tenaciously to the substrate, whereas others attempted to hide under debris or in an exposed tunnel and were picked up with fingers or forceps.

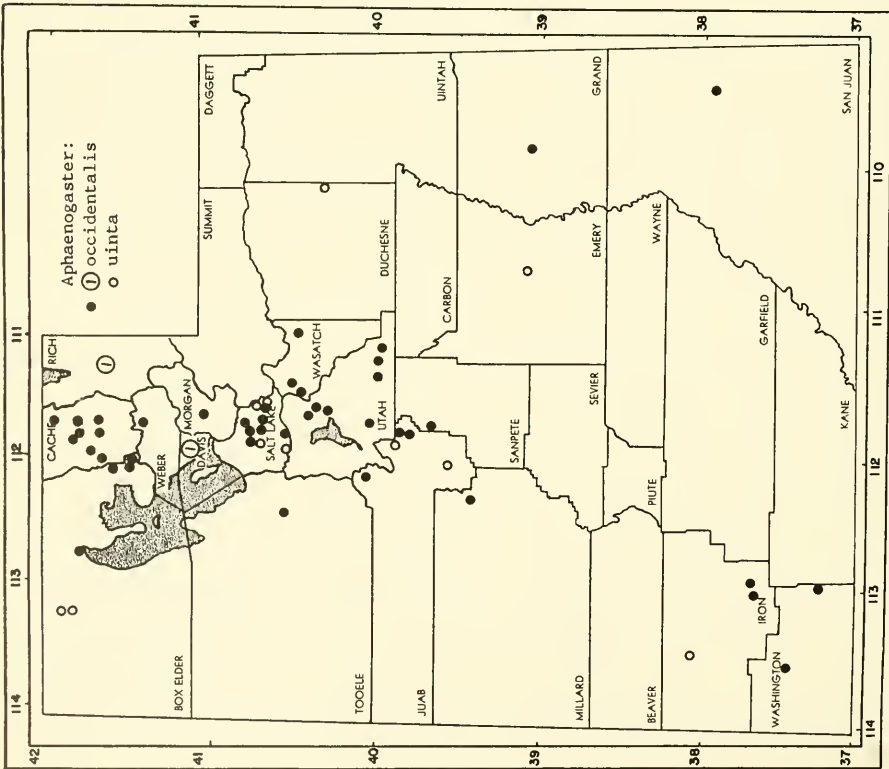
Based on listings and distribution of collection localities, counties that apparently have been most thoroughly collected, likely because of the presence of a major university in the vicinity, are Cache County (except the mountainous southeastern part) by Utah State University, Salt Lake County (except the western and northwestern parts, which are primarily mountainous and salty, mesic areas, respectively) by the University of Utah, and Utah County (except the southwestern part, which is partly mountainous area) by Brigham Young University. Southeastern Iron County, central and eastern Washington County, and western Kane County were fairly well collected by Ingham (1959) in studies for his master's thesis. Plotting of all of the collection localities listed for the state shows an interesting distribution pattern (Map 28). Comparatively speaking, relatively little of the state has been adequately collected, even within many collected (unshaded) areas of the map. The southern and northern areas of Box Elder and Tooele counties, respectively, are covered by salt flats of the Great Salt Lake desert and would be expected to have only rather isolated habitats favorable for ants, such as some of the knolls and mountains above the level of the perennial salt deposits. Other noncollected areas of the state are mountainous, plateau, or desert areas not readily accessible except by four-wheel drive vehicles, horseback, or walking. However, even in some of those areas, limited access is possible because of the building of many

roads for mineral explorations in recent years.

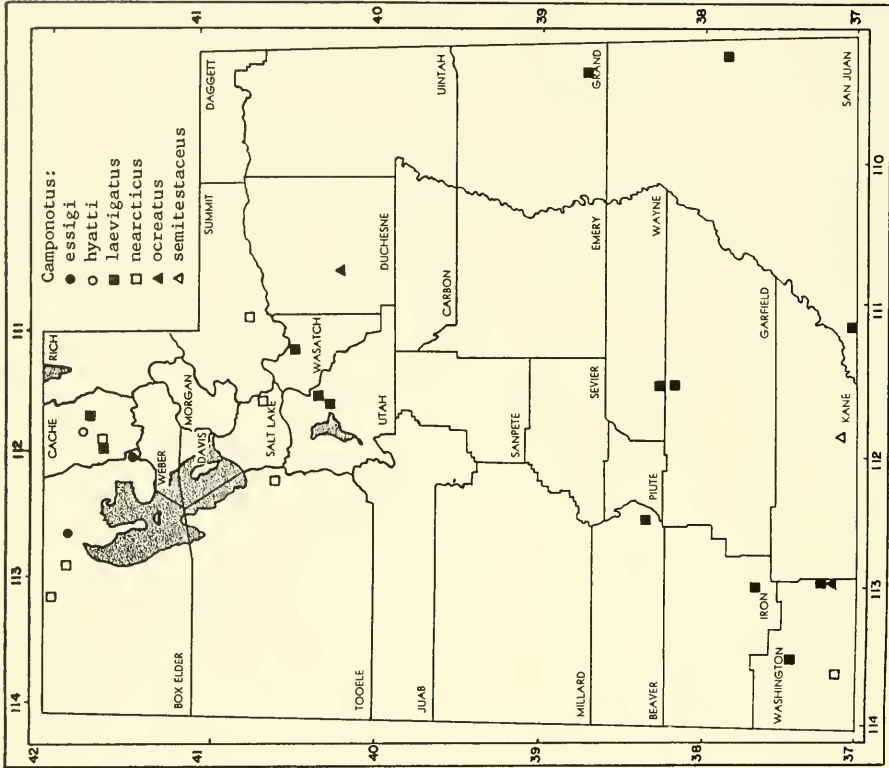
Some areas visited demonstrated a uniqueness of abundance or absence of ants. In the plateau areas of southern Utah where sandstone was the predominant exposed strata, no ants were found under sandstone slabs or boulders, whereas in other parts of the state other types of rocks most frequently sheltered ant colonies. Perhaps one reason for their absence under sandstone was the dryness of the area and inability of the porous sandstone to maintain a moist habitat underneath. In coniferous forest areas where almost pure stands of lodgepole pine occurred, extensive searching in and under fallen logs failed to disclose more than a few ants of any species, particularly the carpenters. In one particular area 13.4 miles north of Utah Highway 121 on the Dry Fork-Red Cloud Loop road in the foothills of the Uinta Mountains in northern Uintah County at an elevation of 7000 ft, a greater diversity of ants was encountered than in any other place in the state. The specific site was a west-facing slope that was covered with many medium-sized to large boulders in a dense stand of sagebrush and snowberry. Ingham (1963) indicated that in southern Utah the greatest numbers of species occur in sagebrush, rabbitbrush, and juniper habitats. About half as many species were found in more alkaline situations supporting greasewood, shadscale, and saltbush. Fewest species were found in Sonoran habitats supporting Joshua trees, creosote bush, and bur sage.

#### Systematics

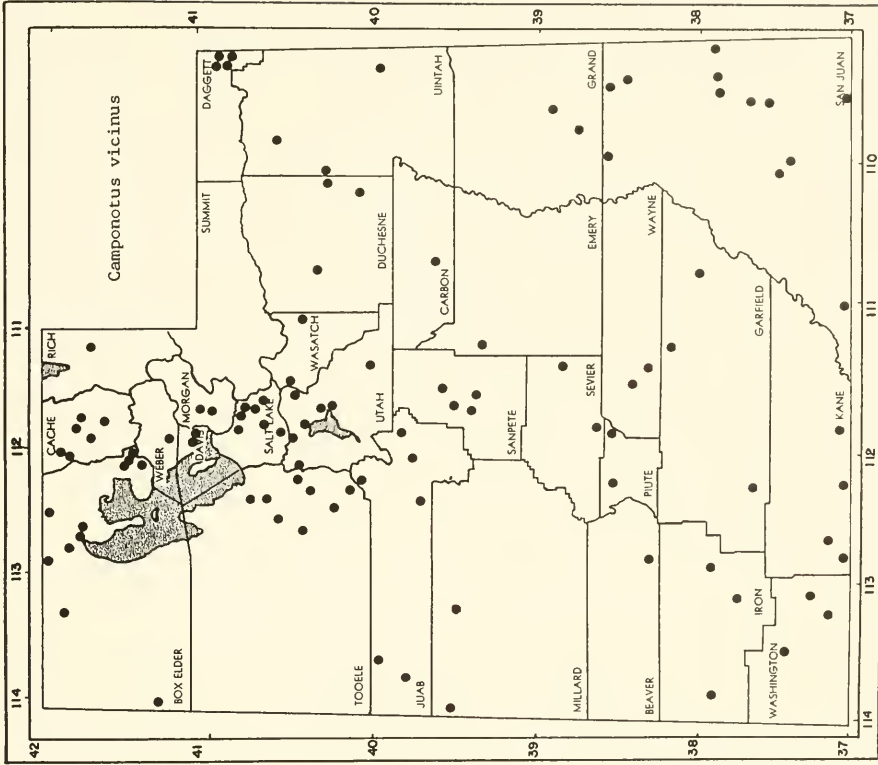
The listing of species in the main body of the report follows Creighton (1950) and Smith (1979) except that I have dropped their subspecies designations. In the keys I have included subspecies and varieties only to their specific level. This is not intended to indicate synonymy, but is only for convenience and brevity. Likewise, species, subspecies, and variety names and references applicable to them (except for the first reference that cites the description of the species) listed immediately under the centered species headings in the body of the report are as recorded in published and



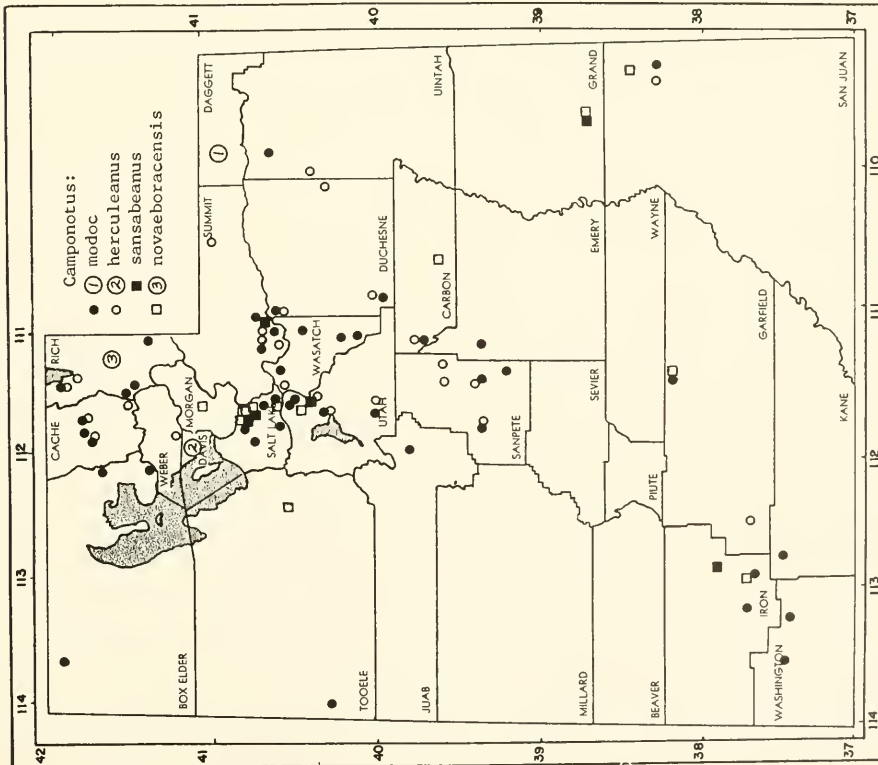
Map 1. Distribution of *Aphaenogaster occidentalis* and *uinta* in Utah. Number in circle indicates specific plot in county unknown.



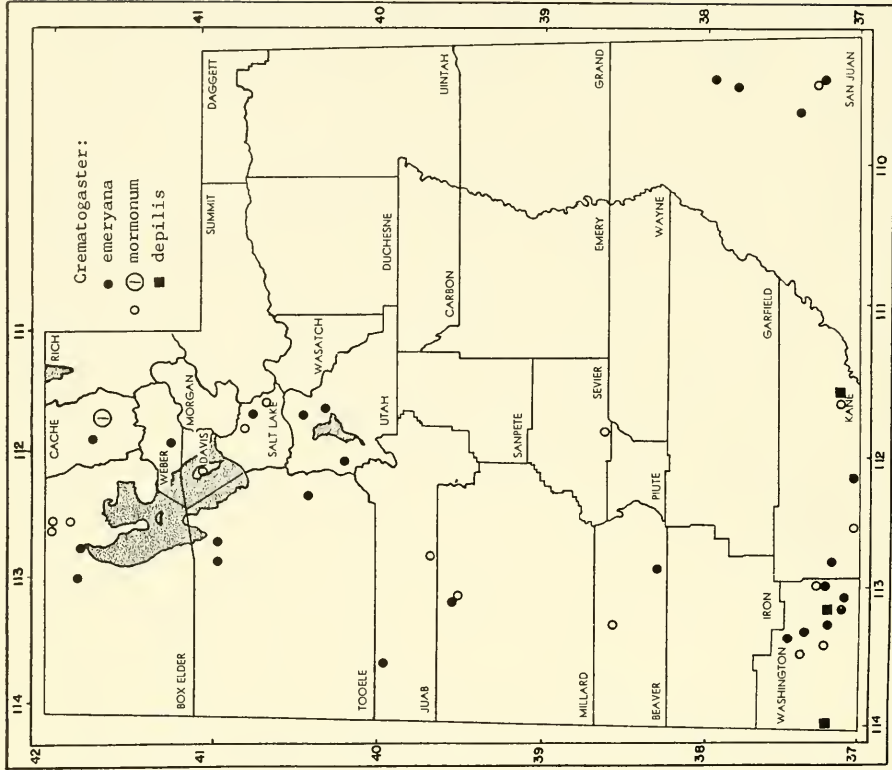
Map 2. Distribution of *Camponotus essigi*, *hyatti*, *laevigatus*, *nearcticus*, *ocreatus*, and *semitestaceus* in Utah.



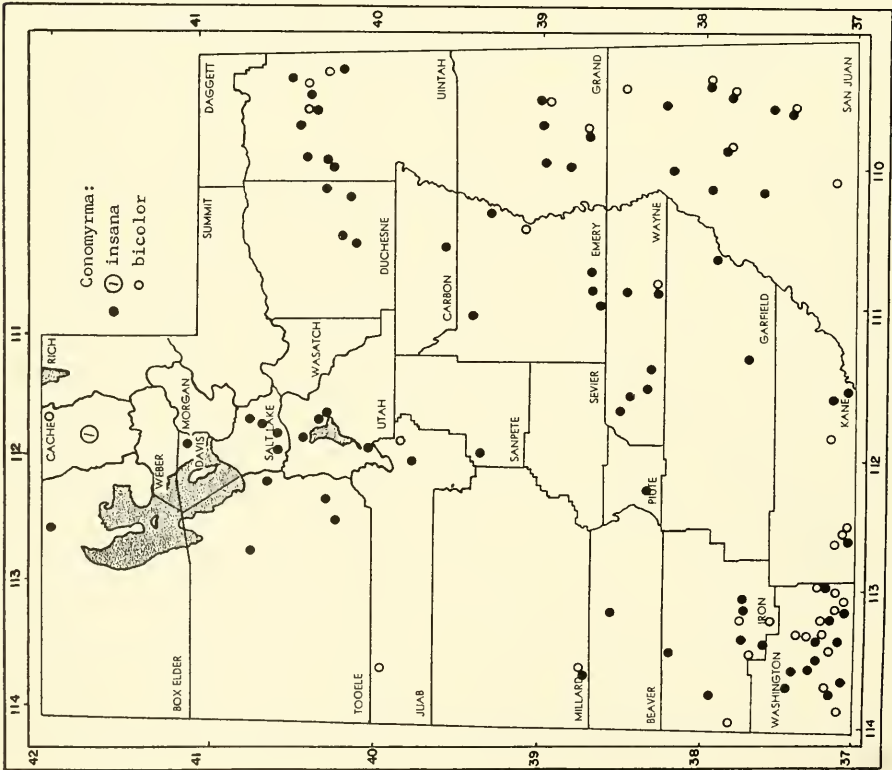
Map 4. Distribution of *Camponotus vicinus* in Utah.



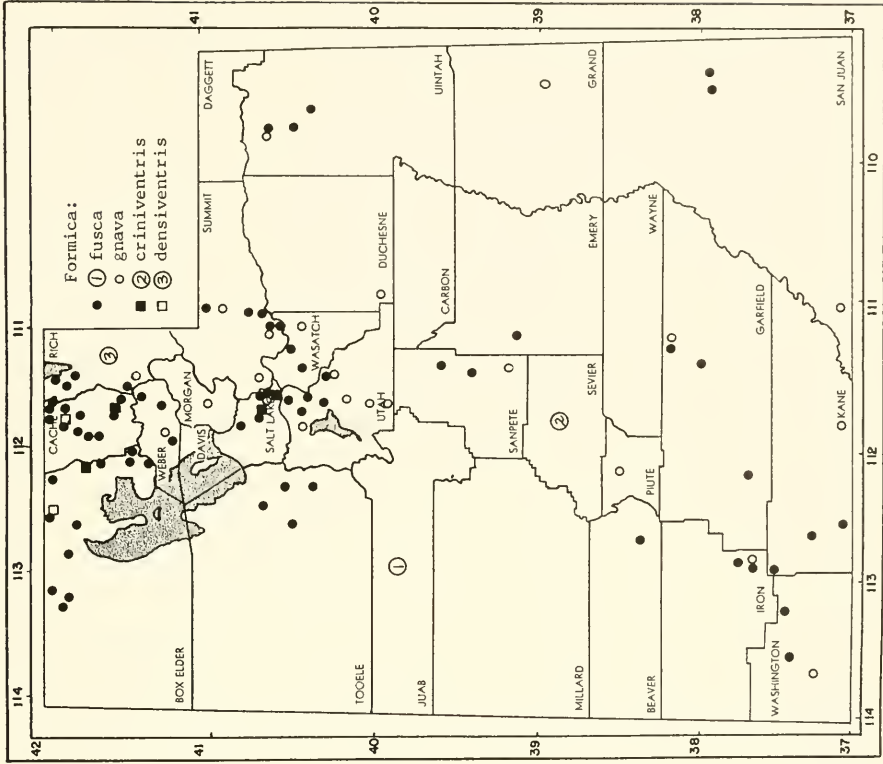
Map 3. Distribution of *Camponotus herculeanus*, *modoc*, *novaeboracensis*, and *sansabeanus* in Utah. Number in circle indicates specific plot in county unknown.



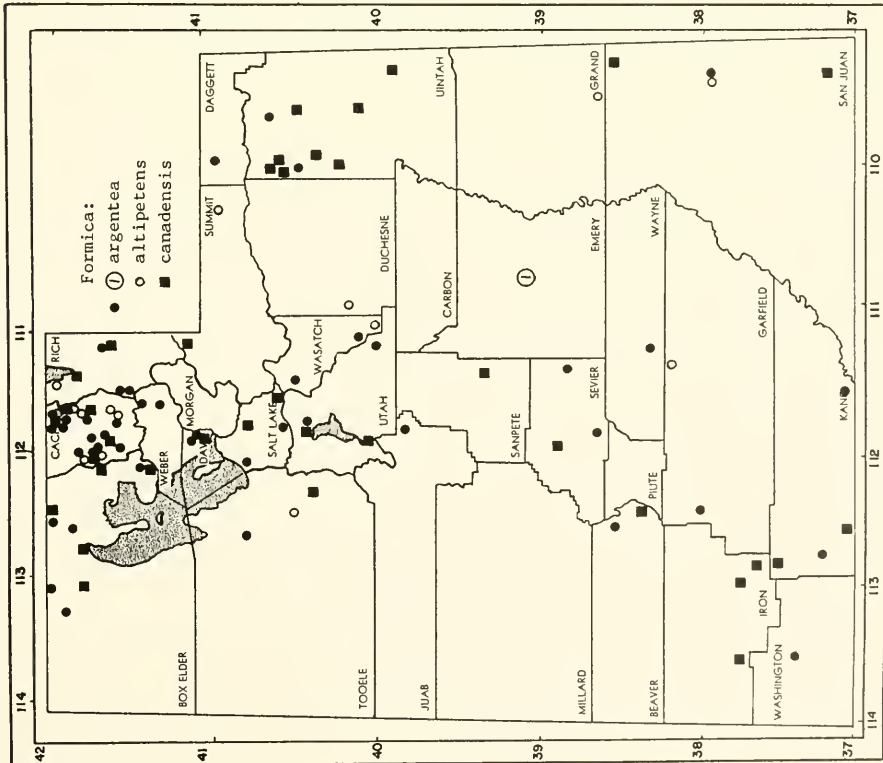
Map 6. Distribution of *Crematogaster depilis*, *emeryana*, and *mormonum* in Utah. Number in circle indicates specific plot in county unknown.



Map 5. Distribution of *Cononyma bicolor* and *insana* in Utah. Number in circle indicates specific plot in county unknown.

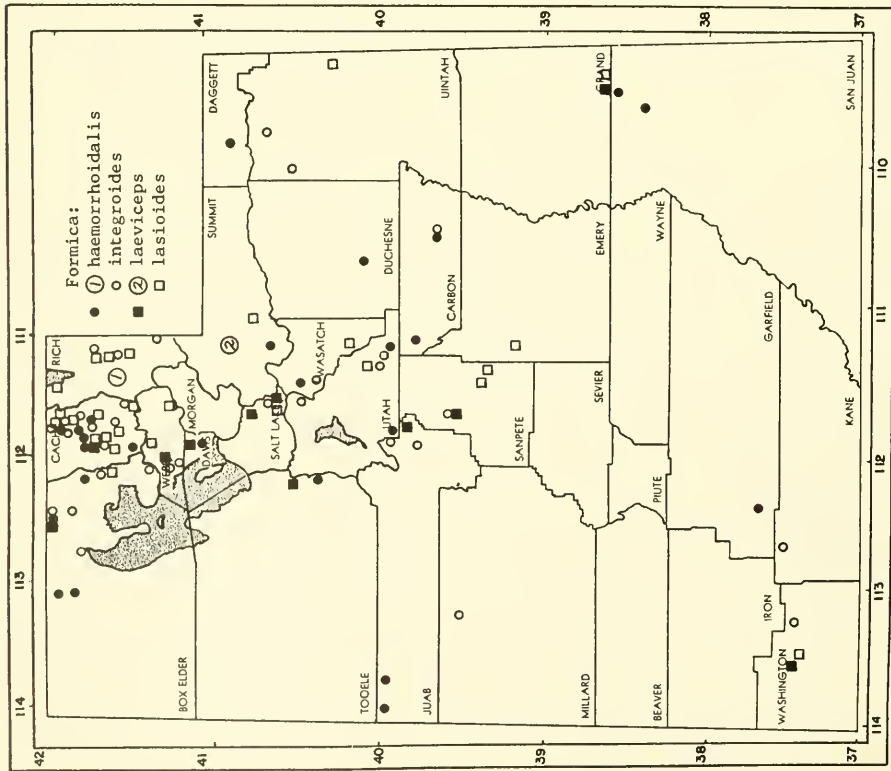


Map 8. Distribution of *Formica crinitiventris*, *densiventris*, *fusca*, and *gnava* in Utah. Number in circle indicates specific plot in county unknown.

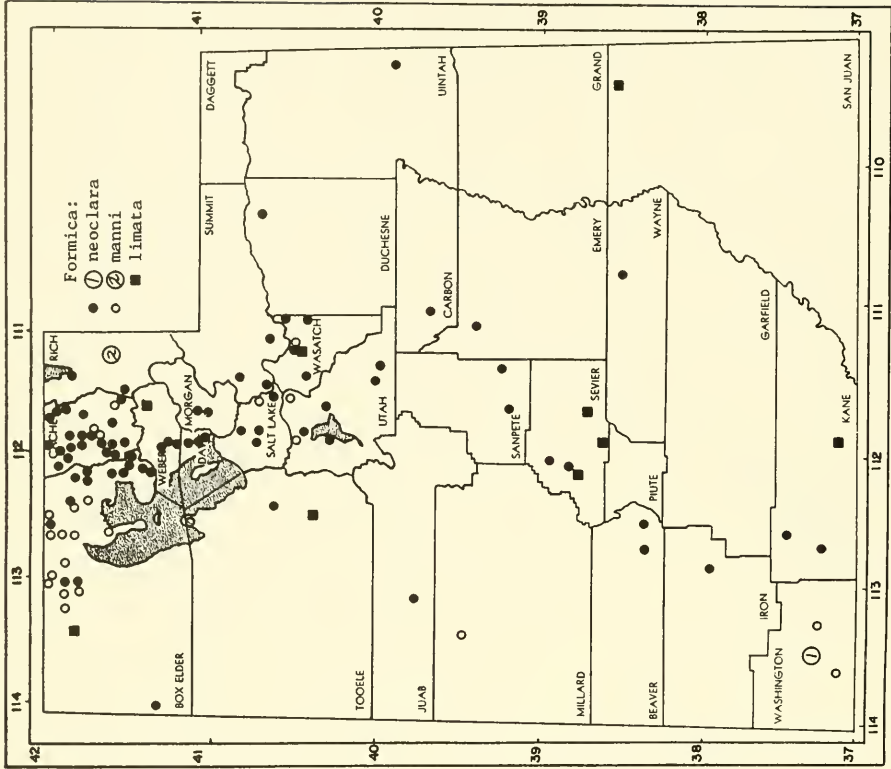


Map 7. Distribution of *Formica altipetens*, *argentea*, and *canadensis* in Utah. Number in circle indicates specific plot in county unknown.

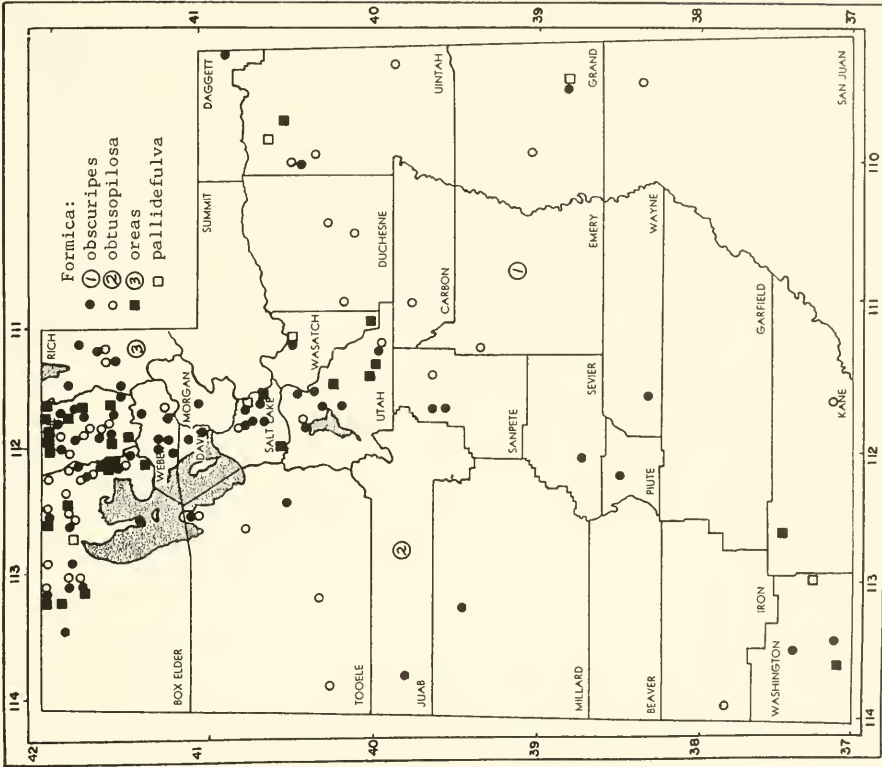




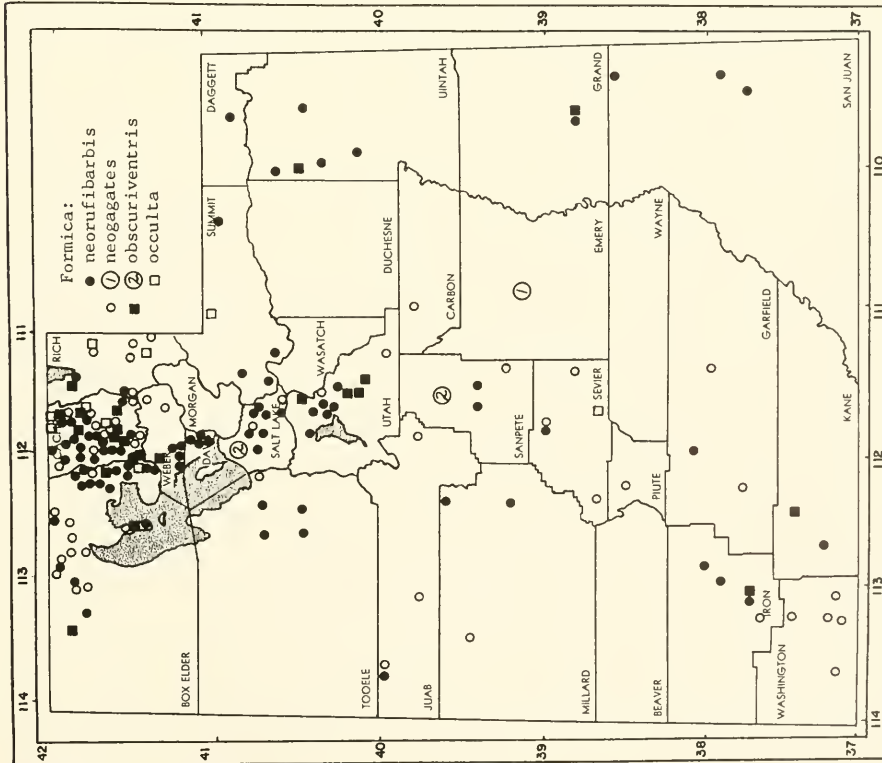
Map 9. Distribution of *Formica haemorrhoidalis*, *integroides*, *laeviceps*, and *lasioides* in Utah. Number in circle indicates specific plot in county unknown.



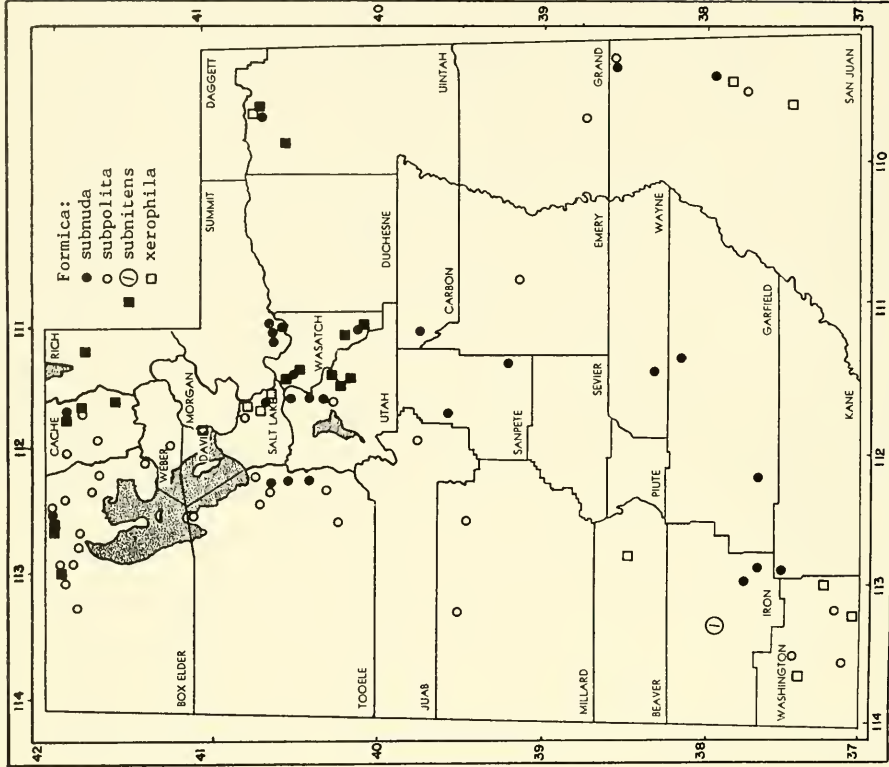
Map 10. Distribution of *Formica limata*, *manni*, and *neoclara* in Utah. Number in circle indicates specific plot in county unknown.



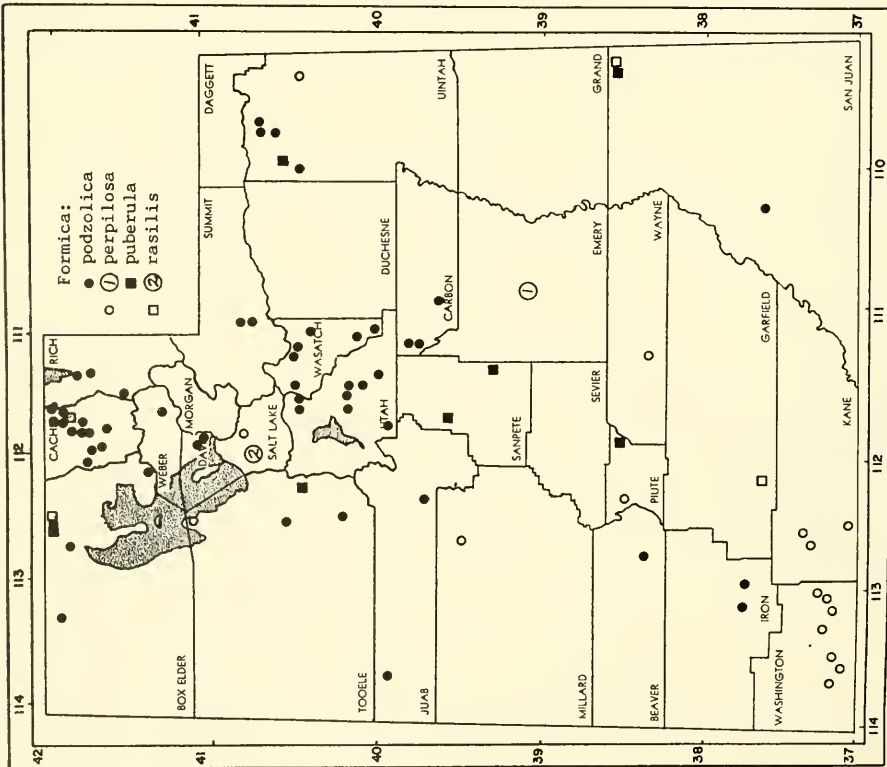
Map 12. Distribution of *Formica obscuripes*, *obtusopilosa*, *areas*, and *pallidefulva* in Utah. Number in circle indicates specific plot in county unknown.



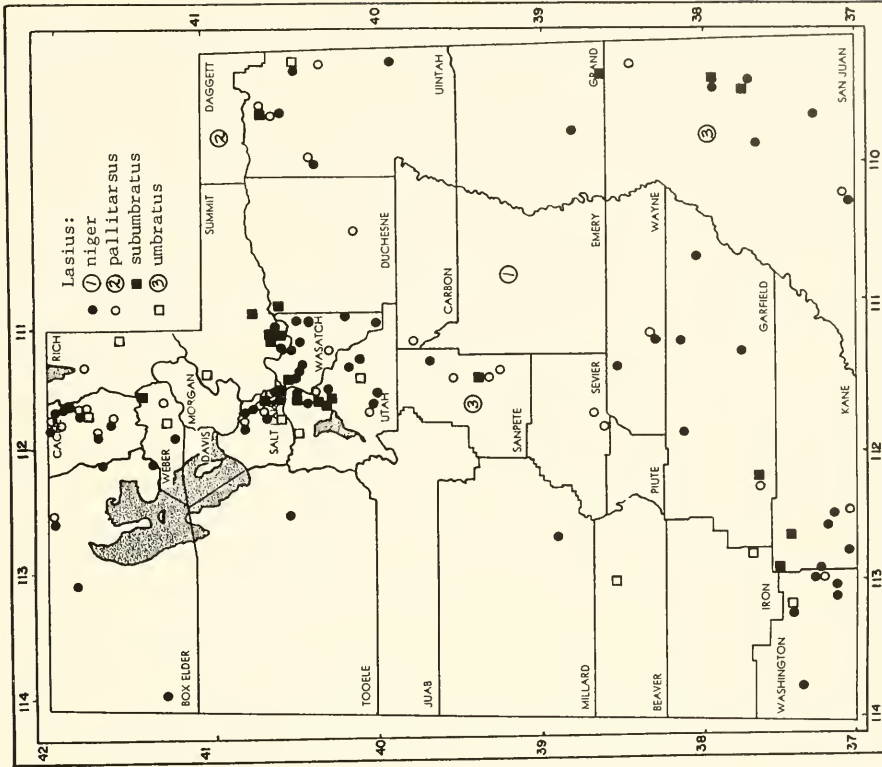
Map 11. Distribution of *Formica neogagates*, *neorufibarbis*, *obscuriventris*, and *occulta* in Utah. Number in circle indicates specific plot in county unknown.



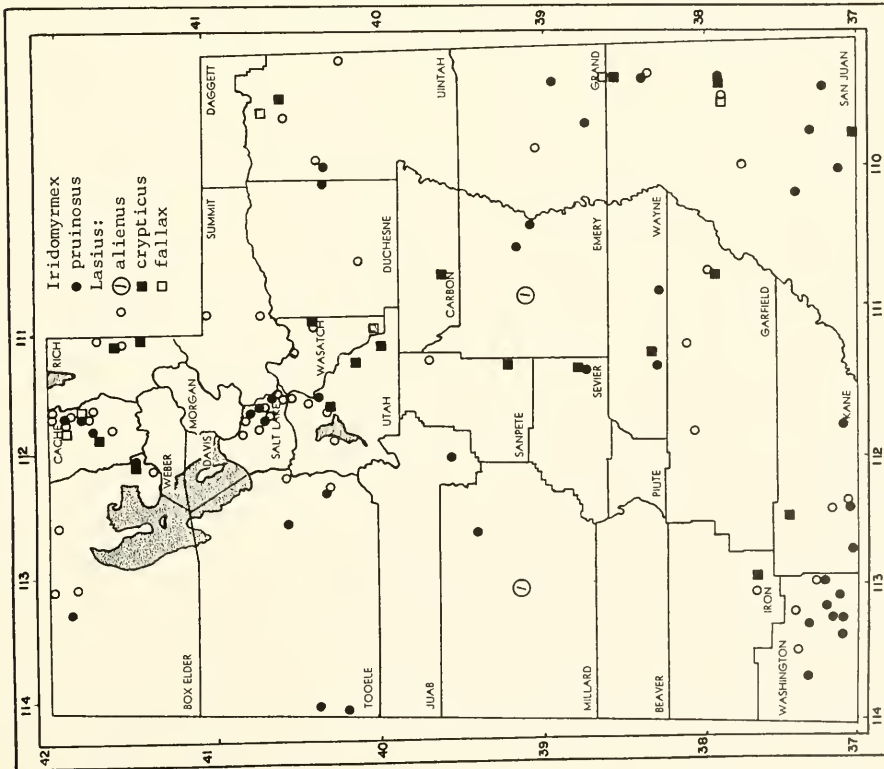
Map 14. Distribution of *Fomica subnuda*, *subpolita*, *subnitens*, and *xerophila* in Utah. Number in circle indicates specific plot in county unknown.



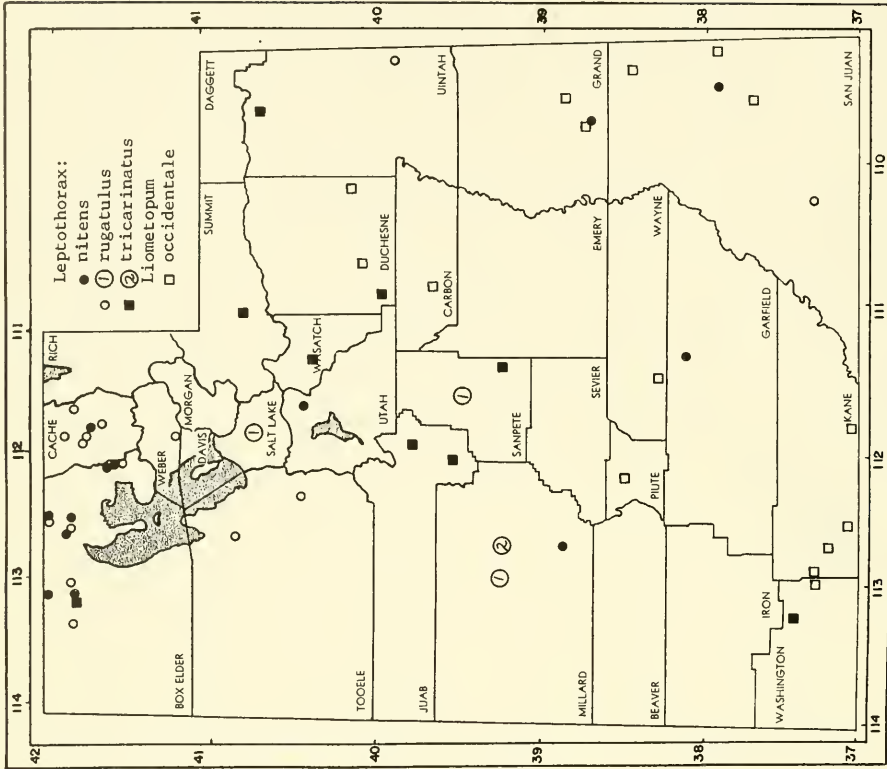
Map 13. Distribution of *Fomica podzolica*, *perpilosa*, *puberula*, and *rasilis* in Utah. Number in circle indicates specific plot in county unknown.



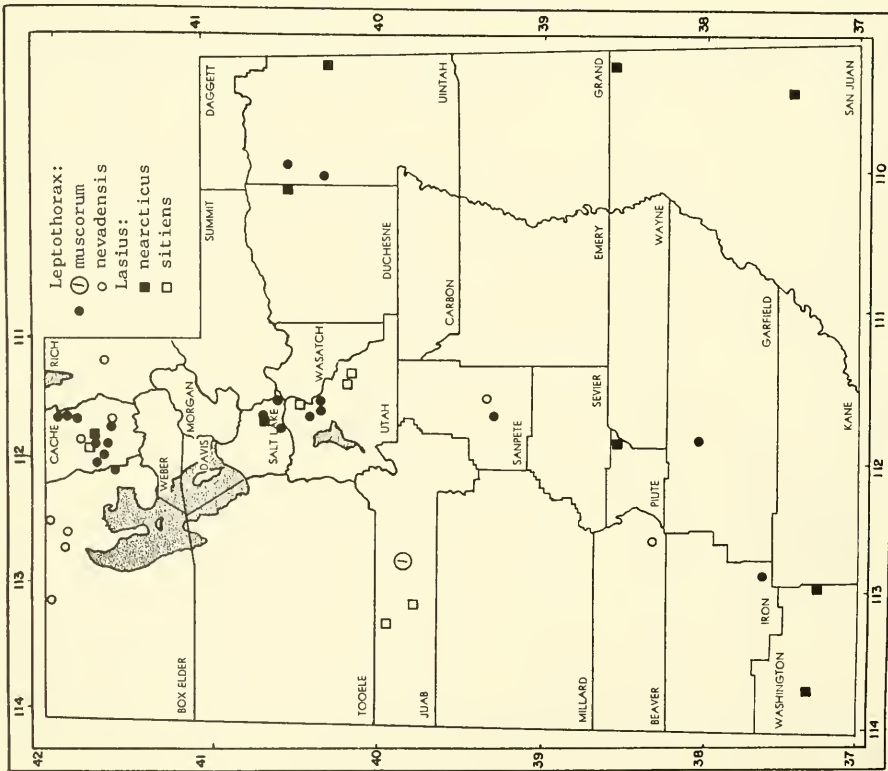
Map 16. Distribution of *Lasius niger*, *pallitarsus*, *subumbratus*, and *umbratus* in Utah. Number in circle indicates specific plot in county unknown.



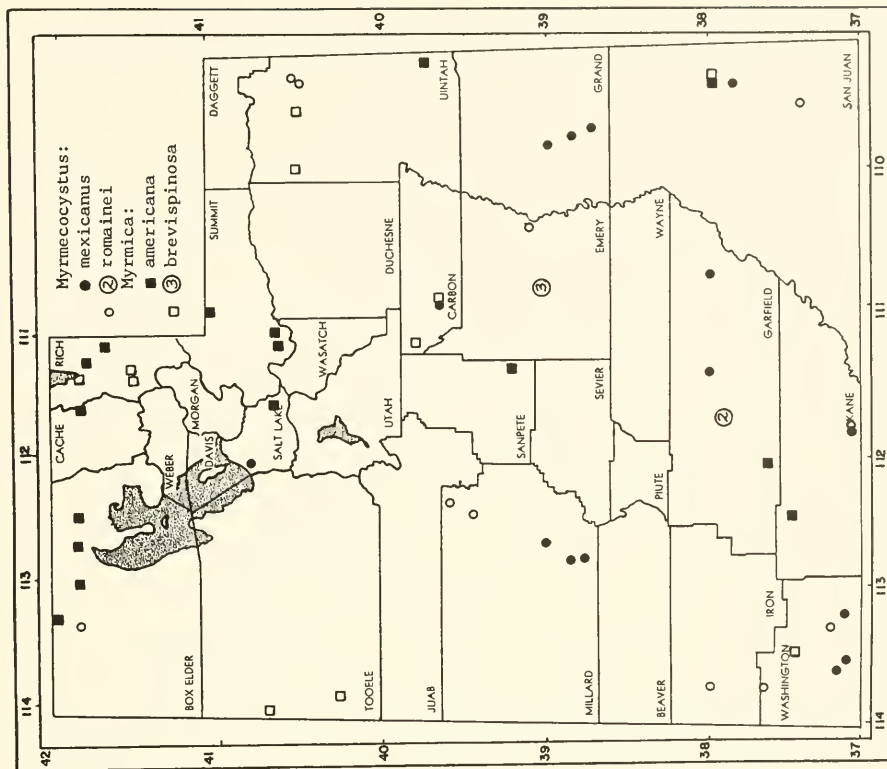
Map 15. Distribution of *Iridomyrmex pruinosus*, *Lasius alienus*, *crypticus*, and *fallax* in Utah. Number in circle indicates specific plot in county unknown.



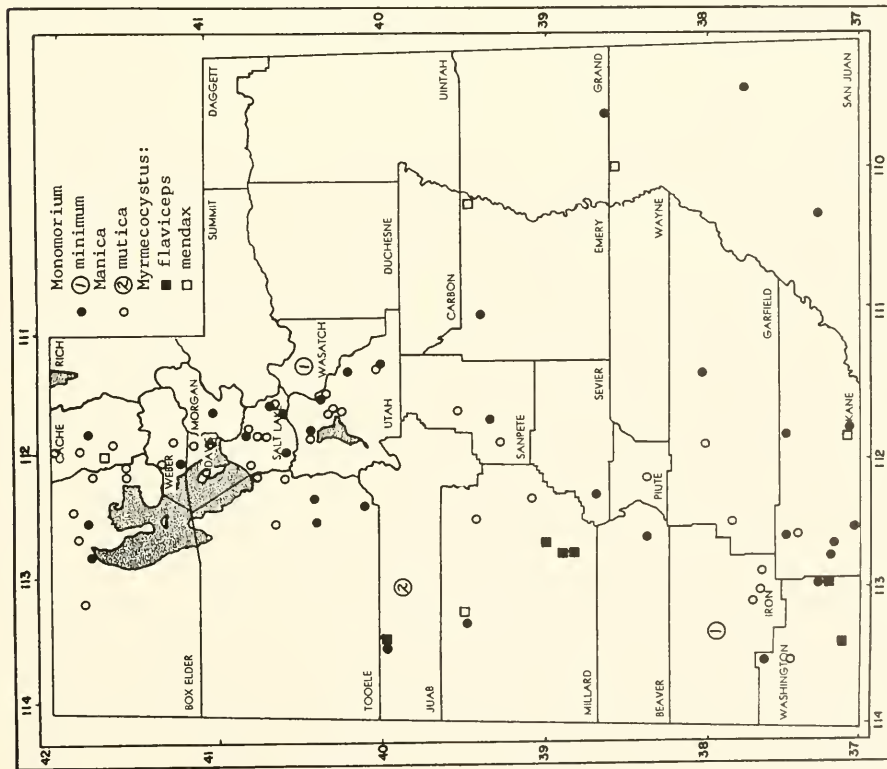
Map 18. Distribution of *Leptothorax nitens*, *rugatulus*, *tricarlinatus*, and *Liometopum occidentale* in Utah. Number in circle indicates specific plot in county unknown.



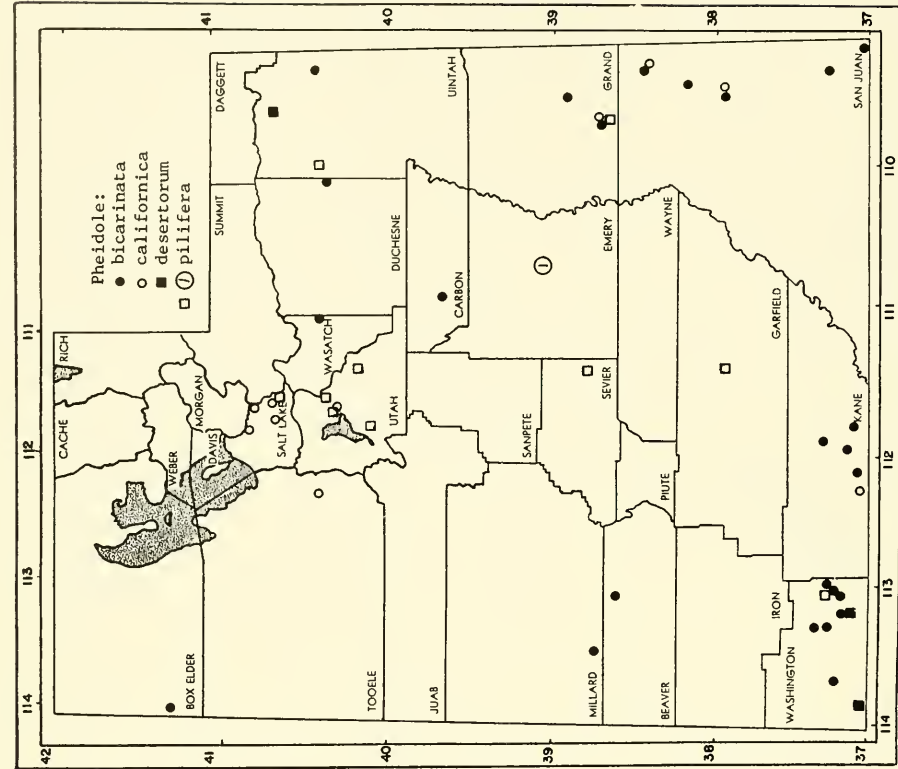
Map 17. Distribution of *Lasius nearcticus*, *sitiens*, *Leptothorax muscorum*, and *nevadensis* in Utah. Number in circle indicates specific plot in county unknown.



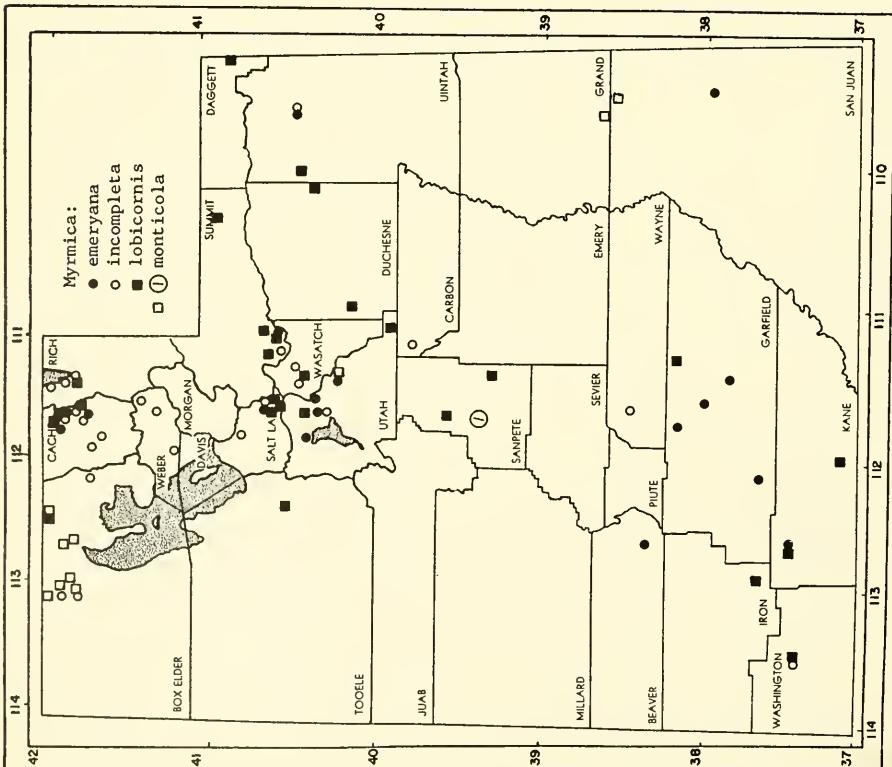
Map 19. Distribution of *Manica mutica*, *Monomorium minimum*, *Myrmecocystus flaviceps*, and *mendax* in Utah. Number in circle indicates specific plot in county unknown.



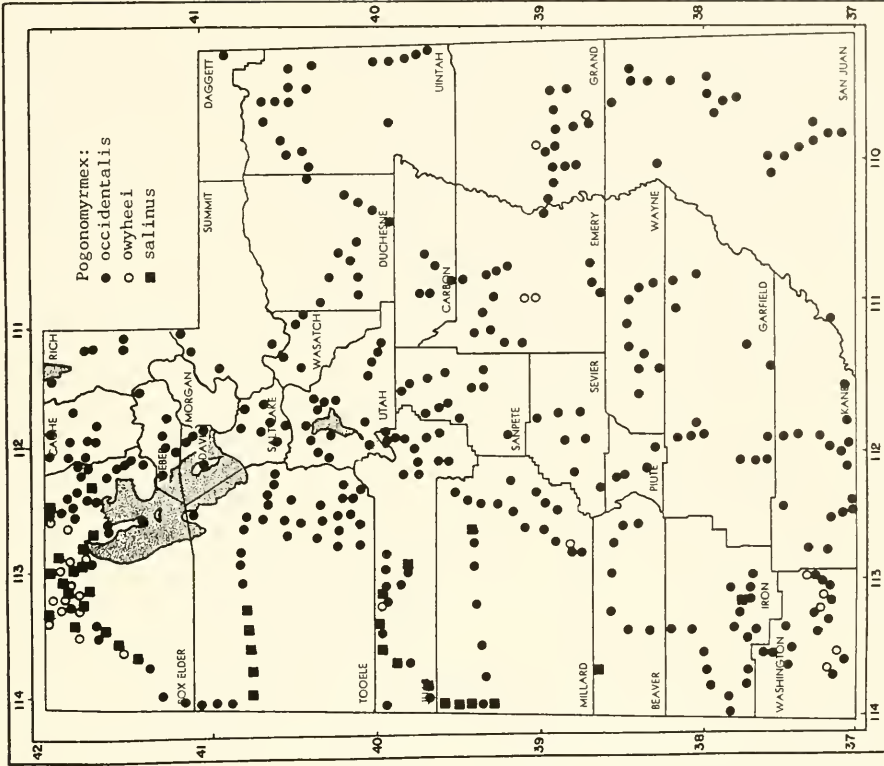
Map 20. Distribution of *Myrmecocystus mexicanus*, *romainei*, *Myrmica americana*, and *brevispinosa* in Utah. Number in circle indicates specific plot in county unknown.



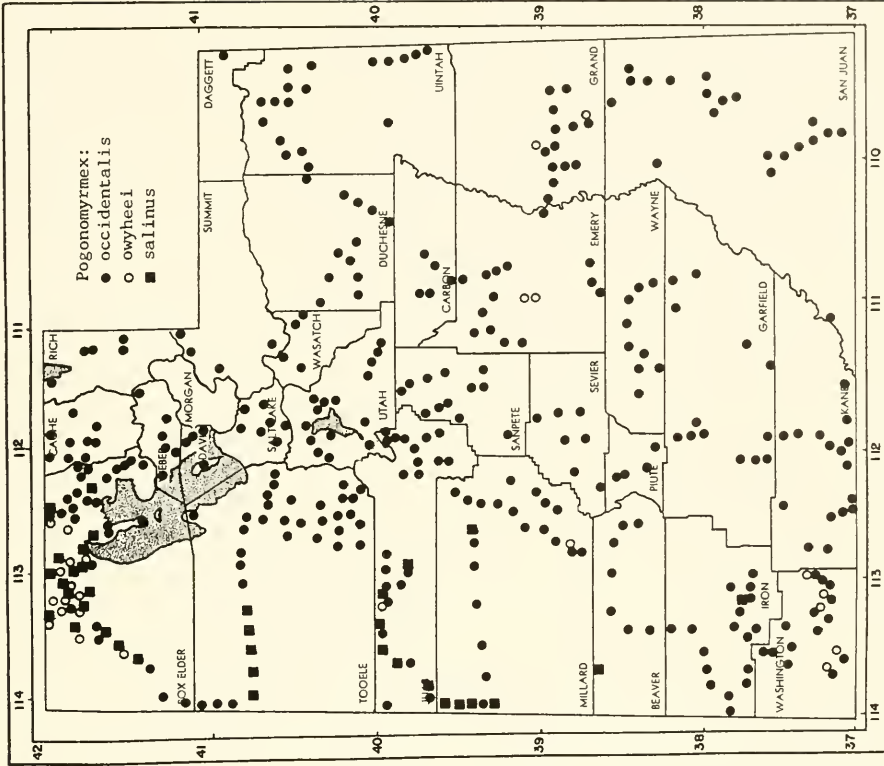
Map 21. Distribution of *Mymica emeryana*, *incompleta*, *lobicornis*, and *monticola* in Utah. Number in circle indicates specific plot in county unknown.



Map 22. Distribution of *Pheidole bicarinata*, *californica*, *desertorum*, and *pilifera* in Utah. Number in circle indicates specific plot in county unknown.

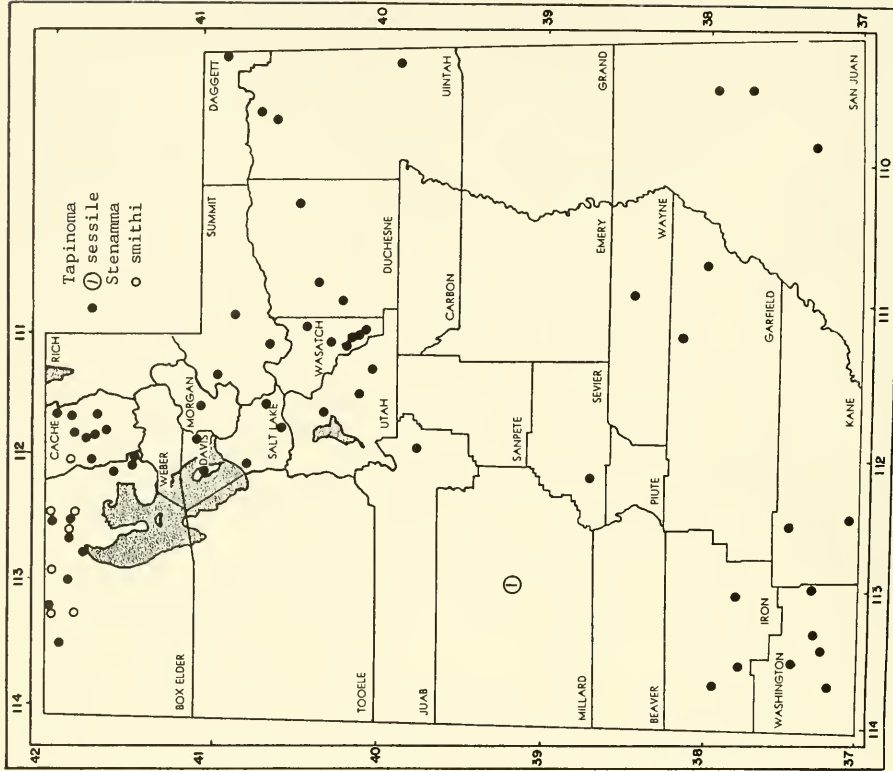


Map 23. Distribution of *Pheidole sitarches*, *Pogonomyrmex californicus*, *maricopa*, and *rugosus* in Utah. Number in circle indicates specific plot in county unknown.

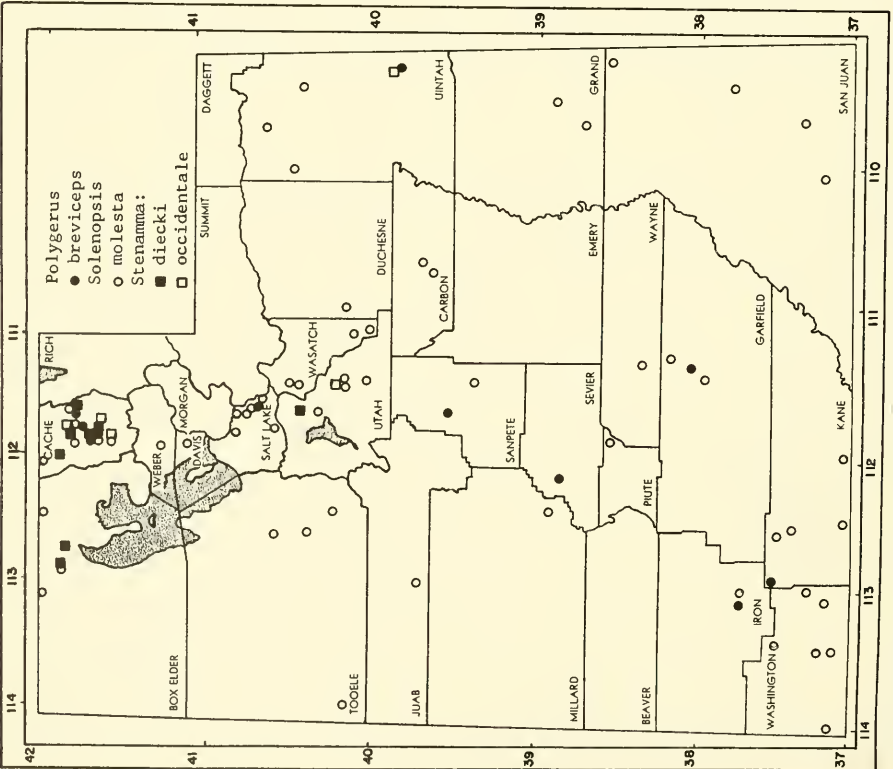


Map 24. Distribution of *Pogonomyrmex occidentalis*, *owyhee*, and *salinus* in Utah.

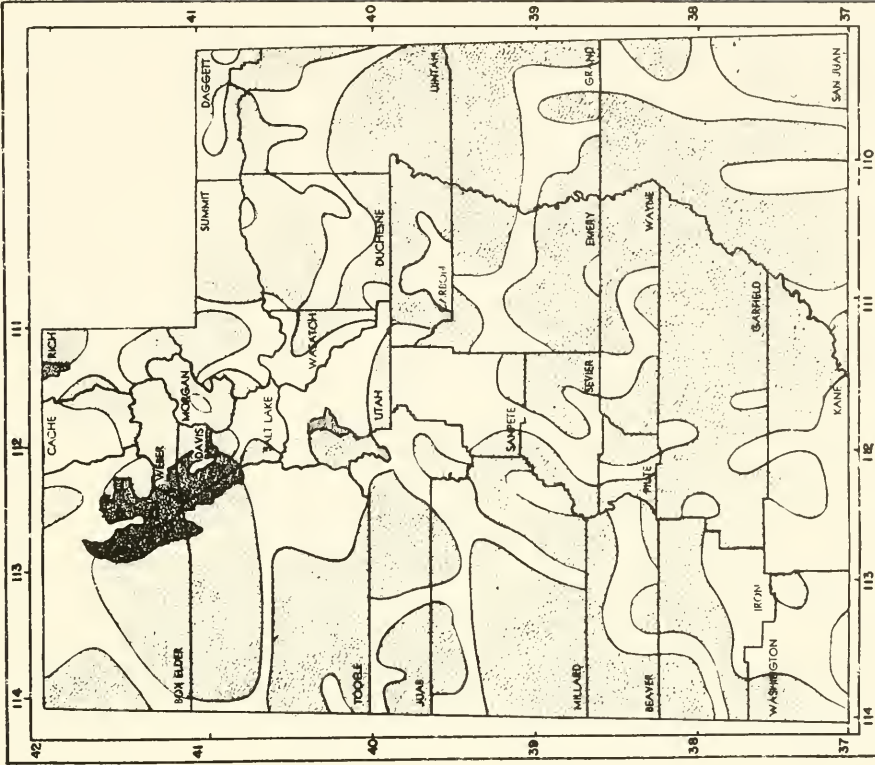




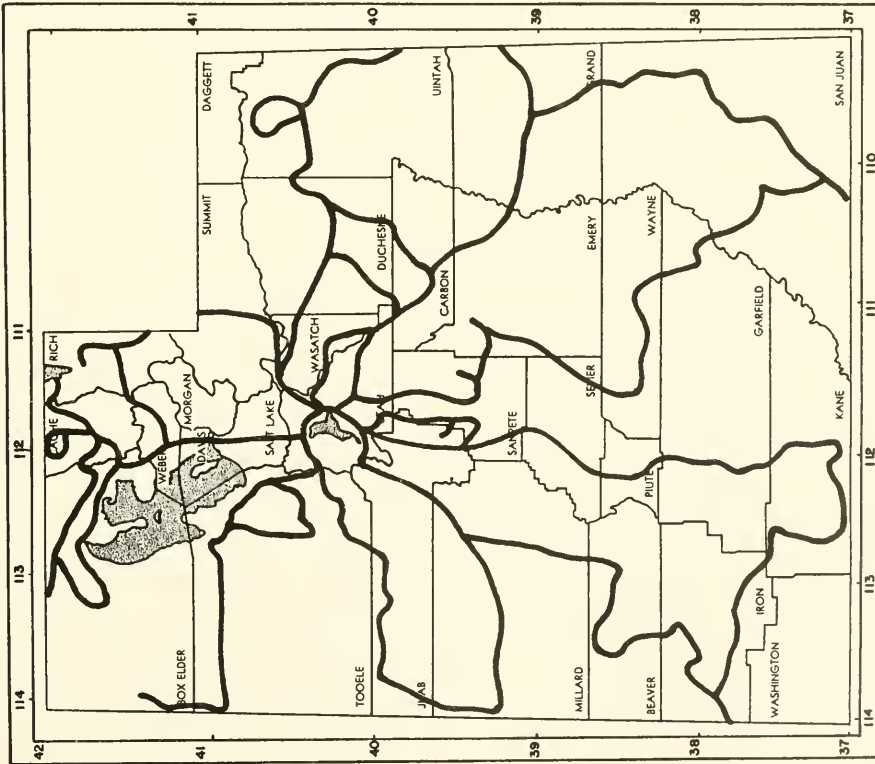
Map 26. Distribution of *Stenamma smithi*, and *Tapinoma sessile* in Utah. Number in circle indicates specific plot in county unknown.



Map 25. Distribution of *Polyergus breviceps*, *Solenopsis molesta*, *Stenamma diecki*, and *occidentale* in Utah.



Map 28. Areas of ant collections in Utah (clear areas). Shaded areas indicate where no (or few) collections have been reported.



Map 27. Collecting routes of the author in 1979 and 1980.

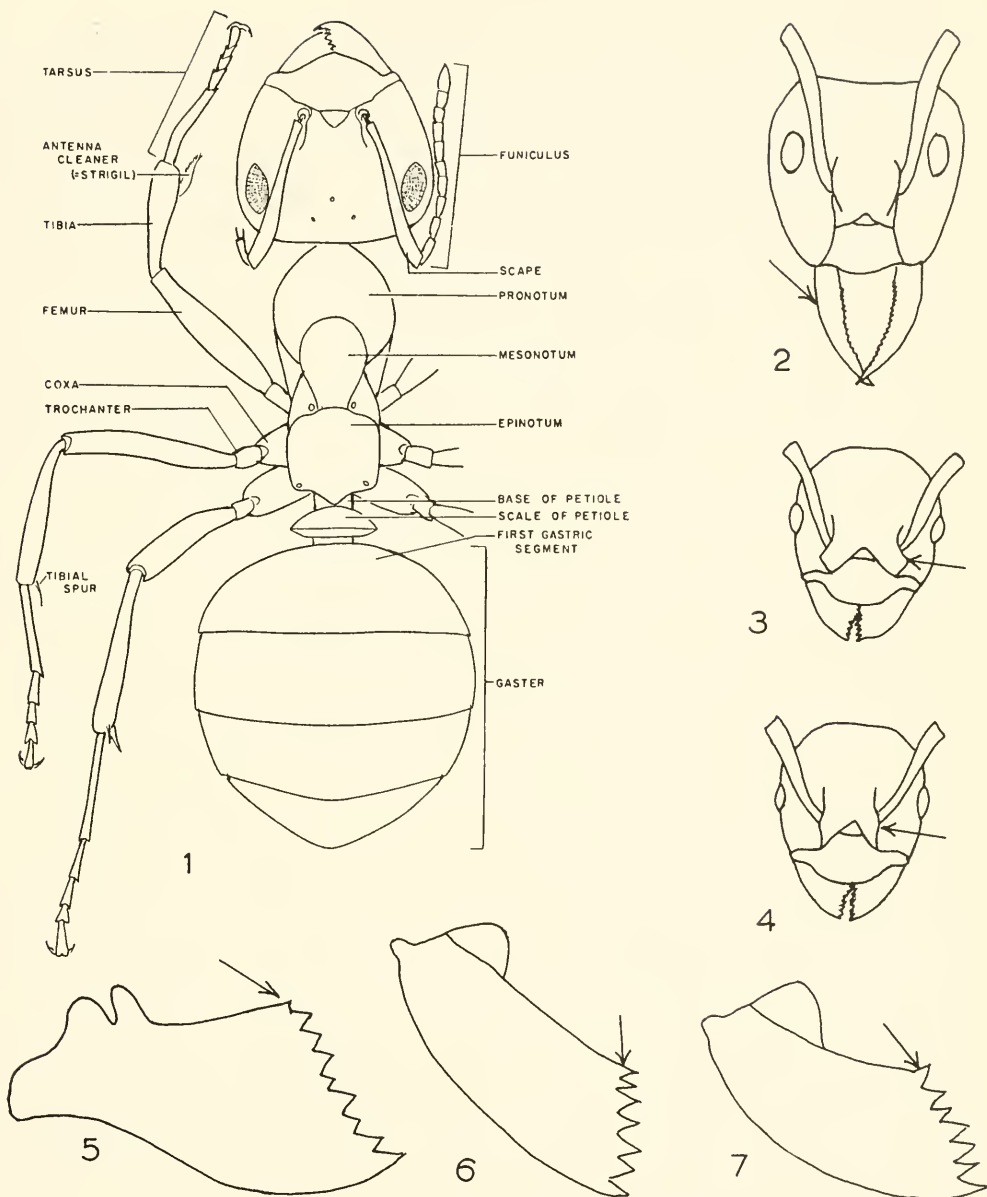
unpublished data for Utah records, and are not intended as synonyms except in those cases as indicated by Creighton (1950), Smith (1979), and other contemporary workers. These and other names applicable to unpublished records and identification labels on specimens in collections examined are given in a separate list at the end of this paper as a means to relate those names to the ones I have used in the body of this report. Where two or more subspecies under a given species have been reported from Utah, they can be separated by characters discussed under the respective species listing in the main body of the paper.

In the treatment of species, generic and trivial names are listed alphabetically in the form of a checklist without regard to subfamily designations, which may be ascertained by reference to the keys. This facilitates location of a species where an index is not present, and extensive searching need not be done by the person who is not well versed in its phylogenetic placement.

Terminology in the keys to subfamilies, genera, and species has been simplified to the lay person's language as far as possible to avoid frustration for those who are not well versed in taxonomic jargon. A glossary of most of the structures referred to in the keys is included, and many structures are figured. Figures 1 and 9 will help in overall structural orientation (Figure 8 was deleted).

### GLOSSARY

- ABDOMEN:** the hindmost of the three major body regions of an insect, situated behind the thorax.
- ANTENNAL CLUB:** last two or three antennal segments that are abruptly enlarged to form clublike appearance, sometimes gradually enlarged to much larger terminal segment.
- ANTENNAL FOSSA:** pit or base of antenna where it attaches to head.
- CLAVATE:** clubbed, gradually thickening toward tip.
- CLYPEUS:** the broad plate, frequently triangular, situated on the front of the head between the base of the antennae and the mandibles.
- DEPRESSED:** flattened or indented.
- EPINOTUM** (propodeum of some authors): the posterior major subdivision of the thorax (the second major body part of the ant), actually a structural part of the abdomen anterior to the pedicel, fused to the thorax.
- ERECT HAIR:** a hair projecting at essentially a right angle to the surface of the integument.
- EYE LENGTH:** maximum measureable length, usually from ventral to dorsal (anterior to posterior).
- FACET:** one of the small lenses of the compound (large) eye.
- FEMUR:** the third segment of the leg (first long one from the base).
- FLEXOR SURFACE:** that surface of the segment of a leg that faces and comes close to another such surface when a leg is bent.
- FOSSA:** a pit or deep groove.
- FRONTAL AREA:** a small triangular plate attached to the dorsal edge of the clypeus, situated between the bases of the antennae.
- FRONTAL CARINA:** a distinct ridge or line running upward from the clypeus, and separating the cheek and antennal base from the median part of the head.
- FUNICULUS:** that part of the antenna terminal to the scape (the first greatly elongated segment attached to the head) consisting of 8 to 11 segments.
- GASTER:** the globular or ovoid segments of the abdomen posterior to the pedicel.
- GENA:** area of head below and behind posterior margin of eye.
- HEAD LENGTH:** maximum measureable length from ventral (anterior) border of clypeus to median dorsal (posterior) border of head, or to line equal with corners if posterior edge of head is concave.
- HEAD WIDTH:** maximum width of head exclusive of compound eyes if they extend beyond lateral margins of head.
- HUMERAL ANGLE:** the shoulder angle of the prothorax.
- IMPRESSED:** shallow depressed area or marking.
- INTEGUMENT:** the outer covering of the body.
- KEEL:** a sharply angled, elevated ridge.
- LABIAL PALPS:** the two antennalike appendages from the lower lip situated between the mandibles.
- MAJOR:** a worker of the largest subcaste.
- MANDIBLE:** one of the paired, heavily chitinized and usually toothed processes on the extreme latero-ventral sides of the head.
- MAXILLARY PALPS:** the antennalike appendages from the second jaws situated on each side between the mandibles and the labium (lower lip).
- MESEPINOTAL SUTURE:** the transverse indentation that separates the mesonotum from the epinotum.
- MESONOTUM:** dorsal surface of mesothorax.
- MESOPLEURA:** side of mesothorax.
- MESOTHORAX:** the second major subdivision of the thorax (the second major part of the ant).
- METASTERNUM:** the ventral area of the thorax between coxae 3.
- MINOR:** a worker of the smallest subcaste.
- PEDICEL:** the one or two segments between the thorax and gaster, much reduced in diameter and sometimes bearing a scale.
- PETIOLE:** a single-segmented pedicel, or the first segment of a two-segmented pedicel.
- POSTPETIOLE:** the posterior segment of a two-segmented pedicel.
- PRONOTUM:** the dorsal surface of the prothorax.
- PROTHORAX:** the anterior major subdivision of the thorax (the second major part of the ant).
- PSAMMOPHORE:** two rows of long hairs or bristles, one row on each side of the underside of the head.



Figs. 1-7. 1, Dorsal view of worker showing major structures (from Wheeler and Wheeler 1963); 2, Sickle-shaped mandibles; 3, Frontal carinae covering antennal insertions, and strongly projected laterally; 4, Frontal carinae not strongly projecting laterally; 5, Triangular mandible with large teeth, the basal tooth offset from other teeth; 6, Basal tooth aligned with other teeth and with mandibular margin; 7, Basal tooth offset and at angle to mandibular margin.

PUBESCENCE: a covering of fine soft hairs, usually lying flat against the integument.

PUNCTATE: possessing puncta.

PUNCTATE: possessing puncta.

RUGA: see WRINKLE.

SCALE OF PETIOLE: a scalelike, somewhat oval vertical or angled projection arising from the dorsal surface of the petiole.

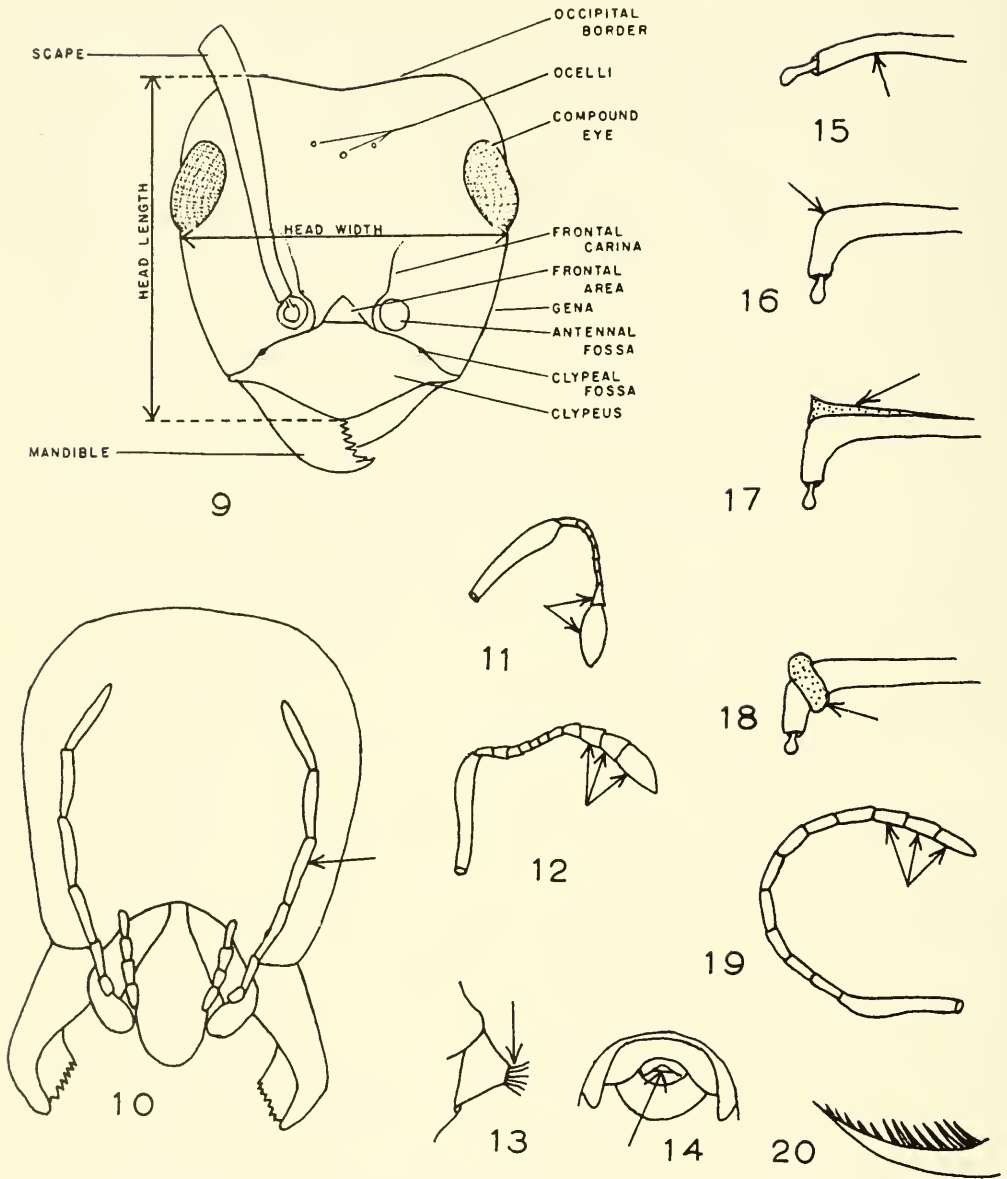
SCALE OF SCAPE: thick plate at base of scape.

SCAPE: first greatly elongated segment of the antenna attached to the head.

SCULPTURED: pattern of elevations and depressions on the integument.

SPINASTERNAL CAVITY: a minute cavity situated on the ventral side of the metathorax medially between coxae 2 and 3 (can be seen only by removing coxae 2 and 3 on one side).

STRIAE: longitudinal impressed lines.



Figs. 9-20. 9, Frontal view of head of worker showing structures and areas of measurement (from Wheeler and Wheeler 1963); 10, Ventral view of head showing short 4-segmented labial palps and longer 6-segmented maxillary palps; 11, 10-segmented antenna with 2-segmented club; 12, 12-segmented antenna with club of 3 or more segments; 13, Terminal, circular anus fringed with hairs; 14, Subterminal, slitlike anus not fringed with hairs; 15, Scape evenly curved near base; 16, Scape abruptly bent at base; 17, Scape with lobed plate extending one-third along its length; 18, Scape with basal collar or flange; 19, 12-segmented antenna without club; 20, Toothed tibial spur of coxa 3.

**SUBERECT HAIR:** a small hair that projects from the integument at an angle less than 90 degrees but more than 45 degrees.

**TERCITE:** the dorsal plate or surface of a segment, usually applicable to the gaster.

**THORAX:** second major division of ant between head and pedicel, composed of prothorax, mesothorax, and epinotum ("metathorax").

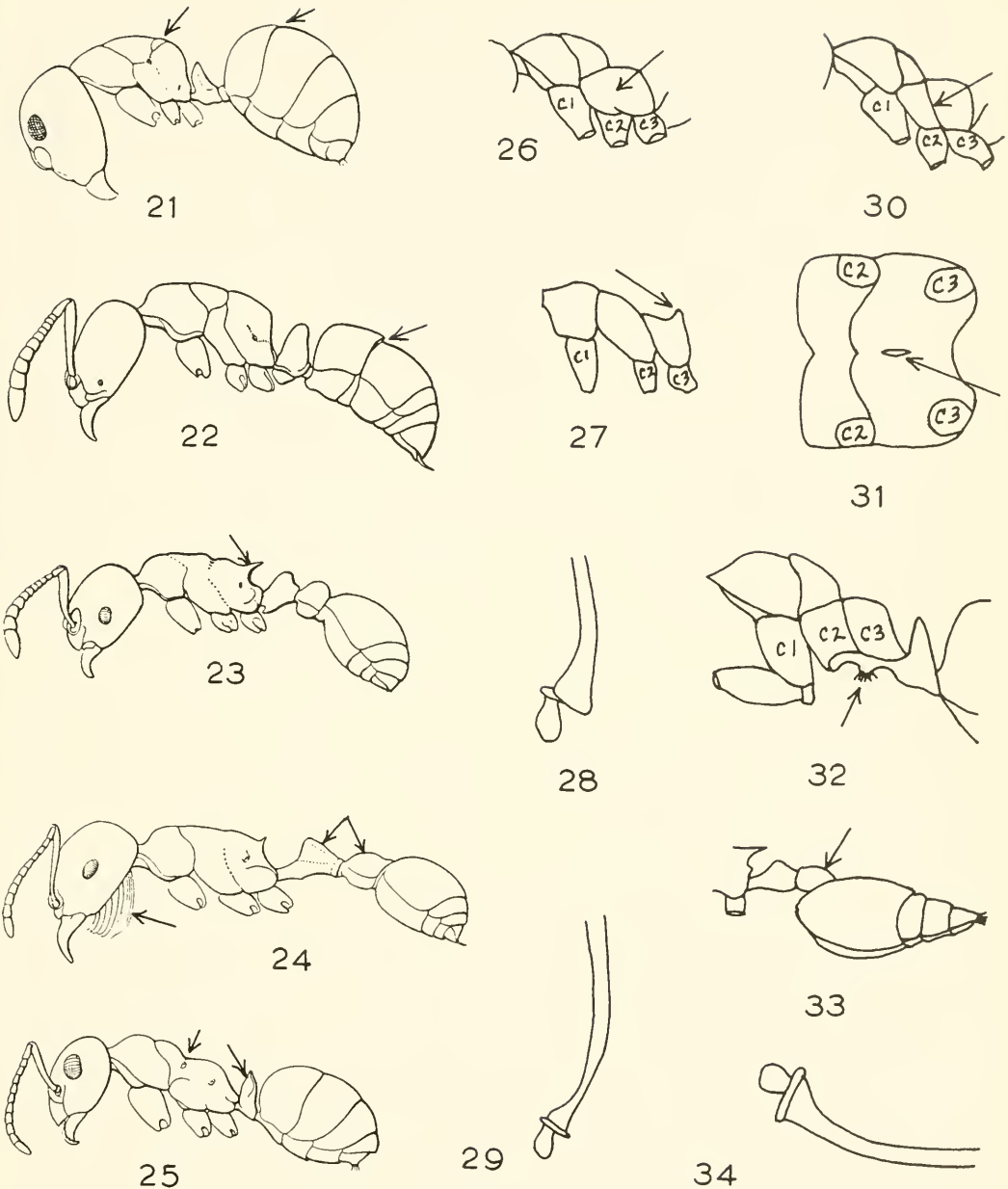
**TIBIA:** the fourth segment of the leg (second long one from the base).

**VERTEX:** top of head between and posterior to eyes.

**WHORLS:** in concentric rings.

**WRINKLE (ruga):** a small ridge or furrow on the surface.

Specimens in the Utah State University collection and of unpublished records of



Figs. 21-34. 21, Worker of *Camponotus sansabeanus* showing lack of constriction between 1st two segments of gaster, well-developed eye, and even convexity of thorax (from Creighton 1950); 22, Worker of *Ponera opacior* showing constriction between 1st two segments of gaster, and poorly developed eye (from Creighton 1950); 23, Worker of *Myrmica brevinodis* showing attachment of postpetiole to anterior end of gaster, and epinotal spines (from Creighton 1950); 24, Worker of *Pogonomymex occidentalis* showing pedicel consisting of two segments, and psammophore on underside of head (from Creighton 1950); 25, Worker of *Formica rubicunda* showing well-developed scale on pedicel of one segment, and dorsal convexity of thorax (from Creighton 1950); 26, Side of epinotum evenly curved and lacking abrupt angle; 27, Epinotum with dorsal, conical elevation; 28, Base of scape with rounded corner and poorly developed flange; 29, Base of scape thin with thin flange; 30, Side of epinotum not evenly curved, but with abrupt angle; 31, Spinasternal cavity; 32, Elevated and fringed lateral lobes of spinasternal cavity; 33, Attachment of postpetiole to dorsal surface of pointed gaster; 34, Base of scape with thick flange.

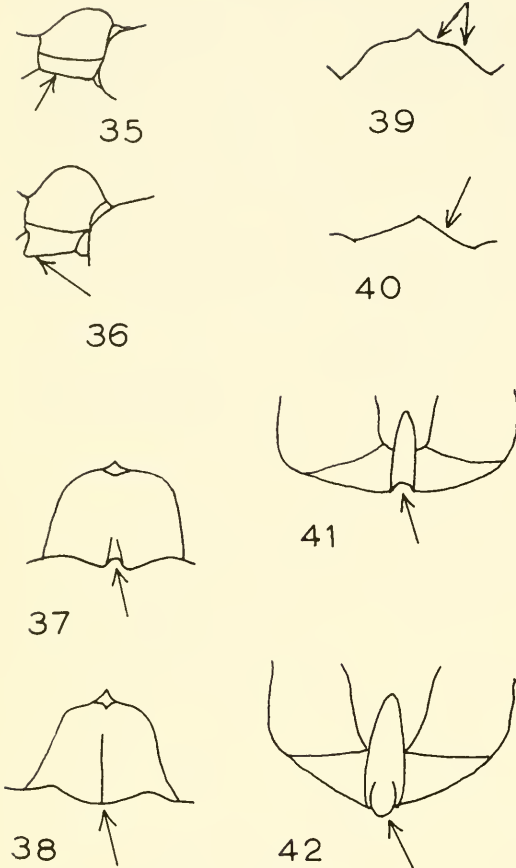
## ACKNOWLEDGMENTS

I am most grateful for the unselfishness and kindness of George F. Knowlton, who loaned his personal collection records to me, which he had been accumulating for many years as a basis for a third *Ants of Utah*. He continued to periodically send me identifications of contemporary collections that he sent to Wheeler and Francoeur. Wilford Hansen, curator of the Utah State University collection, loaned all their collection and records. Mary Fors, curator of the University of Utah collection, and Albert Grundmann loaned me all their ant collections and records, and Dr. Grundmann kindly provided me with the reports of Charles Ingham on his unpublished studies of ants of southwestern Utah. George Wheeler provided records of Utah collections from his personal collection. Russell Anderson of Southern Utah State College sent their collection for identification. Andre Francoeur corrected the identification of some specimens collected by me and provided information concerning the status of some species of the large genus *Formica*. I am grateful to Brigham Young University for funds to collect ants over the state, to study collections at other universities, and for partial support of publication costs of the manuscript.

## TREATMENT OF SPECIES

Under each species are listed its known collection localities in Utah, grouped by county (in boldface type), and its general distribution in the United States. Specific states of occurrence are listed only for those intermountain ones immediately adjacent to Utah (Colorado, Arizona, Nevada, Idaho, and Wyoming), which may in certain cases support some records for Utah that are questionable. In the specific locality listings for Utah, the source of the collection record is designated in parentheses for each locality, or for a series of localities listed between two record sources.

Isolated collections may be made of a species out of its normal range, elevation, or habitat. Such instances may be the result of accidental transport of winged females by directional winds or on vehicles. In most instances such individuals or small resulting



Figs. 35-42. 35, Postpetiole lacking ventral projection; 36, Postpetiole showing ventral projection; 37, Ventral median notch of clypeus; 38, Ventral margin of clypeus lacking median notch; 39, Clypeus with median flattening next to keel; 40, Clypeus with median area gradually curved to fossa; 41, Notch in apex of clypeus; 42, Anterior projection of ventral median lobe of clypeus.

George Knowlton were identified predominantly by George Wheeler, Roy Snelling, and Andre Francoeur; those in the Brigham Young University collection by Arthur Cole; and those in the University of Utah collection by Albert Grundmann and Arthur Cole. Ingham identified his own collections, and verified them by comparison with identified specimens in the University of Utah collection. I identified the ants, most of which were in the genus *Pogonomymex*, which I collected during my two summers of travel over Utah.

colonies are not apt to survive long in unfavorable habitats. Where only one or two records are listed for the state, or its occurrence in Utah is out of place in its otherwise known range, such should be considered as temporarily questionable. Specimens representing some of these records are not available for examination; hence, the records must remain as tentative until verified by additional collections. However, one must realize that any new distribution record must always begin with one collection.

Following the Utah records, findings of other workers with reference to specific habitat, plant community relationships, and elevation are indicated. Finally, collection data taken in my study are given with pertinent field observations.

CODE FOR COLLECTION LOCALITY SOURCES

A	Dorald M. Allred unpublished records
AC	Allred and Cole 1979
B	Buren 1968
BAD	Beck et al. 1967
BY	Brigham Young University entomology museum
C42	Cole 1942
C56	Cole 1956
C68	Cole 1968
Cr	Creighton 1950
F	Francoeur 1973
G52	Grundmann 1952
G58	Grundmann 1958
Gr63	Gregg 1963
Gr72	Gregg 1972
H	Hayward 1945
I59	Ingham 1959
I63	Ingham 1963
K70	Knowlton 1970

K75	Knowlton 1975
KU	George F. Knowlton unpublished records
O	Olsen 1934
RAU	Russell Anderson unpublished records
RC	Rees and Grundmann 1940
S73	Snelling 1973
S76	Snelling 1976
Sm52	Smith 1952
Sm53	Smith 1953
Sm57	Smith 1957
Sm79	Smith 1979
U	University of Utah entomology museum
US	Utah State University entomology museum
W67	Wheeler and Wheeler 1967
W70	Wheeler and Wheeler 1970
Wb	Weber 1947
Wi	Wilson 1955
Wg	Wing 1968
WU	George C. Wheeler unpublished records

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KEYS TO THE IDENTIFICATION OF UTAH ANTS

Key to Subfamilies of Formicidae Workers  
(Modified by Cole 1942)

- 1. Pedicel of two segments (Fig. 24) ..... 2
- Pedicel of one segment (Fig. 25) ..... 3
- 2(1). Frontal carinae close together, do not cover antennal insertions (one species known from Utah, *Neivamyrmex californicus*) ..... Ecitoninae
- Frontal carinae wide apart, cover antennal insertions (Fig. 3) ..... Myrmicinae
- 3(1). Gaster constricted between first two segments (Fig. 22) ..... Ponerinae
- Gaster not constricted as above (Fig. 21) ..... 4
- 4(3). Anus (acidopore) terminal, circular and fringed with hairs (Fig. 13) ..... Formicinae
- Anus (acidopore) subterminal and ventral, slit-shaped and not fringed with hairs (Fig. 14) ..... Dolichoderinae



Key to Utah Genera and Species of Ponerinae Workers  
(Modified from Creighton 1950)

1. Petiole slender, narrower dorsally than ventrally ..... *Hypoponera opacior*  
 — Petiole robust, as wide dorsally as ventrally ..... 2  
 2(1). Head has coarse puncta ..... *Ponera pennsylvanica*  
 — Head has fine puncta ..... *Hypoponera opaciceps*

Key to Utah Genera of Myrmicinae Workers  
(Modified from Cole 1942, Creighton 1950)

1. Postpetiole attached to dorsal surface of gaster, which is flattened dorsally, convex ventrally, and acutely pointed (Fig. 33) ..... *Crematogaster*  
 — Postpetiole attached to medioanterior or ventroanterior end of gaster, which is of usual shape, not as above (Fig. 23) ..... 2  
 2(1). Antenna 10-segmented, has 2-segmented club (Fig. 11) ..... *Solenopsis*  
 — Antenna has more than 10 segments; club, when developed, has more than 2 segments (Fig. 12) ..... 3  
 3(2). Antenna 11-segmented ..... 4  
 — Antenna 12-segmented ..... 6  
 4(3). Thorax and petiole lack spines or teeth; pronotum never angular (one species known from Utah, *M. minimum*) ..... *Monomorium*  
 — Epinotum has spines or teeth (Fig. 23) ..... 5  
 5(4). Mesepinotal suture relatively deep (one species known from Utah, *F. chamberlini*) ..... *Formicoxenus*  
 — Mesepinotal suture faint or absent ..... *Leptothorax*  
 6(3). Laterodorsal part of clypeus elevated as a narrow ridge that forms abrupt semicircular boundary at front of antennal fossa (one species known from Utah, *T. caespitum*) ..... *Tetramorium*  
 — Laterodorsal part of clypeus not as above ..... 7  
 7(6). Ants of two distinct sizes, no intermediates between the extremes; antenna has a 3-segmented club that is longer than remainder of funiculus ..... *Pheidole*  
 — Ants of several sizes, with intermediates between the extremes; antenna lacks distinct club, or, if club present, it is shorter or no longer than remainder of funiculus ..... 8  
 8(7). Last 3 antennal segments together much shorter than remainder of funiculus, do not form an abrupt club, although they may gradually enlarge to the terminal largest segment ..... 9  
 — Last 3 antennal segments together form an abrupt club nearly as long as remainder of funiculus ..... *Leptothorax*  
 9(8). Dorsum of thorax has a relatively deep mesepinotal suture; psammophore absent; head, thorax and petiole sometimes with widely spaced, deep parallel wrinkles ..... 10  
 — Dorsum of thorax lacks such a suture or at most has a slight impression; psammophore present (Fig. 24); head, thorax and petiole not as above ..... *Pogonomyrmex*

- 10(9). Posterior tibial spurs comblike (Fig. 20) ..... 11
- Posterior tibial spurs lack teeth ..... 12
- 11(10). Epinotum has spines (Fig. 23) ..... *Myrmica*
- Epinotum lacks spines ..... *Manica*
- 12(10). Eyes small, poorly developed (Fig. 22); clypeus has 2 keels ..... *Stenamamma*
- Eyes large, well developed (Fig. 21); clypeus lacks keels ..... 13
- 13(12). Spines of epinotum long and narrow, about as long as petiole; head not longer than broad (one species known from Utah, *V. lobognathus*) ..... *Veromessor*
- Spines of epinotum short and robust, shorter than petiole; head longer than broad ..... *Aphaenogaster*

Key to Utah Species of *Aphaenogaster* Workers  
(Modified from Cole 1942, Creighton 1950)

- 1. Scape of larger workers (sometimes smaller ones) surpasses corner of head by amount less than length of 1st two funicular segments ..... 2
- Scape of large and small workers surpasses corner of head by amount greater than length of 1st two funicular segments ..... 3
- 2(1). Epinotal spines prominent; body chestnut brown ..... *occidentalis*
- Epinotal spines small tubercles; head and thorax yellowish red, gaster dark brown or black ..... *uinta*
- 3(1). Epinotum lacks teeth or spines ..... *boulderensis*
- Epinotum has teeth or spines ..... *huachucana*

Key to Utah Species of *Crematogaster* Workers  
(Modified from Creighton 1950, Buren 1968)

- 1. Postpetiole lacks median groove ..... *minutissima*
- Postpetiole divided by distinct median groove ..... 2
- 2(1). Dorsum of thorax lacks erect hairs, or has not more than 8 confined to humeral angle of pronotum; rarely has 3 or 4 short hairs in mesepinotal suture ..... 3
- Dorsum of thorax has at least 15 scattered erect hairs ..... 7
- 3(2). Thorax densely punctate; has one or no erect hairs on humeral angle of pronotum ..... 4
- Thorax not punctate, or, if so, has 2 or more erect hairs on humeral angle of pronotum ..... 5
- 4(3). Thorax lacks erect hairs ..... *depilis*
- Thorax has one erect hair on humeral angle of pronotum ..... *nocturna*
- 5(3). Lower mesopleura has distinct striae ..... 6
- Lower mesopleura lacks striae ..... *hespera*
- 6(5). Head completely covered with striae and puncta ..... *coarctata*
- Head smooth and shining at least behind eye, sometimes has weak impressed lines elsewhere ..... *mormonum*
- 7(2). Hairs on thorax short, 4 or more on each pronotal shoulder, 2 or more at rear of mesonotum ..... *emeryana*
- Hairs on thorax long, 1 to 3 on each pronotal shoulder; mesonotum lacks hairs ..... *cerasi*

Key to Utah Species of *Leptothorax* Workers  
(Modified from Creighton 1950)

1. Antenna 11-segmented ..... 2  
 — Antenna 12-segmented ..... 3
- 2(1). Scape has abundant erect hairs ..... *hirticornis*  
 — Scape lacks erect hairs, or has only a few ..... 9
- 3(1). Anterior part of 1st gastric tergite covered with striae and puncta ..... *silvestrii*  
 — Anterior part of 1st gastric tergite smooth and shining ..... 4
- 4(3). Posterior half of head mostly smooth and shining; broad central strip that extends forward to antennal lobes lacks sculpture ..... *nitens*  
 — Head largely or entirely sculptured, its entire surface opaque or feebly shining ..... 5
- 5(4). Dorsum of thorax densely and evenly punctate, wrinkles absent or feeble; sides of thorax have heavy puncta that obscure wrinkles ..... 6  
 — Dorsum of thorax has puncta interrupted by prominent wrinkles on at least epinotum and mesonotum; wrinkles on sides of thorax not obscured by puncta ..... 7
- 6(5). Epinotal spines reduced to short, stumpy angles ..... *andrei*  
 — Epinotal spines well developed ..... *nevadensis*
- 7(5). Scale of petiole has feeble wrinkles and dense puncta ..... *furunculus*  
 — Scale of petiole has coarse wrinkles ..... 8
- 8(7). Dorsum of thorax completely covered with coarse longitudinal wrinkles except for small heavy puncta on mesonotum ..... *nevadensis*  
 — Wrinkles on dorsum of thorax largely confined to epinotum and rear of mesonotum; anterior prothorax has puncta only ..... *tricarinatus*
- 9(2). Clypeus lacks ridges, its center usually flattened; mesepinotal suture present and deeply depressed ..... 10  
 — Clypeus has one or more small median ridges; mesepinotal suture absent, or, if present, is not deep ..... 11
- 10(9). Erect body hairs long, numerous, usually pointed ..... *crassipilis*  
 — Erect body hairs short, sparse, usually thickened at tip ..... *muscorum*
- 11(9). Longitudinal wrinkles of head delicate, not much coarser than sculpture between them ..... *ambiguus*  
 — Longitudinal wrinkles of head coarse, notably heavier than sculpture between them ..... *rugatulus*

Key to Utah Species of *Manica* Workers  
(Modified from Creighton 1950)

1. Postpetiole has conspicuous ventral projection that extends anteriorly (Fig. 36) ..... *hunteri*  
 — Postpetiole lacks such a projection (Fig. 35) ..... *mutica*

Key to Utah Species of *Myrmica* Workers  
(Modified from Cole 1942, Creighton 1950)

1. Scape gradually and evenly bent at base, upper area does not form right angle at bend (Fig. 15) ..... 2  
 — Scape abruptly bent at base, upper area forms right angle (Fig. 16) ..... 3

- 2(1). Lateral margin of frontal carina strongly angular above antennal insertion, thick and deflected downward toward base of antenna (Fig. 3) ..... *incompleta*
- Lateral margin of frontal carina rounded and thin, deflected upward (Fig. 4) ....  
..... *brevispinosa*
- 3(1). Bend of scape has large, thick lobed plate that extends backward along basal third of scape (Fig. 17) ..... *monticola*
- Bend of scape has small transverse plate, or thin scale, which surrounds bend like a collar and does not extend backward (Fig. 18) ..... 4
- 4(3). Ventral surface of postpetiole flat or nearly so, does not form projection in front (Fig. 35) ..... *americana*
- Ventral surface of postpetiole convex, or forms prominent anterior projection (Fig. 36) ..... 5
- 5(4). Scale of scape forms high, semicircular welt that surrounds scape at bend .. *hamulata*
- Scale of scape not as above ..... 6
- 6(5). Scale of scape small and diagonally transverse on upper surface of scape, continues as prominent transparent flange along inner surface of scape below bend ..... *emeryana*
- Scale of scape not as above ..... 7
- 7(6). Epinotal spines bent downward; thorax reddish yellow, head and gaster black with reddish tinge ..... *emeryana*
- Epinotal spines straight, color combination not as above ..... *lobicornis*

Key to Utah Species of *Pheidole* Workers  
(Modified from Creighton 1950)

- 1. Scape of major reaches or surpasses corner of head ..... 2
- Scape does not reach corner of head ..... 3
- 2(1). Eye has more than 20 facets; head unicolored, dark brown to black ..... *desertorum*
- Eye has less than 15 facets; dorsal surface of head bicolored ..... *grundmanni*
- 3(1). Scape of major bent laterally at base toward midline of head, its flattened basal portion as wide as distal part ..... *hyatti*
- Scape not bent at base, or, if slightly so, flat part at base not as wide as distal part ..... 4
- 4(3). Top of head above eye and usually front face of major marked with elevations or depressions, surface opaque or feebly shining ..... 5
- Top of head not so marked except for hair pits; surface strongly shining ..... 7
- 5(4). Humeral angles of pronotum of major feebly developed, do not form lateral knobs ..... *sitarches*
- Humeral angles strongly developed into epauletlike lateral knobs ..... 6
- 6(5). Postpetiole of major lens-shaped, lateral projections well developed ..... *pilifera*
- Postpetiole four-sided, lateral projections absent or poorly developed ..... *californica*
- 7(4). Head of major at least 2 mm long ..... *virago*
- Head of major not over 1.5 mm long ..... 8

- 8(7). Sculpture on head of major extends to top of head, only the corners above the eyes smooth and shining ..... *ceres*  
 — Sculpture largely confined to anterior half of head, all the posterior half smooth and shining ..... 9
- 9(8). Mesonotum of major depressed below adjacent portion of pronotum to form distinct step or angular projection between pronotum and mesonotum ..... *dentata*  
 — Mesonotum not so depressed, forms evenly curved outline with pronotum .....  
 ..... *bicarinata*

Key to Utah Species of *Pogonomyrmex* Workers  
 (Modified from Cole 1968)

1. Mandible has 6 teeth, the basal one much reduced; eye situated below approximate center of side of head; epinotal spines short, blunt, laterally compressed, joined posteriorly by transverse keel ..... *imberbiculus*  
 — Mandible has 7 teeth, basal one not reduced; eye at about center of side of head; epinotal spines not as above ..... 2
- 2(1). Viewed dorsally, lateral lobe of clypeus in front of base of antenna forms anteriorly-projecting broad blunt process; head much broader than long; eye small, in front view does not extend beyond side of head; 1st segment of gaster broader than long ..... *rugosus*  
 — Viewed dorsally, lateral lobe of clypeus does not extend anteriorly; head not broader than long or only slightly so; eye large, extends beyond side of head; 1st segment of gaster not broader than long ..... 3
- 3(2). Base of scape strongly enlarged, broad, its basal flange thick (Fig. 34); wrinkles on head above eye not in concentric whorls; dorsum of postpetiole not longer than broad; epinotal spines always present ..... 4  
 — Base of scape weakly enlarged, its basal flange thin (Fig. 29); wrinkles of head above eye in concentric whorls; dorsum of postpetiole longer than broad; epinotal spines absent or present ..... 7
- 4(3). Spaces between wrinkles on head opaque, densely and strongly punctate, producing beaded appearance ..... 5  
 — Spaces between wrinkles subopaque or shining, not densely or strongly punctate, do not produce beaded appearance; spines may be reduced to tubercles ...  
 ..... *subnitidus*
- 5(4). Basal tooth of mandible offset, meets short basal mandibular margin at pronounced angle (Fig. 7), or forms a gradual curve with margin ..... *occidentalis*  
 — Basal tooth not offset, meets long basal mandibular margin at straight angle (Fig. 6) ..... 6
- 6(5). Dorsum of petiole and postpetiole has numerous strong, wavy, closely spaced, subparallel, usually transverse wrinkles; upper edge of base of scape broadly rounded, thin collar does not project beyond rounded corner (Fig. 28) ..... *salinus*  
 — Dorsum of petiole and postpetiole not as above, but may have irregular wrinkles or lines; base of scape not broadly rounded, may be angled, thin collar projects beyond upper corner ..... *owyheeii*
- 7(3). Puncta of head and side of epinotum deep, spaces between wrinkles subopaque ..... *maricopa*  
 — Puncta of head and thorax weak or absent; spaces between wrinkles strongly shining ..... *californicus*

Key to Utah Species of *Solenopsis* Workers  
(Modified from Creighton 1950)

- 1. 2nd segment of funiculus at least 1½ times as long as broad ..... 2
- 2nd segment of funiculus at most only slightly longer than broad ..... 3
- 2(1). Distance between eye and base of mandible 1½ times maximum diameter of eye ..... *xyloxi*
- Distance between eye and base of mandible at least 2 times maximum diameter of eye ..... *aurea*
- 3(1). Puncta of head much larger in diameter than hairs that arise from them ..... *salina*
- Puncta of head barely larger than hairs that arise from them ..... *molesta*

Key to Utah Species of *Stenamamma* Workers  
(Modified from Snelling 1973)

- 1. Median lobe of clypeus extends beyond clypeal ventral margin, in frontal view its apex rounded or truncate (Fig. 42); eyes large, distance between eye and mandible less than 2 times eye length ..... 2
- Median lobe of clypeus does not extend beyond clypeal anterior margin, its apex notched (Fig. 41); eye small, distance between eye and mandible more than 2 times eye length ..... 3
- 2(1). Eye large, has 8–12 facets in greatest diameter ..... *smithi*
- Eye small, has 6–7 facets in greatest diameter ..... *chiricahua*
- 3(1). Frontal carinae of median lobe of clypeus subparallel or slightly divergent apically, area between carinae concave, which gives apex notched appearance ..... 4
- Frontal carinae of clypeus strongly divergent from base, area between them flattened, apex not notched ..... *huachucanum*
- 4(3). Sides of mesothorax have dense puncta; pronotal sides have coarse puncta between wrinkles ..... *occidentale*
- Sides of mesothorax have coarse wrinkles; pronotal sides lack puncta between wrinkles ..... *diecki*

Key to Utah Genera of Dolichoderinae Workers  
(Modified from Cole 1942, Creighton 1950)

- 1. Scale of petiole well developed (Fig. 25) ..... 2
- Scale of petiole vestigial or absent (one species known from Utah, *T. sessile*) ....  
..... *Tapinoma*
- 2(1). Epinotum has conical elevation (Fig. 27) ..... *Conomyrma*
- Epinotum lacks conical elevation ..... 3
- 3(2). Dorsum of thorax lacks impression at mesepinotal suture; workers of several sizes (one species known from Utah, *L. occidentale*) ..... *Liometopum*
- Dorsum of thorax has slight to moderate impression at mesepinotal suture; workers of one size ..... 4
- 4(3). Erect body hairs long and sparse, absent on scape and tibia ..... *Iridomyrmex*
- Erect body hairs short and numerous, present on scape and tibia (one species known from Utah, *F. foetidus*) ..... *Forelius*

Key to Utah Species of *Conomyrma* Workers  
(Modified from Creighton 1950)

- 1. Head and thorax deep reddish yellow, gaster brownish black ..... *bicolor*
- Color not as above ..... *insana*

Key to Utah Species of *Iridomyrmex* Workers  
(Modified from Creighton 1950)

- 1. Scape extends beyond corner of head by amount equal to or greater than length of 1st funicular segment ..... *humilis*
- Scape extends beyond corner of head by amount less than length of 1st funicular segment ..... *pruinus*

Key to Utah Genera of Formicinae Workers  
(Modified from Creighton 1950)

- 1. Antenna has 9 segments (one species known from Utah, *B. depilis*) ..... *Brachymyrmex*
- Antenna has 12 segments (Fig. 19) ..... 2
- 2(1). Dorsum of thorax in profile evenly convex (Fig. 21) ..... *Camponotus*
- Dorsum of thorax distinctly depressed behind level of mesonotum (Fig. 25) ..... 3
- 3(2). Mandible sickle-shaped, inner border has tiny teeth (Fig. 2); maxillary palp 4-segmented, labial palp 2-segmented (one species known from Utah, *P. breviceps*) ..... *Polygerus*
- Mandible triangular, inner border has large teeth (Fig. 5); maxillary and labial palps not as above ..... 4
- 4(3). Maxillary palp short, 3-segmented ..... *Acanthomyops*
- Maxillary palp longer, has at least 5 apparent segments (Fig. 10) ..... 5
- 5(4). Psammophore present (Fig. 24); maxillary palp longer than head ..... *Myrmecocystus*
- Psammophore absent; maxillary palp not longer than head ..... 6
- 6(5). Frontal carinae prominent, their lateral margins slightly deflected upward; ocelli large and conspicuous ..... *Formica*
- Frontal carinae poorly marked, their lateral margins flat; ocelli small and indistinct or absent ..... 7
- 7(6). Scape extends past corner of head by at least one-third length of scape, usually more; erect body hairs coarse, long, usually brown or black (one species known from Utah, *P. parula*) ..... *Paratrechina*
- Scape does not surpass corner of head; erect body hairs fine, short, and golden ..... *Lasius*

Key to Utah Species of *Acanthomyops* Workers  
(Modified from Wing 1968)

- 1. Erect hairs on dorsum of gaster segments restricted to or concentrated near posterior margins; in side profile top of scale sharp to moderately sharp; top of scale usually with median indentation ..... *interjectus*
- Erect hairs on dorsum of gaster segments uniformly distributed over entire surface; scale variable in shape ..... 2

- 2(1). In side profile, top of scale moderately to greatly blunt; throat has erect hairs from front to rear ..... 3
- In side profile, top of scale moderately to greatly sharp; throat has erect hairs only on one-half to three-fourths of posterior surface ..... 4
- 3(2). Erect hairs more numerous on dorsum of epinotum than on pro- and mesothorax; 1st femur has 10 or less erect hairs; scape lacks erect hairs ..... *murphyi*
- Erect hairs about evenly distributed over entire dorsum of thorax; 1st femur has 12 or more erect hairs; scape may have or lack erect hairs ..... *latipes*
- 4(2). Side of 2nd segment of gaster densely covered with hairs, the distance between hairs less than one-third their length; appendages and most of body densely covered with hairs ..... *occidentalis*
- Side of 2nd segment of gaster moderately to thinly covered with hairs, the distance between hairs more than one-half their length; appendages and body moderately to thinly covered with hairs ..... 5
- 5(4). Body color yellow; erect hairs on throat 0.13 mm or more in length, those on gaster 0.18 mm or more; hairs delicate ..... *creightoni*
- Body color yellowish brown to brown; erect hairs on throat 0.12 mm or less in length, those on gaster 0.17 mm or less; hairs coarse ..... *coloradensis*

Key to Utah Species of *Camponotus* Major Workers

(Modified from Creighton 1950, Gregg 1963)

- 1. Ventral border of clypeus depressed in middle to form thin anterior edge, usually with narrow median notch (Fig. 37); clypeus usually has short triangular depression behind notch ..... 2
- Ventral border of clypeus not depressed, edge wide, sometimes with notch; short triangular depression absent ..... 5
- 2(1). Mesepinotal suture broadly impressed, involves rear of mesonotum and front of epinotum ..... *hyatti*
- Mesepinotal suture not impressed, or, if slightly so, only as groove on front of epinotum ..... 3
- 3(2). Corner of head strongly shining, sides of head notably narrowed at level of mandibles ..... *essigi*
- Corner of head opaque or feebly shining, sides of head not unusually narrowed at level of mandibles ..... 4
- 4(3). Clypeus much broader than long ..... *nearcticus*
- Clypeus only slightly broader than long ..... *rasisili*
- 5(1). Clypeus lacks distinct ridge or keel, but sometimes has slight one; scape not flattened at base; head broader than long ..... 6
- Clypeus has distinct ridge or keel, sometimes reduced; if reduced, scape flattened at base; head as long as or longer than broad ..... 9
- 6(5). Scape has scattered erect hairs; entire ant jet black and shining, often with bluish reflections ..... *laevigatus*
- Scape lacks erect hairs except for small cluster at extreme tip; color not as above, but if black then not shining and lacks bluish luster ..... 7
- 7(6). Scape reaches only to or barely extends beyond corner of head ..... *herculeanus*
- Scape extends beyond corner of head by amount greater than maximum diameter of scape ..... 8



- 8(7). Pubescence on gaster absent or fine and sparse; entire surface of gaster shining ..... *novaeboracensis*  
 — Pubescence on gaster coarse and relatively dense, surface dull except for narrow lighter-colored band at posterior edge of each segment ..... *modoc*
- 9(5). Scape extends beyond corner of head by amount equal to or greater than length of 1st funicular joint ..... 10  
 — Scape does not extend beyond corner of head, or, if so, by amount less than length of 1st funicular joint ..... *sansabeanus*
- 10(9). Scape distinctly flattened at base, flattened portion forms small lateral lobe ..... *semitestaceus*  
 — Scape not flattened at base, or, if flattened, lacks lateral lobe ..... 11
- 11(10). Cheek strongly shining, has tiny inconspicuous puncta ..... *ocreatus*  
 — Cheek dull or feebly shining, has coarse and conspicuous puncta ..... *vicinus*

#### Key to Utah Species of *Formica* Workers

(Modified from Creighton 1950, Francoeur 1973, Wheeler and Wheeler 1977)

1. Ventral margin of clypeus has median notch (Fig. 37); short hairs on gaster dense; body bicolored with head and thorax reddish brown or reddish yellow, gaster brown or black; in side profile dorsomedian area of the epinotum between mesoepinotal suture and petiole angled, not broadly curved ..... 2  
 — Lacks above combination of characters (Fig. 38) ..... 10
- 2(1). Dorsum of 1st segment of gaster strongly shining, its thin hairs do not obscure delicate rough sculpture ..... 3  
 — Dorsum of 1st segment of gaster opaque or feebly shining, its dense hairs partially obscure fine leatherlike sculpture ..... 4
- 3(2). Basal face of petiole has many long erect hairs; other body hairs long and numerous ..... *perpilosa*  
 — Basal face of petiole lacks long erect hairs, or has cluster of short erect ones near junction with sloping face; other body hairs short and not abundant ..... *manni*
- 4(2). Dorsum of thorax lacks erect hairs, or has few fine short inconspicuous ones only on pronotum ..... 5  
 — Dorsum of pronotum and mesonotum has conspicuous erect hairs ..... 8
- 5(4). In front face view of largest workers, outer margin of eye reaches or surpasses margin of head ..... 6  
 — In front face view of largest workers, distinct space evident between outer margin of eye and margin of head ..... 7
- 6(5). Scape slender, not thickened at tip; basal face of epinotum lacks transverse impression ..... *pergandei*  
 — Scape robust, tip thickened; basal face of epinotum has distinct transverse impression ..... *emeryi*
- 7(5). Scale of petiole has blunt crest; gaster plain brown; upper face of epinotum at right angle to base ..... *subintegra*  
 — Scale of petiole has sharp crest; gaster blackish brown; upper face of epinotum at greater than right angle to base ..... *subnuda*

- 8(4). Gaster has long, stout, silvery, erect hairs blunt at tip; erect hairs on other parts of body about as abundant as those on gaster ..... *obtusopilosa*  
 — Erect hairs on gaster yellow, not blunt at tip; erect hairs on other parts of body much more sparse than on gaster ..... 9
- 9(8). Scape has abundant suberect hairs, those on inner surface near tip distinctly erect ..... *puberula*  
 — Scape lacks suberect or erect hairs ..... *wheeleri*
- 10(1). From posterior profile, upper surface of side of epinotum evenly curved to base (Fig. 26); body surface shining ..... 11  
 — From posterior profile, upper surface of side of epinotum angled before its base (Fig. 30); body surface dull ..... 14
- 11(10). Scale more than 1¼ length of head; frontal carinae diverge dorsally; posterior face of petiole scale convex ..... *pallidefulva*  
 — Scape less than 1¼ length of head; frontal carinae subparallel, do not diverge dorsally; posterior face of petiole scale not convex ..... 12
- 12(11). Scape has short, delicate, whitish, erect hairs ..... *lasioides*  
 — Scape lacks erect hairs except for small cluster at extreme tip ..... 13
- 13(12). Thorax has numerous erect hairs ..... *neogagates*  
 — Thorax lacks erect hairs, or has only 1 or 2 ..... *limata*
- 14(10). Dorsal border of head of larger workers strongly concave; pronotum in profile angled between base and upper surface ..... *opaciventris*  
 — Dorsal border of head of larger workers straight or only slightly concave; pronotum in profile evenly convex ..... 15
- 15(14). Erect hairs on pronotum distinctly broader at tip than at base ..... 16  
 — Erect hairs on pronotum absent, or, if present, taper from base to pointed tip or of equal width throughout their length ..... 20
- 16(15). Tibia has erect or suberect hairs in addition to double row on flexor surface; scape hairs variable, often erect ..... *microgyna*  
 — Tibia lacks erect hairs except for double row on flexor surface; scape lacks erect hairs except for few at extreme tip ..... 17
- 17(16). Dorsal border of head evenly convex ..... *querquetulana*  
 — Dorsal border of head flat or concave ..... 18
- 18(17). Crest of petiole lacks erect hairs; pubescence on dorsum of gaster thin, does not wholly conceal surface at rear edges of segments ..... *whymperi*  
 — Crest of petiole has erect hairs; pubescence on dorsum of gaster dense, wholly conceals surface ..... 19
- 19(18). Erect hairs on dorsum of head and thorax sparse, or inconspicuous or absent .... *rasilis*  
 — Erect hairs on dorsum of head and thorax abundant and conspicuous ..... *densiventris*
- 20(15). Body bicolored with head and thorax reddish or yellowish red, both lighter than dark gaster; front of head shining; frontal carinae strongly divergent ..... 21  
 — Body unicolored or bicolored—if bicolored then only thorax lighter than gaster; front of head opaque; frontal carinae parallel or moderately divergent dorsally .... 33
- 21(20). Scape has numerous delicate erect or suberect hairs ..... *oreas*  
 — Scape lacks erect hairs except at extreme tip, or has few scattered on inner surface near tip ..... 22

- 22(21). In ventral profile, median face of clypeus on each side of keel almost flattened to form abrupt curve or angle between keel and fossa (Fig. 39) ..... 23  
 — In ventral profile, upper face of clypeus not flattened, face forms a gradual curve from keel to fossa (Fig. 40) ..... 25
- 23(22). Middle and hind tibiae lack erect hairs except for double row of bristles on flexor surface ..... 24  
 — Middle and hind tibiae have many erect hairs in addition to double row of bristles ..... *obscuriventris*
- 24(23). Upper surface of body lacks erect hairs; gaster pubescence thin, surface strongly shining ..... *fossiceps*  
 — Upper surface of body has abundant erect hairs; gaster pubescence dense, whitish, surface opaque ..... *laeviceps*
- 25(22). Middle and hind tibiae have many erect hairs on all surfaces besides bristles on flexor surface ..... 26  
 — Middle and hind tibiae lack or rarely have 1 or 2 erect hairs other than bristles on flexor surface ..... 27
- 26(25). Head of major as broad as or broader than long; erect hairs on thorax unequal in length ..... *obscuripes*  
 — Head of major longer than broad; erect hairs on thorax short and about equal in length ..... *subnitens*
- 27(25). Gaster densely covered with short erect hairs of plushlike appearance viewed in profile ..... 28  
 — Erect hairs of gaster widely spaced, not plushlike in profile ..... 30
- 28(27). Throat lacks erect hairs, or has 1 or 2 suberect ones ..... *ciliata*  
 — Throat has several to 12 or more erect hairs ..... 29
- 29(28). Erect hairs on gaster short, average about 0.06 mm ..... *comata*  
 — Erect hairs on gaster long, average about 0.12 mm ..... *mucescens*
- 30(27). Mid and hind tibiae lack row of bristles but have 3 or 4 near spur ..... *criniventris*  
 — Mid and hind tibiae have row of erect bristles that extend for one-half length or more of tibiae ..... 31
- 31(30). Head of largest worker as broad as long ..... *obscuripes*  
 — Head of largest worker longer than broad ..... 32
- 32(31). Throat, crest of petiole, and dorsum of thorax lack erect hairs, sometimes few present ..... *haemorrhoidalis*  
 — Throat, crest of petiole, and dorsum of thorax have numerous erect hairs, sometimes throat and petiole have only 1 or 2 ..... *integroides*
- 33(20). Metasternum has 2 distinct hairy lobes that arise on each side of spinasternal cavity (Figs. 31, 32) ..... 34  
 — Metasternum lacks such lobes ..... 42
- 34(33). Head and body of uniform color ..... 35  
 — Head and body each bicolored ..... 39
- 35(34). Dark brown or black ..... 36  
 — Pale brown or yellowish brown ..... 38
- 36(35). Throat lacks erect hairs ..... *occulta*  
 — Throat has erect hairs ..... 37

- 37(36). Cheek and side of prothorax have erect hairs ..... *canadensis*  
 — Cheek and side of prothorax lack erect hairs ..... *altipetens*
- 38(35). Throat lacks erect hairs ..... *neoclara*  
 — Throat has erect hairs ..... *canadensis*
- 39(34). Throat lacks erect hairs ..... *neoclara*  
 — Throat has erect hairs ..... 40
- 40(39). Yellowish brown to brownish black; gaster darker than head, which is darker than thorax; head of largest worker as broad as long; gaster pubescence thin, surface strongly shining ..... *subpolita*  
 — Gaster and upper portion of head yellowish brown to dark brown, thorax and lower part of head paler; head of largest worker longer than broad; gaster pubescence normal or dense, surface opaque or feebly shining ..... 41
- 41(40). Corner of head and side of prothorax have erect hairs ..... *canadensis*  
 — Corner of head and side of prothorax lack erect hairs ..... *altipetens*
- 42(33). Head and body of uniform color ..... 43  
 — Head and body each bicolored ..... 52
- 43(42). Dark brown or black ..... 44  
 — Pale brown or yellowish brown ..... 51
- 44(43). Cheek between eye and mandible has coarse, elongate puncta widely spaced on upper half ..... *hewitti*  
 — Cheek between eye and mandible lacks coarse, elongate puncta, or, if present, concentrated mostly on upper half ..... 45
- 45(44). Throat lacks erect hairs ..... 46  
 — Throat has erect hairs ..... 50
- 46(45). Hairs on dorsum of 1st segment of gaster (exclusive of posterior row) usually more than 10; spinasternal cavity not surrounded by hairs (Fig. 31) ..... 48  
 — Hairs on dorsum of 1st segment of gaster (exclusive of posterior row) less than 10; spinasternal cavity surrounded by hairs ..... 47
- 47(46). Length of scape greater than length of head; anterior margin of clypeus angled ..... *accreta*  
 — Length of scape less than length of head; anterior margin of clypeus broadly convex ..... *fusca*
- 48(46). Cheek and dorsum of 1st 4 segments of gaster have dense pubescence producing a silvery luster ..... *argentea*  
 — Cheek and dorsum of 1st 4 segments of gaster have normal to thin pubescence, not silvery, but may have silky luster ..... 49
- 49(48). Length of scape shorter than length of head; sides of head only slightly rounded, diverge toward base of mandibles; posterior margin of head straight or slightly convex ..... *podzolica*  
 — Length of scape equal to or longer than length of head; sides of head broadly rounded; posterior margin of head strongly convex ..... *subsericea*
- 50(45). Length of scape greater than length of head; scale of petiole has dorsal median notch ..... *transmontanis*  
 — Length of scape not greater than length of head; scale of petiole not notched ..... *aerata*

51(43).	Throat has erect hairs .....	<i>aerata</i>
—	Throat lacks erect hairs .....	<i>argentea</i>
52(42).	Throat has erect hairs .....	53
—	Throat lacks erect hairs .....	54
53(52).	Cheek between eye and mandible has coarse, elongate puncta, widely spaced on upper half .....	<i>hewitti</i>
—	Cheek between eye and mandible lacks coarse, elongate puncta, or, if present, concentrated on upper half .....	<i>aerata</i>
54(52).	Cheek between eye and mandible has coarse, elongate puncta, widely spaced on upper half .....	<i>neurufibarbis</i>
—	Cheek between eye and mandible lacks coarse, elongate puncta, or, if present, concentrated on upper half .....	55
55(54).	Epinotum high with distinct angle .....	<i>gnava</i>
—	Epinotum long and low with even convexity .....	<i>xerophila</i>

#### Key to Utah Species of *Lasius* Workers

(Modified from Wilson 1955)

1.	Eye length 0.2 times or more width of head .....	2
—	Eye length 0.17 times or less width of head .....	6
2(1).	Mandible has one or more offset teeth at basal angle (Fig. 5) .....	<i>pallitarsus</i>
—	Basal tooth of mandible aligned with adjacent teeth (Fig. 6) .....	3
3(2).	Scape lacks erect hairs; eye length usually less than 0.25 times width of head; color yellowish brown .....	<i>sitiens</i>
—	Scape has erect hairs; eye length more than 0.25 times width of head; color other than yellowish brown .....	4
4(3).	Next to last basal tooth of one or both mandibles markedly reduced in size relative to 2 flanking teeth, or gap between next to last and last basal teeth larger than last basal tooth .....	<i>crypticus</i>
—	Next to last basal tooth subequal in size or larger than last basal tooth, gap between them about same as last tooth .....	5
5(4).	Scape and tibia have less than 10 or lack erect or suberect hairs .....	<i>alienus</i>
—	Scape and tibia have more than 10 erect or suberect hairs .....	<i>niger</i>
6(1).	In frontal or posterior view, dorsal crest of petiole strongly convex and not notched .....	<i>humilis</i>
—	Dorsal crest of petiole truncate or slightly convex, often notched .....	7
7(6).	Eye has less than 35 facets .....	8
—	Eye has 35 or more facets .....	9
8(6).	Outer surface of tibia has numerous erect or suberect hairs .....	<i>fallax</i>
—	Outer surface of tibia has only 1 or 2 erect or suberect hairs .....	<i>nearcticus</i>
9(7).	Longest hairs of posterior half of dorsum of 1st segment of gaster (exclusive of extreme posterior strip) not longer than one-half maximum width of hind tibia at midlength .....	<i>umbratus</i>
—	Longest hairs situated as above at least three-fifths as long as tibia width .....	10

- 10(9). Posterior half (except extreme posterior strip) of dorsum of 1st segment of gaster has hairs no more than semierect; erect hairs on tibia absent or sparse .... *subumbratus*
- Posterior half (except extreme posterior strip) of dorsum of 1st segment of gaster has erect hairs; erect hairs on tibia abundant ..... *vestitus*

Key to Utah Species of *Myrmecocystus* Workers  
(Modified from Snelling 1976)

- 1. Mandible has 8 to 10 teeth; integument light yellow or brownish yellow; ocelli absent or much reduced ..... 2
- Mandible has 6 or 7 teeth; integument not as above, but rusty red brown, black, orange or combination; ocelli well developed ..... 5
- 2(1). Dorsal surface of epinotum strongly projected upward over posterior two-thirds; erect hairs sparse; upper margin of eye barely below upper margin of head ..... *pyramicus*
- Dorsal surface of epinotum flat or evenly convex; body often abundantly hairy; upper margin of eye well below upper margin of head ..... 3
- 3(2). Head, pronotum, and gaster shiny, have few if any nonerect hairs; mid and hind tibiae have no more than 3 or 4 erect hairs beyond basal third of outer face; mesepinotal suture deeply impressed ..... *navajo*
- Head, pronotum, and gaster abundantly hairy; mid and hind tibiae have numerous erect hairs; mesepinotal suture not deeply impressed, but, if so, head length exceeds 1.3 mm ..... 4
- 4(3). Mesepinotal suture impressed; epinotum as long as or longer than high, juncture of dorsal and posterior faces broadly rounded ..... *mexicanus*
- Mesepinotal suture not impressed; epinotum higher than long, juncture abruptly rounded or slightly angular ..... *testaceus*
- 5(1). Uniform blackish or dark brown; anterior one-third of head may be paler; hairs on head sparse, with few erect hairs ..... *hammettensis*
- Bicolored or rusty red brown; head has abundant hairs, many of them erect ..... 6
- 6(5). 20 or more erect hairs on cheek in front view; scape, femur, and tibia have numerous suberect hairs on all surfaces ..... *mendax*
- Less than 20 erect hairs on cheek; scape and femur have sparse suberect hairs ..... 7
- 7(6). Cheek in frontal view has 6 or more erect hairs evenly distributed between eye and base of mandible ..... 8
- Cheek in frontal view has no more than 4 erect hairs confined to lower half near mandible ..... 10
- 8(7). Erect hairs present over at least one-half distance between inner margin of eye and base of antenna; puncta of face irregularly distributed ..... *semirufus*
- Erect hairs present only adjacent to inner margin of eye, do not extend more than one-fourth distance between eye and antennal base; puncta of face evenly distributed ..... 9
- 9(8). Longest pronotal hairs more than one-half length of minimum diameter of eye; cheek usually has 12 to 16 erect hairs; top of head finely punctate toward sides ..... *romainei*
- Longest pronotal hairs less than one-half diameter of eye; cheek usually has fewer than 12 erect hairs; top of head not punctate ..... *flaviceps*

- 10(7). Dorsum of segment 3 of gaster has dense short hairs ..... *flaviceps*  
 — Dorsum of segment 3 of gaster has few or no short hairs ..... 11  
 11(10). Face has sparse short hairs; head shiny; head, thorax, and legs brownish ..... *mimicus*  
 — Face has abundant hairs; head not shiny; head, thorax, and legs rusty red  
 brown ..... *kennedyi*

*Acanthomyops coloradensis* (Wheeler)

*Lasius interjectus coloradensis* Wheeler, 1917, Proc. Amer. Acad. Arts, Sci. 52:532.

*L. claviger*: Rees and Grundmann 1940:7; Cole 1942:375.  
*A. coloradensis*: Wing 1968:79; Smith 1979:1441.

Records: **SALT LAKE**: Lake Blanche (RG). **SAN JUAN**: locality unknown (Wg68). **UINTAH**: Vernal 13.4 mi NW (A). **WASATCH**: Francis 14.4 mi E, Soldier Summit 3.3 mi N (A).

Smith (1979:1441) lists this species from western United States, including Utah and Colorado. Most colonies have been found under stones. Gregg (1963:484) lists it in Colorado between 4654 and 8000 ft under rocks in conifers, oak, grass, and other habitats. Wing (1968) lists it from Arizona with an altitudinal range of 2000 to 7000 ft. Three elevational records for Utah are 4750, 7100, and 7463 ft.

*Acanthomyops creightoni* Wing

*A. creightoni* Wing, 1968, Cornell Univ. Agric. Expt. Sta., Mem. 405:141; Smith 1979:1441.

Record: **GRAND**: Warner Ranger Sta (Wg68).

Smith (1979:1441) lists this species only from Utah. One elevational record is 9750 ft.

*Acanthomyops interjectus* (Mayr)

*Lasius interjectus* Mayr, 1866, Zool.-Bot. Ges. Wien, Verh. 16:888; Rees and Grundmann 1940:7; Cole 1942:375.

*A. interjectus*: Ingham 1959:75; Wing 1968:95; Smith 1979:1441.

*A. claviger*: Beck et al. 1967:68.

Records: **IRON**: Cedar City (RG). **JUAB**: Joy (BAD). **KANE**: locality unknown (Wg68). **SALT LAKE**: Big Cottonwood Cyn (C42).

Smith (1979:1441) lists this species from eastern to western United States, including Utah and Idaho, where it occurs mainly in woodlands, pastures, or meadows in exposed soil sometimes mounded, or under stones or logs. Gregg (1963:484) lists it from Colorado between 5200 and 8700 ft under rocks and logs in a variety of habitats. Wing (1968) lists it from Arizona. Cole (1942:375) indicates its

habitat in Utah as under stones, one collection known at 10,000 ft. Ingham (1959) found it under stones in southern Utah. Wheeler and Wheeler (1977) found it in North Dakota most frequently under rocks. Two elevational records for Utah are 5800 and 5834 ft. Beck et al. (1967:68) found it feeding on a dead pocket mouse in one instance in Utah.

*Acanthomyops latipes* (Walsh)

*Formica latipes* Walsh, 1862, Proc. Ent. Soc. Phila. 1:311.

*Lasius latipes*: Rees and Grundmann 1940:7; Cole 1942:375.

*A. latipes*: Wing 1968:101.

Records: **CACHE**: Logan (C42). **CARBON**: Spring Cyn (City) (C42) (= Storrs). **DUCHESNE**: Blue Bench (C42), Currant Crk (US). **GARFIELD**: locality unknown (Wg68). **IRON**: locality unknown (Wg68). **SALT LAKE**: locality unknown (RG). **SAN JUAN**: Monticello (RG). **SANPETE**: Majors Flats (KU). **UTAH**: Aspen Grove (BY). **WASATCH**: Currant Crk (C42).

Smith (1979:1441) lists this species from eastern to western United States, including Arizona, where it occurs in open woodlands, meadows, or pastures in earthen mounds, or under stones or at the base of stumps. Gregg (1963:486) lists it from Colorado between 4800 and 8500 ft under rocks in a variety of habitats. Wing (1968) lists it from Arizona. Cole (1966:20) found its nests under stones in pinyon-juniper in southern Nevada. Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota.

One hundred thirty ants in three colonies in Utah were under rocks. Three collections were in sagebrush: one with matchbrush, one with snowberry, and one at the edge of aspen.

*Acanthomyops murphyi* (Forel)

*Lasius murphii* Forel, 1901, Ann. Soc. Ent. Belg. 45:367.  
*A. murphyi*: Wing 1968:115; Smith 1979:1441.

Records: **DUCHESNE**: locality unknown (Wg68). **SAN JUAN**: locality unknown (Wg68).

Smith (1979:1441) designates this species as eastern to western United States, including Utah and Idaho, where it nests under stones in open woodlands. Gregg (1963:490) lists it from Colorado between 5354 and 7200 ft under rocks in several habitats. Wing (1968) lists it from Arizona.

*Acanthomyops occidentalis* (Wheeler)

*Lasius occidentalis* Wheeler, 1909, J. New York Ent. Soc. 17:83.

*A. occidentalis*: Wing 1968: 124; Wheeler and Wheeler 1977; Smith 1979:1442.

Record: UINTAH: locality unknown (Wg68).

Smith (1979:1442) lists this species from midwestern and western United States, including Utah, Colorado, and Wyoming. Wing (1968) lists it from Arizona under stones.

*Aphaenogaster boulderensis* M.R. Smith

*A. boulderensis* Smith, 1941, Great Basin Nat. 2:120; Ingham 1959:47.

Records: WASHINGTON: St. George, Zion Nat Park (I59).

Smith (1979:1360) lists two subspecies from the western United States, including Arizona and Nevada, probably nesting under stones. The population in Utah is likely *A. b. boulderensis*. Cole (1966:9) found it in southern Nevada in mixed desert shrubs. Ingham (1963) found it in blackbrush in southern Utah. Eight elevations for Utah are between 2500 and 7066 ft.

*Aphaenogaster huachucana* Creighton

*A. huachucana* Creighton, 1934, Psyche 41:189; Ingham 1959:48.

Record: IRON: New Harmony (I59).

Smith (1979:1361) lists two subspecies from western United States, including Colorado and Arizona. The race in Utah is likely *A. h. huachucana*. Gregg (1963:340) lists it between 5100 and 6300 ft under rocks in pinyon-juniper-oak areas in Colorado. Ingham (1959) found it under rocks in juniper, pinyon, sagebrush, and oak in southern Utah. Two elevation records for Utah are 5250 and 6000 ft.

*Aphaenogaster occidentalis* (Emery)

*Stenamma subterraneum occidentale* Emery, 1895, Zool. Jahrb. Syst. 8:301.

*A. subterranea occidentalis*: Rees and Grundmann 1940:4; Cole 1942:364; Beck et al. 1967:68.

*A. subterranea valida*: Creighton 1950:150; Ingham 1959:49; Beck et al. 1967:68; Smith 1979:1362.

Records (Map 1): **BOX ELDER**: Box Elder Cyn (US), Brigham (C42), Locomotive Spngs (BAD), Mantua Mt (C42). **CACHE**: Blacksmith Fk Ranger Sta (BAD), Franklin Basin (KU), Green Cyn, Hyde Park (US), Logan, Logan Cyn, Providence Cyn (C42), Wellsville Cyn (US). **DAVIS**: Muellers Cyn (U). **GRAND**: Thompson (C42). **IRON**: Cedar City 7 mi E (A), Summit Crk (RAU). **JUAB**: Eureka 0.5 mi E, Nebo Loop Rd 9.9 mi S Santaquin Cyn, Ponderosa Cmpgnd (A). **MILLARD**: Oak Crk Cyn (US). **MORGAN**: Morgan (BAD). **RICH**: Chalk Crk (U). **SALT LAKE**: Big Cottonwood Cyn, Butterfield Cyn, S Dry Cyn, Ft Douglas, Holliday (C42), Little Willow Cyn (RG), Mt Olympus, Red Butte Cyn (U), Salt Lake City (RG), Univ Utah Campus (C42). **SAN JUAN**: Abajo Mts (U), **SANPETE**: Fountain Green 3 mi W (A), Majors Flats (KU). **TOOELE**: S Willow Cyn (U). **UTAH**: American Fk Cyn (U), Provo (A), N Fk Provo Cyn (U), Santaquin 3.6 and 4.6 mi E (A), Spanish Fk Cyn (KU), Thistle 2.7 and 20.4 mi E (A). **WASATCH**: Midway 3.7 mi NW and 5.7 mi W (A), Soapstone Cyn (U). **WASHINGTON**: Pine Valley (City) (BAD), Zion Nat Park (I59). **WEBER**: Woodruff 34.8 mi W (A).

Creighton (1950) and Smith (1979:1362) list two subspecies as occurring in the western United States, including Utah, Colorado, and Nevada, where they nest under stones in foothill canyons. Both races have been recorded from Utah, and may be separated as follows. Largest workers of *valida* are 6 mm in length and are bright red brown, whereas *occidentalis* workers are only 4.5 mm and are blackish brown. Gregg (1963:344) lists this species between 5354 and 7500 ft under rocks and logs predominantly in oak and deciduous areas in Colorado. Hunt and Snelling (1975:21) list it from Arizona. Wheeler and Wheeler (1978:391) found it between 5200 and 8400 ft in Nevada. Cole (1942:364) indicates its habitats in Utah as under stones and in ditch banks. Ingham (1959) lists its habitat as under stones and logs in pinyon-juniper, oak, sagebrush, and ponderosa pine in southern Utah.

There were 374 ants of 11 colonies under rocks. One colony was under the same rock as a colony of *Lasius pallitarsus*. Seven ants were attracted to a can containing meat juices. Six colonies were in grass: one with herbs and sagebrush; one with herbs, sagebrush, and rabbitbrush; one herbs, maple, and oak; two serviceberry, maple, and oak; and one maple and oak. Two colonies were in sagebrush, one in fir, two in oak, one in fir



and oak, and one in mahogany. In 51 recorded Utah habitats it occurred 34 times in canyons above 5000 ft. In 27 collections where the elevation was known, it occurred about equally between 4253 and 7700 ft. One collection was at 9000. Eggs were found in late June and early July, and larvae in late June.

In one instance, when the cover rock was removed, these ants attempted to carry the exposed larvae into their burrow. In another instance, when ants of a nearby *Formica integroides* colony periodically crawled into the home range area of *subterranea*, these latter ants quickly entered their burrow. Beck et al. (1967:68) found it feeding on dead mice in four instances in Utah.

### *Aphaenogaster uinta* Wheeler

*A. uinta* Wheeler, 1917, Proc. Amer. Acad. Arts Sci. Boston 52:517; Rees and Grundmann 1940:4; Cole 1942:364; Creighton 1950:154; Ingham 1963:77; Knowlton 1970:208, 1975:2; Smith 1979:1363.

Records (Map 1): **BOX ELDER**: Dolphin Island (in Great Salt Lake) (C42), NW Kelton (K75) and 9 mi N (K70). **DUCHESNE**: NW Roosevelt (KU); **EMERY**: Goblin Valley 10 mi E (KU). **IRON**: SE Lund (I63). **JUAB**: Chicken Crk Res (KU), Eureka 0.5 mi E (A). **SALT LAKE**: Big Cottonwood Cyn (U), S Dry Cyn (C42), E Mill Crk Cyn (RG), Point-of-Mt (C42), Salt Lake City (RG).

Smith (1979:1363) lists this as a western intermountain species, including Utah, Colorado, Nevada and Idaho, where it nests in fully exposed, dry areas. Cole (1942:364) indicates its nests as under stones in Utah. Ingham (1963) found it in alkali flats in southern Utah.

Forty ants of one colony were in grass, herbs, and sagebrush under a rock. In 13 recorded Utah habitats it occurred only 3 times in montane areas. In 7 recorded elevations between 4253 and 6425 ft, 5 were between 5000 and 5500.

### *Brachymyrmex depilis* Emery

*B. heeri depilis* Emery, 1893, Zool. Jahrb. Syst. 7:635.  
*B. depilis flavescens*: Grundmann 1952:117.

Records: **BOX ELDER**: Wellsville Mts (KU). **SALT LAKE**: Big Cottonwood Cyn (G52).

Smith (1979:1424) lists this species as mainly eastern United States, nesting under stones and wood. He does not list an intermountain state. Gregg (1963:449) lists it from

Colorado between 4600 and 7000 ft under rocks in conifers, oak, and deciduous habitats. Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota.

### *Camponotus essigi* M.R. Smith

*C. caryae* var. *essigi* Smith, 1923, Ent. News 24:306.

Records (Map 2): **BOX ELDER**: Hansel Mts, Mantua (KU).

Smith (1979:1432) lists this species as western United States, including Nevada and Idaho. Hunt and Snelling (1975:22) list it from Arizona. Wheeler and Wheeler (1978:393) found it between 6000 and 7800 ft in Nevada. One Utah elevational record is 5175 ft.

### *Camponotus herculeanus* (Linnaeus)

*Formica herculeana* Linnaeus, 1758, Syst. Nat. Ed. 10, 1:579.

*C. herculeanus whymperi*: Rees and Grundmann 1940:11; Cole 1942:388; Hayward 1945:120.

*C. herculeanus*: Smith 1979:1426.

Records (Map 3): **CACHE**: Logan (KU), Logan Cyn (US), Monte Cristo (KU). **CARBON**: Scofield (BAD). **DAVIS**: Mueller Park (C42). **DUCHESNE**: Duchesne 30 mi SW (US), Mirror Lake (U), Roosevelt (C42). **GARFIELD**: Bryce Cyn Nat Park (US). **JUAB**: Nephi 5.5 mi W (A). **RICH**: Garden City, Meadowville (KU). **SALT LAKE**: Brighton (U), Cottonwood, Draper (US), Lake Blanche (C42), Red Butte Cyn (U). **SAN JUAN**: Monticello 9.5 mi W (A). **SANPETE**: Bluebell Flats, Ephraim Cyn (KU), Maple Cyn (U), Mt. Pleasant, Pleasant Crk (BAD). **SUMMIT**: Henrys Fk (RG), Kamas 11 mi E (U). **UINTAH**: Whiterocks Cyn (KU). **UTAH**: Aspen Grove (BY), Provo (U), Santaquin 6.7 mi E (A). **WASATCH**: Horse Crk (C42), Midway 11.6 mi W (A), N Fk Provo River (U). **WEBER**: Uintah (US).

Smith (1979:1426) lists this species as eastern to western United States, including Utah and Colorado, where it nests in rotting logs and stumps primarily in montane forest. Gregg (1963:658) lists it between 5150 and 12,500 ft under rocks and logs predominantly in conifer habitats in Colorado. Cole (1942:388) indicates its habitats as logs and stumps, particularly conifers, at high elevations in Utah.

One ant was taken singly in the open, three under a log, and five under a rock. Specimens were found in grass, sagebrush, and oak; chokecherry and aspen; junipers and conifers. In 33 recorded Utah habitats it occurred 20 times in montane forest. In 15 recorded elevations between 4490 and 10,050

ft, it occurred most frequently under 6000. When disturbed by removal of their covering these ants quickly hide.

### *Camponotus hyatti* Emery

*C. hyatti* Emery, 1893, Zool. Jahrb. Syst. 7:669.  
Record (Map 2): CACHE: Green Cyn (KU).

Smith (1979:1432) lists two subspecies as western United States, including Nevada, where they nest in the soil or in or under dead limbs. The Utah race is likely *hyatti*, which may be differentiated by its entire black or dark brown gaster, whereas in *bakeri* the basal two-thirds of the 1st gastric segment is red. Cole (1966:19) found one nest under a juniper log in mixed brush in a desert area in southern Nevada.

### *Camponotus laevigatus* (F. Smith)

*Formica laevigata* Smith, 1858, Cat. Hym. Brit. Mus. 6:55.

*C. laevigatus*: Rees and Grundmann 1940:11; Cole 1942:388; Ingham 1959:70.

Records (Map 2): BEAVER: Beaver Cyn (RG). CACHE: Logan, Logan Cyn (C42). GARFIELD: Carcass Crk on Boulder Mt (U). GRAND: La Sal Mts (BY). IRON: Cedar City 7 mi E (I59). SAN JUAN: Monticello 18.5 mi E (U), Navajo Mt (US). UTAH: Aspen Grove (C42), Provo (BY). WASATCH: Kamas 11 mi SE (U). WASHINGTON: Pine Valley (City) (I59), Zion Nat Park (BY). WAYNE: Boulder Mt (US).

Smith (1979:1426) lists the distribution of this species as western United States, including Colorado, where it nests in logs and stumps in forested areas. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:662) lists it between 5354 and 8700 ft under logs predominantly in conifer habitats in Colorado. La Rivers (1968:7) lists it from Nevada, where Wheeler and Wheeler (1978:392) found it between 6400 and 8600 ft. Cole (1942:388) indicates its habitat as dry logs in open woods in Utah. Ingham (1959) found it in logs in ash, willow, poplar, oak, and ponderosa pine in southern Utah.

In 14 recorded Utah habitats it occurred 10 times in montane forest. In 10 elevational records between 4276 and 9000 ft, it occurred four times under 4900, three times between 7000 and 7900.

### *Camponotus modoc* Wheeler

*C. herculeanus* var. *modoc* Wheeler, 1910, Ann. New York Acad. Sci. 20:299; Rees and Grundmann 1940:11; Cole 1942:388; Beck et al. 1967:68.

*C. pennsylvanicus modoc*: Ingham 1959:69.

Records (Map 3): BOX ELDER: Raft River Mts, Tacoma Mt (U), Wellsville Mts, Willard Basin (KU). CACHE: Green Cyn, Leeds Cyn (KU), Logan, Logan Cyn (C42). CARBON: Scofield 4 and 6 mi S (A). DAGGETT: Palisade Park (RG). DUCHESNE: Avintaquin Cmpgnd (A), Mirror Lake (BY), Trial Lake (U). EMERY: Ferron Res (RG). GARFIELD: Carcass Crk on Boulder Mt (U). IRON: Cedar Breaks Nat Mon (U), Cedar City (RAU). KANE: Long Valley Jct 11 mi W (I59). RICH: Garden City, Monte Cristo (KU), Woodruff 18.4 mi W (A), Wyoming brdr 0.5 mi S on U16 (A). SALT LAKE: Big Cottonwood Cyn (C42), Brighton (U), Little Willow Cyn (C42), Red Butte Cyn, Salt Lake City (U), Taylorsville (C42). SAN JUAN: Monticello 5 mi W (U). SANPETE: Ephraim 8.8 mi E (A), Maple Cyn (U), Orangeville 23.9 mi W (A). SUMMIT: Kamas 21 mi E, Mirror Lake 6.4 mi N (A), Oakley (U). TOOELE: Deep Crk Mts (U). UINTAH: Dinosaur Nat Mon (GR63), Jet Red Cloud Loop rd and U44 14 mi W (A), E Wall Lake (in Uinta Mts) (U), Whiterocks Cyn (KU). UTAH: Provo, Santaquin 6.7 and 7.7 mi E, Silver Lake Flat, Tibble Fk Cyn (A), Utah Lake (U). WASATCH: Francis 8.1 mi E, Hanna 14.3 mi W, Soldier Summit 7.9 and 10.1 mi N (A), Strawberry Valley (C42). WASHINGTON: Kolob, Pine Valley (City) (I59). COUNTY UNKNOWN: Woodburn (C42) (no such city listed in *Utah Gazetteer*).

Smith (1979:1426) lists this species as western United States, including Colorado, where it occurs in logs and stumps in forested areas. Gregg (1963:667) lists it in Colorado between 4800 and 11,300 ft under rocks and logs predominantly in conifer habitats. Hunt and Snelling (1975:22) list it from Arizona. La Rivers (1968:7) lists it from Nevada, where Wheeler and Wheeler (1978:392) found it between 6000 and 12,000 ft. They found it frequently in wood in North Dakota (1963). Cole (1942:388) indicates its habitat in Utah as logs and stumps of conifers at high elevations. Ingham (1959) found it in southern Utah in logs in sagebrush, fir, aspen, and ponderosa pine.

Seventy-two ants in 10 collections were found under logs. In 5 of these the ants were under the same log with ants of the genus *Formica*: once with *F. gnava*, once *F. podzolica*, once *F. gnava* and *F. neoclara*, once *F. fusca* and *F. subnuda*, and once *F. obscuriventris*, *F. podzolica*, and *F. subnitens*. Thirty-two ants in 2 collections were taken from inside a log, 15 ants in 2 collections from the base of a dead standing tree, one ant under a rock, one from a dead chipmunk, 12 in 4 collections crawling in the open, and 23 of 2 collections from ground burrows. The burrows did not have mounds: one of them was in an area of Oregon grape and herbs,

where 13 ants were found, and the other, with 10 ants, was in sagebrush and grass. The burrows in the sage-grass habitat were also occupied by *F. neogagates*. Twelve collections were in aspen: 8 in association with conifers, one with grass, herbs, and shrubs, and one grass and herbs. Four collections were in conifers; one cottonwoods; one oak, grass, herbs, and sagebrush; one herbs and Oregon grape; and one grass and sagebrush. In 54 recorded Utah habitats it occurred 42 times in montane forest. In 23 elevations between 4200 and 10,399 ft, 11 collections were under 7000 and 12 over 8000.

These ants are awkward crawlers, and when they are disturbed they hide under debris. Beck et al. (1957:68) found it feeding on dead rodents in three instances in Utah.

### *Camponotus nearcticus* Emery

*C. marginatus* var. *nearcticus* Emery, 1893, Zool. Jahrb. Syst. 7:669.

*C. caryae decipiens*: Rees and Grundmann 1940:11.

*C. nearcticus decipiens*: Cole 1942:388.

*C. nearcticus*: Knowlton 1970:208, 1975:2.

Records (Map 2): **BOX ELDER**: Kelton Pass (K70), Wildcat Hills (KU). **CACHE**: Logan (KU). **SALT LAKE**: E Mill Crk Cyn (RG). **SUMMIT**: Mirror Lake 17.3 mi N (A). **TOOELE**: Tooele (US). **UINTAH**: Dinosaur Nat Mon (Gr63). **WASHINGTON**: St George (KU).

Smith (1979:1432) lists this as eastern to western United States, including Colorado and Idaho, where it lives in trees, logs, pine cones, and other wood products. Gregg (1963:675) lists it between 4800 and 7000 ft in duff and under logs predominantly in cottonwood-willow habitats in Colorado. Hunt and Snelling (1975:22) list it from Arizona. Wheeler and Wheeler (1963) found it frequently in wood in North Dakota. Cole (1942:388) indicates its habitat in Utah as standing dead trees.

One collection of 10 ants was taken from under a log in sagebrush, aspen, and conifers. In seven known specific habitats, it was taken twice in montane forest. Three known elevations are between 2760 and 4923 ft.

### *Camponotus novaeboracensis* (Fitch)

*Fornica novaeboracensis* Fitch, 1845, Trans. New York State Agr. Soc. 14:766.

*C. herculeanus ligniperdus* var. *noveboracensis*: Rees and Grundmann 1940:11; Cole 1942:388.

*C. novaeboracensis*: Smith 1979:1426.

Records (Map 3): **CARBON**: Myton rd 10.5 mi E US6 (A). **DAVIS**: Bountiful (U). **DUCHESNE**: Muellers Prk, Roosevelt (C42). **GARFIELD**: Carcass Crk (on Boulder Mt) (U). **GRAND**: Moab (U). **IRON**: Cedar City 7 mi E (A). **RICH**: Chalk Crk (U). **SALT LAKE**: Big Cottonwood Cyn, Butterfield Cyn, Ft Douglas, Emigration Cyn, Red Butte Cyn, Salt Lake City (U). **SAN JUAN**: La Sal (U). **TOOELE**: S Willow Cyn (U). **UTAH**: American Fk Cyn (U).

Smith (1979:1426) lists this species as eastern to western United States, including Utah and Colorado, nesting in logs and stumps in wooded areas. Gregg (1963:663) lists it from Colorado between 5500 and 8500 ft under logs predominantly in conifer forest. Wheeler and Wheeler (1963) found it frequently in wood in North Dakota.

One collection of four ants was from under a rock in pinyon and juniper, and the other of one ant under a log in mahogany. In 15 recorded Utah habitats it was taken 9 times in montane areas. In 10 known elevations between 4042 and 9000 ft it was found most frequently under 7000. In one collection, when the cover boulder was removed, the exposed ants crawled rapidly into a burrow.

### *Camponotus ocreatus* Emery

*C. maculatus ocreatus* Emery, 1893, Zool. Jahrb. Syst. 7:673.

*C. ocreatus*: Ingham 1959:71.

Records: **DUCHESNE**: Duchesne 9 mi W (WU). **WASHINGTON**: Zion Nat Park (I59).

Smith (1979:1429) lists this species as southwestern United States, including Arizona and Nevada, nesting under stones. Cole (1966:20) found a nest under a stone in mixed shrubs in southern Nevada. Ingham (1959, 1963) found it in southern Utah under stones in sagebrush, juniper, galletagrass, rabbitbrush, winterfat, shadscale, greasewood, and alkali flats. In four recorded Utah elevations it was taken three times between 4000 and 5000 ft and once at 7000 in desert situations.

### *Camponotus rasilis* Wheeler

*C. fallax* subsp. *rasilis* Wheeler, 1910, J. New York Ent. Soc. 18:227.

*C. rasilis*: Gregg 1963:677.

Record: **UINTAH**: Dinosaur Nat Mon (Gr63).

Gregg (1963:677) lists this species from Colorado between 4800 and 6970 ft in duff and decaying logs in pinyon-juniper-oak and cottonwood-willow habitats, and shows a Utah record. Hunt and Snelling (1975:22) list it from Arizona.

*Camponotus sansabeanus* (Buckley)

*Fornica San Sabeanus* Buckley, 1866, Proc. Ent. Soc. Phila. 6:167.

*C. maculatus sansabeanus*: Rees and Grundmann 1940:11.

*C. maculatus sansabeanus* var. *torrefactus*: Rees and Grundmann 1940:11.

*C. sansabeanus*: Cole 1942:387.

*C. sansabeanus torrefactus*: Cole 1942:388; Creighton 1950:379; Grundmann 1958:165; Beck et al. 1967:68; Smith 1979:1429.

*C. sansabeanus sansabeanus*: Smith 1979:1429.

Records (Map 3): **GRAND**: Moab (G48). **IRON**: Parowan (RG). **SALT LAKE**: Big Cottonwood Cyn (U), Mill Crk Cyn, Salt Lake City (RG). **SUMMIT**: Mirror Lake 1 mi N (A). **UINTAH**: Dinosaur Nat Mon (Gr63). **UTAH**: Aspen Grove (BY). **COUNTY UNKNOWN**: Oris (RG) (? = Osiris in Garfield Co).

Smith (1979:1429) designated three subspecies, *bulimosus*, *sansabeanus*, and *torrefactus*, as primarily western United States, including Utah, Colorado, Arizona, and Nevada, nesting under stones. He designated the latter two subspecies as occurring in Utah. They may be separated by the scape of the major, which is lobulate at the base in *sansabeanus*, but not lobulate in *torrefactus*. Gregg (1963:669) lists this species from Colorado between 4500 and 7000 ft under rocks, under logs, and in large mounds in pinyon-juniper and cottonwood-willow habitats, and shows a Utah record. Cole (1942:387) indicates that in Utah it nests under stones in dry woods. Grundmann (1958:165) indicates that in Utah it may be found under stones in mountain brush-juniper areas.

One collection of 10 ants was under a log in conifers. In eight recorded Utah habitats four were in montane forest. In seven recorded elevations between 4042 and 10,050 ft three were under 5000. Beck et al. (1967:68) found it feeding on dead rodents in one instance in Utah.

*Camponotus semitestaceus* Emery

*C. maculatus vicinus* var. *semitestaceus* Emery, 1893, Zool. Jahrb. Syst. 7:668.

*C. semitestaceus*: Allred and Cole 1979:99.

Record (Map 2): **KANE**: Glen Cyn City (AC).

Smith (1979:1429) lists this species as mostly western United States, but no intermountain state is indicated. It nests under stones or in low crater mounds. Hunt and Snelling (1975:22) list it from Arizona. Allred and Cole (1979) found it in southern Utah in ephedra-grass and sagebrush. La Rivers

(1968:7) lists it from Nevada. One record in Utah was taken at 3250 ft.

*Camponotus vicinus* Mayr

*C. vicinus* Mayr, 1870, Verh. Zool.-Bot. Ges. Wien 20:940; Grundmann 1958:165; Ingham 1959:71; Beck et al. 1967:68; Knowlton 1970:208, 1975:2; Allred and Cole 1979:97.

*C. maculatus vicinus*: Rees and Grundmann 1940:11.

*C. sansabeanus vicinus*: Cole 1942:387, 388; Hayward 1945:120.

*C. sansabeanus vicinus* var. *nitidiventris*: Cole 1942:387.

*C. sansabeanus vicinus* var. *luteangulus*: Cole 1942:388.

Records (Map 4): **BEAVER**: Minersville (US). **BOX ELDER**: Brigham, Brigham Cyn, Cedar Crk (City) (US), Dolphin Island (C42), Kelton, Kelton Pass, Locomotive Spngs (K70), Lucin (BAD), Mantua (US), Raft River Mts (BY), Snowville and 16 mi SW (KU), Willard (C42). **CACHE**: Cache Jct (C42), Green Cyn (KU), Logan, Logan Cyn, Providence Cyn, Trenton (C42). **CARBON**: Myton rd 10.5 mi E US6 (A). **DACGETT**: Bridgeport (BAD) and 8 mi S (US), Browns Park (BY), Pipe Crk (US), Willow Crk (BY). **DAVIS**: Farmington (C42), Farmington Cyn (US). **DUCHESNE**: Myton (US), Roosevelt (C42), Sheep Crk (BY), Tabiona 11.6 mi E (A). **EMERY**: Ferron (RG). **GARFIELD**: Boulder Mt (G58), Bryce Cyn Nat Park (BY), Horse Valley (in Henry Mts) (U). **GRAND**: Dewey 3 mi N (U), Moab (RG) 14 mi N (U) and 15 mi SE (KU). **IRON**: Cedar City (RAU), Modena 10.4 mi NE (A), Parowan (C42), Shirts Cyn (RAU). **JUAB**: Callao (BAD), Diamond Cyn (C42), Lynndyl Sand Dunes (BY), Nephi 12.1 mi W, Ponderosa Cmpgnd (A), Tintic, Trout Crk (City) (C42). **KANE**: Glen Cyn City (AC), W Mt Carmel Jct (K59), Navajo Wells (BAD), Pink Coral Sand Dunes (US). **MILLARD**: Gandy (BAD), Swasey Spngs (RG), White Valley (C42). **MORGAN**: Morgan (US), Porterville, Sage Range Mts (KU). **PIUTE**: Fish Lake Jct 1 mi S (U), Marysvale (A). **RICH**: Sage Crk Jct 5.1 mi W (A). **SALT LAKE**: Big Cottonwood Cyn, Butterfield Cyn (C42), City Crk Cyn (U), Draper (US), Ft Douglas, Granite, E Mill Crk Cyn, Salt Lake City (C42). **SAN JUAN**: Abajo Mts (G58), Blanding (C42) and 8 mi N (U), Dead Horse Pt (BAD), Hole-in-the-Rock (U), La Sal Crk (RG), La Sal Jct (A), Mexican Water (BAD), Monticello 2 mi W (A) and 17 mi E (U), Nat Bridges Nat Mon (US), Navajo Mt (US), Pack Crk (US), Jet U95 and U261 7.7 mi W (A). **SANPETE**: Chester (C42), Ephraim (US), Ephraim Cyn (U), Mt Pleasant (BAD). **SEVIER**: Koosharem, Paradise Valley (BAD), Salina Cyn nr Fremont Jct (U). **TOOELE**: Benmore, Clover (C42), Dolomite (US), Gransville (C42) (? = Grantsville), Mercur (BAD), Orrs Ranch, Vernon (C42), S Willow Cyn (U), Willow Spngs (C42). **UINTAH**: Bonanza (US), Dinosaur Nat Mon (Gr63), Dry Fk rd 13.4 mi N U121 (A), Duchesne 9 mi W (WU) (? = Ft Duchesne), Pelican Lake (US). **UTAH**: American Fk (RG), Jordan Narrows, Mercur (US), Provo, Springville, Thistle (BY), Tibble Fk Cyn, Tibble Fk Lake 0.5 mi W (A). **WASATCH**: Deer Crk Res (U), Hanna 9.2 mi W, Midway 3.7 mi NW (A). **WASHINGTON**: Pine Valley (City), nr Short Crk (Arizona) (I59), Sunset Cyn (nr Virgin) (RAU), Zion Nat Park (BY). **WAYNE**: Fruita 5 mi SE (U), Torrey (BAD). **WEBER**: Ogden (C42).

Smith (1979:1430) lists this species from western United States, including Colorado, nesting under stones or rotting wood in soil. Gregg (1963:674) lists it between 3500 and 9600 ft. under rocks and logs in a variety of habitats in Colorado. Hunt and Snelling (1975:22) list it from Arizona. Cole (1966:20) found it in southern Nevada under rocks commonly in pinyon-juniper, also in open dry areas in Utah (1942:387). Wheeler and Wheeler (1978:393) found it between 6000 and 9100 ft in Nevada, and frequently under rocks in North Dakota (1963). It occurs in Utah under stones in juniper-brush habitats (Grundmann 1958:165). Ingham (1959, 1963) found it under rocks in pinyon-juniper, sagebrush, serviceberry, bur sage, rabbitbrush, galletagrass and greasewood in southern Utah. Allred and Cole (1979:97) found it in southern Utah in habitats of ephedra-van-clevea-grass, juniper-ephedra-grass, sagebrush, juniper-pinyon, grass-sagebrush, and mostly in blackbrush. They also found it in abundance in associations of sagebrush-grass, sagebrush-grass-rabbitbrush, and sagebrush-rabbitbrush and less abundant in a variety of other vegetative types in Idaho (Allred and Cole 1971:239).

There were 186 ants in 12 collections found under rocks, 3 in one collection singly in an open area, and 2 in one collection under a juniper log. In a juniper-sagebrush area in late June 12 miles west of Nephi in Juab County, 20 ants in one collection were found in a mound of *Pogonomyrmex occidentalis*, although no harvester ants were present. The carpenter ants had excavated a large chamber (or cleared out and enlarged the food cache area) about eight inches from the top of the mound. About 50 workers and 50 pupae were present. Eggs were found under one rock in late June. When the rock was removed, the ants attempted to carry the exposed eggs into the burrow.

Ten collections were in sagebrush: one in association with grass and herbs, one grass and juniper, one pinyon and juniper, one pinyon, one snowberry and oak, and one snowberry. One collection was in pinyon and juniper; one grass and oak; one oak; one grass, herbs, maple and oak; and two aspen and fir. In 124 recorded Utah habitats 35 were in montane forest. In 69 recorded elevations be-

tween 3250 and 9000 ft, 51 collections were between 4000 and 6000. Only one was under 4000, two over 8000. Beck et al. (1967:68) found it feeding on dead rodents in 13 instances in Utah.

### *Conomyrma bicolor* (Wheeler)

*Dorymyrmex pyramicus* var. *bicolor* Wheeler, 1906, Bull. Amer. Mus. Nat. Hist. 22:342; Cole 1942:372; Grundmann 1958:164; Ingham 1959:64.

*D. bicolor*: Beck et al. 1967:69.

*C. bicolor*: Allred and Cole 1979:99; Smith 1979:1420.

Records (Map 5): **CACHE**: Hodges Cyn (KU). **EMERY**: Greenriver (U). **GRAND**: Dewey (U), Crescent Jet 5 and 18.8 mi S (A), Moab (C42). **IRON**: Cedar City 6.3 mi W (A), Columbia Iron Mines 7 mi W, Kanaraville (I59), Modena 5.3 mi W (A). **JUAB**: Callao (BAD), Provo 30 mi S (C42). **KANE**: Adairville (BAD), Kanab (C42), 5 mi E (A) and 5 mi N (I59). **MILLARD**: Desert Range Exp Sta (U). **SAN JUAN**: Blanding, Bluff, Glen Cyn Res, Hole-in-the-Rock (G58), La Sal Jct (A), Lost Eden, Mexican Hat (G58), Monticello (US), Nat Bridges Nat Mon (U), Rock Crk (G58). **UINTAH**: Bonanza 15 mi N, Jensen 7.5 mi E (A), Vernal (US). **WASHINGTON**: Grafton, Harrisburg Jct toward Hurricane, LaVerkin, Pintura, Rockville, Shivwits Indian Res, nr Shortcreek (Arizona), Snow Cyn, Springdale, Toquerville, Virgin City, Zion Nat Park (I59). **WAYNE**: Hanksville 17 mi S (US).

Smith (1979:1420) lists this species from southwestern United States, including Utah, Arizona, and Nevada, where it nests in irregular or craterlike mounds in exposed situations. Cole (1966:18) found it commonly in craterlike mounds in creosote bush habitats in southern Nevada. In Utah it inhabits lower elevations along canyon bottoms, where it builds craterlike mounds (Grundmann 1958:164). Ingham (1959, 1963) found it in southern Utah in flat or low crater mounds in creosote bush, sagebrush, pinyon-juniper, ponderosa pine, blackbrush, joshua trees, rabbitbrush, bur sage, sand sagebrush, four-wing saltbush, and shadscale. Allred and Cole (1979:99) found it in blackbrush in southern Utah.

There were 125 ants in four collections taken from small crater mounds less than one-half inch in height and about six inches in diameter, with the dorsal opening in the crater. One mound was at the edge of a clearing of an active colony of *Pogonomyrmex occidentalis*. One collection of 30 ants was taken from a burrow with no mound, in which winged forms were more abundant than the workers. Thirty ants in one collection were taken from a safari; the ants scurried out of line when disturbed. Twenty-two

ants were taken in two collections crawling singly away from their burrows. These ants are fast runners. Occasionally many mounds may occur in close vicinity. Six collections were in grass: two in association with sagebrush, one old man sage, one greasewood, and one juniper. One collection was in sagebrush and matchbrush. Only once in 43 recorded Utah localities was it found in a montane area. It was taken between 2500 and 7066 ft at 35 known elevations, 24 of these between 4000 and 5000 ft. It was taken over 6000 ft only twice.

In one instance a nest of *Formica obtusopilosa*, around which *bicolor* workers were scurrying, was excavated five miles west of Modena in Iron County. When the eggs of the *Formica* were exposed, the *bicolor* ants ran into the excavated area and began carrying the eggs away. In the same area two harvester ants of *Pogonomyrmex occidentalis* were "tending" a *bicolor*, apparently dead, at the fringe of the harvester mound. Several *bicolor* ants kept darting at the harvester ants, not actually making contact, in what appeared to be a type of rescue effort. The harvesters demonstrated no apparent response to the aggressive *bicolor* ants. Beck et al. (1967:69) found it feeding on dead rodents in two instances in Utah.

### *Conomyrma insana* (Buckley)

*Formica insana* Buckley, 1866, Proc. Ent. Soc. Phila. 6:165.

*Dorymyrmex pyramicus*: Rees and Grundmann 1940:6; Cole 1942:371; Creighton 1950:348; Ingham 1959:64; Beck et al. 1967:69.

*D. pyramicus flavus*: Cole 1942:371.

*D. pyramicus pyramicus*: Grundmann 1958:164.

*C. insana*: Allred and Cole 1979:97.

Records (Map 5): **BEAVER**: Frisco (BAD). **BOX ELDER**: Snowville (KU). **CACHE**: Leeds Cyn (KU). **CARBON**: Price 20 mi E (WU). **DAVIS**: Layton 1.5 mi S (A). **DUCHESNE**: Blue Bench (C42), Duchesne (BAD), Myton (US), Roosevelt (BAD). **EMERY**: Goblin Valley (BAD) and 10 mi E (KU), Greenriver (C42), Hanksville 16 mi N (KU), Hideout Cyn nr Green River (U), Huntington (BAD). **GARFIELD**: Escalante 20 mi E (U), Hite (BAD). **GRAND**: Arches Nat Park (WU), Dewey (U), Moab (C42). **IRON**: Cedar City (I59), 3.7 mi E and 16.8 mi N (A), Little Pinto (US), Lund 19 mi N, Modena 10.4 mi NE (A), New Harmony 3 mi NW (I59). **JUAB**: Nephi 5.5 mi W (A). **KANE**: Glen Cyn City (AC), Kanab (RG), Wahweap (KU). **MILLARD**: Desert Range Exp Sta (BAD), White Valley (C42). **PIUTE**: Kingston (BAD). **SALT LAKE**: Butterfield Cyn, Granite (C42), Mt Olympus (U), Parleys Cyn (C42), Riverton 2.6 mi S

(A). **SAN JUAN**: Aztec Cyn (U), Blanding (G58), Bluff (KU) and 11 mi N (U), Hole-in-the-Rock Cyn (U), La Sal Jet 1.6 and 23.1 mi S (A), Monticello (G58), Nat Bridges Nat Mon (U), Squaw Flat Cmpgnd (in Canyonlands Nat Park) (WU), Jet U95 and U261 7.7 mi W, Jet U261 and US163 19.6 mi N (A). **SANPETE**: Yuba Res (BAD). **TOOELE**: Clive, Clover, Orrs Ranch, Tooele (C42). **UINTAH**: Bonanza (KU), Dinosaur Nat Mon (BAD), Ft Duchesne, Gusher (C42), Jensen (U) and 5.5 mi W (A), Lapoint, Ouray Valley (C42), Vernal 10 mi N (A). **UTAH**: Goshen, Lehi, Orem, Provo (C42). **WASHINGTON**: Central (I59), Diamond Valley (BAD), Hurricane (C42), Leeds (US), Leeds Cyn (KU), Pine Valley Res (I59), Rockville (BAD), Snow Cyn (KU), St George (C42), Toquerville (BAD), Virgin (KU), Zion Nat Park (WU). **WAYNE**: Capitol Reef Nat Park (WU), Fruita, Hanksville (BAD), and 17 mi S (KU), Loa (A), Torrey (BAD).

Smith (1979:1420) lists this species as eastern to western United States (no intermountain state listed), where it nests in irregular or craterlike mounds in open areas. Gregg (1963:434) lists it from Colorado between 3500 and 8500 ft under rocks in a variety of habitats, predominantly pinyon-juniper and grass. Hunt and Snelling (1975:22) list it from Arizona. Wheeler and Wheeler (1963) found it frequently in soil craters in North Dakota. Cole (1966:18) found it commonly in creosote bush habitats in southern Nevada. It forms craterlike nests in Utah (Cole 1942:371). Ingham (1959, 1963) found it in southern Utah in pinyon-juniper, sagebrush, creosote bush, mesquite, gallettagrass, rabbitbrush, winterfat, shadscale, greasewood, and alkali flats. It was associated with *Solenopsis molesta* in one nest. Allred and Cole (1979:97) found it in a large variety of desert shrub associations in southern Utah, commonly in juniper-pinyon.

There were 178 ants of seven collections taken from small crater mounds. Two were in the cleared area of active colonies of *Pogonomyrmex occidentalis*. In Davis County 1.5 mi south of Layton on highway US89, many small craterlike mounds were in close vicinity and surrounding a mound occupied by *occidentalis*. Ten ants in one collection were taken from a mound actually on an occupied mound of *occidentalis*. Another mound occupied by *occidentalis* was covered with sticks, and many (30 collected) *insana* were crawling among the sticks. No openings or mounds for these small ants were seen, nor were any of their mounds in the vicinity of the harvester mound. No evidence was seen of the harvesters attacking the *insana*, and the two

species seemingly intermingled in their movements over the large mound. Nineteen miles north of Lund on the road to Pine Valley in Iron County, nine occupied mounds were found on a large flattened mound of *occidentalis*. In San Juan County, 19.6 mi north of the junction of US163 and U261 along U261, *insana* had parts of three *occidentalis* with some appendages and parts of the body missing, as though chewed by the *insana*. Eighty ants in two collections were taken from safaris; in one case some of the ants were grouped around a dead moth. Forty-two ants in two collections were taken under rocks. In one of these colonies eggs were present in late June. Eight collections were in sagebrush: two in association with grass, one clover, one rabbitbrush, one juniper, one pinyon, and one juniper and pinyon. One collection was in grass and clover, one grass and herbs, one herbs, one matchbrush and greasewood, one rabbitbrush, and one juniper. In 87 recorded Utah localities it occurred only 5 times in montane areas. In 53 recorded elevations between 2750 and 7066 ft it was taken most frequently (32 times) between 4000 and 6000. Beck et al. (1967:69) found it feeding on dead rodents in 18 instances in Utah.

#### *Crematogaster cerasi* (Fitch)

*Myrmica cerasi* Fitch, 1855 (1854), Trans. New York State Agr. Soc. 14:835.

Record: WASHINGTON: Leeds (US).

Smith (1979:1378) lists this species as eastern to midwestern United States, no intermountain state listed, where it nests under rocks and logs. The one collection in Utah reportedly taken at 2750 ft is questionable.

#### *Crematogaster coarctata* Mayr

*C. coarctata* Mayr, 1870, Verh. Zool.-Bot. Ges. Wien 20:990.

*C. vermiculata*: Cole 1942:363.

Record: JUAB: Provo 30 mi S (C42).

Smith (1979:1378) lists this species as western United States, including Nevada, nesting under rocks. Cole (1966:16) found its nests in southern Nevada in open soil and under stones in pinyon-juniper and a variety of desert shrub types; it also occurs in sagebrush in Utah (Cole 1942:363). One Utah collection was taken at 4909 ft.

#### *Crematogaster depilis* Wheeler

*C. lineolata opaca* var. *depilis* Wheeler, 1908, Bull. Amer. Mus. Nat. Hist. 24:478.

*C. depilis*: Beck et al. 1967:68; Allred and Cole 1979:97. Records (Map 6): KANE: Glen Cyn City (AC). WASHINGTON: Beaver Dam Wash, Toquerville (BAD).

Smith (1979:1378) lists this species as western United States, including Arizona and Nevada, nesting in roots and lower stems of desert plants. Cole (1966:16) found it in open areas in southern Nevada in various desert shrub types, none in pinyon-juniper. Allred and Cole (1979:97) found it in a variety of desert shrub habitats, most frequently in ephedra-vanclavea-grass and juniper-ephedra-grass associations in southern Utah.

In three desert collections in Utah it was taken between 2350 and 3371 ft. Beck et al. (1967:68) found it feeding on dead rodents in five instances in Utah.

#### *Crematogaster emeryana* Creighton

*C. lineolata emeryana* Creighton, 1950, Bull. Mus. Comp. Zool. 104:213; Grundmann 1958:163; Beck et al. 1967:68.

*C. lineolata* nr *cerasi*: Rees and Grundmann 1940:4; Cole 1942:363.

*C. lineolata*: Ingham 1959:55.

*C. punctulata*: Beck et al. 1967:69.

*C. emeryana*: Smith 1979:1378.

Records (Map 6): BEAVER: Minersville (BAD). BOX ELDER: Locomotive Spngs (BAD), Park Valley (City) (C42). CACHE: Logan (C42). JUAB: Callao (BAD). KANE: Mt. Carmel Jct (159), Navajo Wells (BAD). MIL LARD: Swasey Spngs (RC). SALT LAKE: Parleys Cyn (U). SAN JUAN: Blanding, Bluff, Monticello (G58), Montezuma Crk (BAD). TOOELE: Clover, Delle, Fisher Pass, Low (C42). UTAH: American Fk Cyn (U), Chimney Rock Pass (BAD), Provo (C42). WASHINGTON: Diamond Valley (BAD), Grafton, La Verkin, New Harmony, Pintura, Rockville, Santa Clara River, Zion Nat Park (159). WEBER: Ogden Cyn (U).

Smith (1979:1378) lists this species as western United States, including Utah, Colorado, and Arizona, where it usually nests under rocks in mountains at elevations over 6000 ft. Gregg (1963) lists it between 3500 and 8000 ft in a variety of habitats, predominantly under rocks and logs in oak and pinyon-juniper areas in Colorado. Cole (1942:363) indicates its habitats in Utah as under stones, logs, and bark. Ingham (1959, 1963) found it under stones and wood in willow, poplar, tamarix, oak, juniper, ash, sagebrush, squawbrush, and shadscale in southern Utah.

In 29 localities, only three were in montane forest. In 25 known elevations between 3000 and 7066 ft, 10 were between 4000 and 5000. Beck et al. (1967:68) found it feeding on dead rodents in eight instances in Utah.

### *Crematogaster hespera* Buren

*C. hespera* Buren, 1968, J. Georgia Ent. Soc. 3:98; Smith 1979:1379.

Record: WASHINGTON: Zion Nat Park (B).

Smith (1979:1379) lists this species as western United States, including Utah and Arizona, principally as an arboreal form in cottonwood trees. Buren (1968:100) indicates that it is largely an arboreal species of cottonwoods and other trees, but also occurs in logs at elevations between 2000 and 5500 ft. One Utah collection was taken at 4276 ft.

### *Crematogaster minutissima* Emery

*C. victima missouriensis* Emery, 1895, Zool. Jahrb. Syst. 8:287.

*C. minutissima*: Beck et al. 1967:69.

Record: WASHINGTON: Diamond Valley (BAD).

Creighton (1950) and Smith (1979) list three subspecies as eastern to western United States, including Colorado and Arizona, nesting in soil at the base of stumps. The Utah form is likely *smithi*, although *missouriensis* may come into eastern Utah. The two may be separated by the smooth shining dorsum of the promesonotum in *smithi*, whereas in *missouriensis* it is finely punctate. Gregg (1963:364) lists this species at 4150 ft under rocks in grassy habitats in Colorado. Beck et al. (1967:69) found it feeding on dead rodents in one instance in Utah.

### *Crematogaster mormonum* Emery

*C. lineolata coarctata* var. *mormonum* Emery, 1895, Zool. Jahrb. Syst. 8:284; Rees and Grundmann 1940:4.

*C. coarctata* var. *mormonum*: Cole 1942:363.

*C. mormonum*: Creighton 1950:215; Ingham 1959:56; Beck et al. 1967:69; Knowlton 1970:209; 1975:2; Allred and Cole 1979:99; Smith 1979:1380.

Records (Map 6): BEAVER: Frisco (BAD). BOX ELDER: Hansel Mts (K75), Snowville (KU) and 4 mi W (K70). CACHE: Leeds Cyn (KU). JUAB: Joy (BAD). KANE: Glen Cyn City (AC), Kanab (US). MILLARD: Swasey Spngs (BAD). SALT LAKE: E Mill Crk Cyn, Salt Lake City (RG). SAN JUAN: Bluff (KU). SEVIER: Koosharem (BAD). TOOEELE: Stansbury Island (C42). WASHINGTON: Leeds (KU), Pine Valley Res (I59), Zion Nat Park (KU).

Smith (1979:1380) lists this species as western United States, including Utah, Nevada, and Idaho, nesting under rocks. Cole (1942:363) indicates its habitats in Utah as under stones and logs. Ingham (1959) found it under stones and logs in southern Utah. Allred and Cole (1979:99) found it in a saltbush-sagebrush association in southern Utah.

In 17 recorded Utah habitats it was taken only 3 times in montane forest. In 12 recorded elevations between 2750 and 6850 ft it was taken 6 times between 4000 and 5000, 4 times above 6000. Beck et al. (1967:69) found it feeding on dead rodents in four instances in Utah.

### *Crematogaster nocturna* Buren

*C. nocturna* Buren, 1968, J. Georgia Ent. Soc. 3:112; Knowlton 1975:2; Smith 1979:1380.

Records: BOX ELDER: Hansel Mts (K75). SAN JUAN: Nat Bridges Nat Mon (B).

Smith (1979:1380) lists this species as western United States, including Utah and Arizona. In one Utah collection it was taken at 5700 ft.

### *Forelius foetidus* (Buckley)

*Formica foetida* Buckley, 1866, Ent. Soc. Phila., Proc. 6:167.

*Forelius foetida*: Ingham 1959:64.

Records: EMERY: San Rafael Swell (U). JUAB: Chicken Crk Res (KU). KANE: Grosvenor Arch (US). WASHINGTON: Rockville (I59).

Smith (1979:1419) lists this species as mid-west to western United States, including Colorado, nesting under various objects or in small craters. Gregg (1963:434) lists it between 4400 and 4900 ft under rocks in cottonwood-willow and grass habitats in Colorado. Hunt and Snelling (1975:22) list it from Arizona. LaRivers (1968:7) lists it from Nevada. Ingham (1959) found it in small crater mounds in sagebrush, blackbrush, cliffrose, Russian thistle, and cheatgrass in southern Utah. In four localities in Utah it was taken between 3800 and 5000 ft in desert areas.

### *Formica accreta* Francoeur

*F. accreta* Francoeur, 1973, Soc. Ent. du Quebec, Mem. no. 3, pp 182-9.

Record: WEBER: Beaver Crk (KU).

Smith (1979:1452) lists this species from western United States, including Idaho.



*Formica aerata* Francoeur

*F. aerata* Francoeur, 1973, Soc. Ent. du Quebec, Mem. no. 3, pp. 116-22.

Record: **CACHE**: Tony Grove Lake (KU).

Smith (1979:1452) lists this species from western United States, including Nevada, nesting under rocks. In one Utah collection it was taken at 8075 ft.

*Formica altipetens* Wheeler

*F. cinerea cinerea* var. *altipetens* Wheeler, 1913, Bull. Mus. Comp. Zool. 53:399.

*F. cinerea altipetens*: Rees and Grundmann 1940:10; Cole 1942:383.

*F. altipetens*: Creighton 1950:531; Francoeur 1973:58; Smith 1979:1452.

Records (Map 7): **CACHE**: Ant Valley, Antelope Valley, Blacksmith Fk Cyn, Elk Valley, Franklin Basin, Logan Cyn, Petersboro, Pole Crk Spng, Rock Crk, Tony Grove (KU), Wellsville Cyn (F). **DUCHESNE**: Fruitland (U). **GARFIELD**: Boulder Mt (U). **GRAND**: Warner Ranger Sta (RG). **RICH**: Garden City (KU). **SAN JUAN**: Monticello (KU). **SUMMIT**: Henrys Fk Basin (RG). **TOOELE**: S Willow Cyn (U). **WASATCH**: Soldier Summit 1 mi E (A).

Smith (1979:1452) lists this species from western United States, including Utah, Colorado, Arizona, Idaho, and Wyoming, nesting in open areas sometimes with low mounds or under objects. Gregg (1963:507) lists it between 6000 and 11,000 ft under rocks and logs mostly in conifer areas in Colorado. La Rivers (1968:9) lists it from Nevada. Wheeler and Wheeler (1977) found it frequently in thatched or earthen mounds and under rocks in North Dakota. Cole (1942:383) indicates its habitats in Utah as under stones or in flat earthen mounds in open areas.

Four ants in one collection were found crawling singly on the ground in sagebrush and herbs. In 19 recorded Utah habitats 15 were in montane forest. In nine recorded elevations between 4471 and 10,500 ft it was found most frequently (four times) between 7000 and 9000.

*Formica argentea* Wheeler

*F. fusca* var. *argentata* Wheeler, 1902, Amer. Nat. 36:952; Cole 1942:383.

*F. fusca argentea*: Rees and Grundmann 1940:9; Knowlton 1970:209.

*F. argentea*: Francoeur 1973:150.

Records (Map 7): **BEAVER**: Beaver Crk (F). **BOX ELDER**: Cedar Hill, Clear Crk Cyn (KU), Kelton Pass (K70), Snowville (C42), Willard Basin (in Wellsville Mts)

(KU). **CACHE**: Ant Valley, Bear River Mts (KU), Blacksmith Fk Cyn (C42), Elk Valley, Franklin Basin, High Crk, Leeds Cyn, Logan (KU), Logan Cyn (C42), Mendon (F), Paradise, Petersboro, Providence, Tony Grove Cyn, Tony Grove Lake (KU), Wellsville (F). **DAGGETT**: Sheep Crk (RG). **DAVIS**: Farmington, Farmington Cyn (KU). **EMERY**: Hideout Cyn nr Green River (U). **GARFIELD**: Orton (KU). **JUAB**: Ponderosa Cmpgnd, Red Crk Spng (KU). **KANE**: Mt Carmel (F), Wahweep (KU). **RICH**: Allen Cyn, Monte Cristo and 6 mi S, Randolph (WU). **SALT LAKE**: Garfield (F), Little Willow Cyn (C42). **SAN JUAN**: Monticello (RG) and 2 mi W (A). **SEVIER**: Burrville (U), Salina Cyn nr Fremont Jct (U). **TOOELE**: Delle (C42). **UINTAH**: Jct Dry Fk rd and Red Cloud Loop rd, Jet Red Cloud Loop rd and U44 9.2 mi W (A), Whiterocks (KU). **UTAH**: American Fk (RG), Spanish Fk Cyn (KU). **WASATCH**: Midway 3.7 mi NW, Strawberry Res 4 mi S (A). **WASHINGTON**: Pine Valley (City) (KU). **WAYNE**: Capitol Reef Nat Park (U). **WEBER**: head of Beaver Crk, Monte Cristo (KU). **COUNTY UNKNOWN**: Rand (F) (? = abbr for Randolph in Rich Co).

Smith (1979:1452) lists this species from eastern to western United States including Arizona, nesting in open or semiopen areas under rocks or in low mounds. Gregg (1963:523) lists it from Colorado between 4500 and 11,000 ft under rocks and wood in a variety of habitats. La Rivers (1968:9) lists it from Nevada, where Wheeler and Wheeler (1978:394) found it between 6200 and 11,500 ft. They also found it frequently under rocks, also in earthen mounds in North Dakota (1977). Cole (1942:383) indicates its habitats in Utah as under stones and logs in cold forests at higher elevations.

Twenty-four ants in four collections were taken from under rocks. In one collection it was under the same rock with *Formica lasioides*, once *F. fusca*, and once *F. pallidifulva* and *Pheidole desertorum*. Four specimens in one collection were taken singly crawling in the open. Two collections were in oak, one associated with grass. One collection was in legumes and sagebrush, one a grassy meadow, and one grass and sagebrush in an open area of aspen and pine. In 54 recorded Utah habitats it was taken 28 times in montane forest. In 23 recorded elevations between 4225 and 9300 ft it was taken 10 times under 5000, 12 times between 6000 and 9000.

*Formica calviceps* Cole

*F. calviceps* Cole, 1954, J. Tenn. Acad. Sci. 29:164.

Record: **UTAH**: Spanish Cyn (KU) (? = Spanish Fk Cyn).

Smith (1979:1457) lists this species only from New Mexico nesting under stones banked with detritus. Its occurrence in Utah is questionable.

### *Formica canadensis* Santschi

- F. cinerea* var. *canadensis* Santschi, 1913, Ann. Soc. Ent. Belg. 57:435; Knowlton 1975:2.  
*F. cinerea*: Rees and Grundmann 1940:10; Knowlton 1970:209.  
*F. cinerea neocinerea*: Rees and Grundmann 1940:10; Cole 1942:383; Knowlton 1970:209, 1975:2.  
*F. cinerea lepida*: Creighton 1950:531; Beck et al. 1967:69.  
*F. montana*: Ingham 1959:82.  
*F. canadensis*: Francoeur 1973:66; Smith 1979:1452.  
*F. cinerea canadensis*: Knowlton 1975:2.

Records (Map 7): **BEAVER**: Puffers Woke (F) (? = Puffer Lake). **BOX ELDER**: Locomotive Spngs (K70), Park Valley (City) (KU), Snowville (C42), Wellsville Mts, Willard Basin (KU). **CACHE**: near Franklin (Idaho), Franklin Basin, Hyrum, Logan Cyn, Tony Grove Lake (KU), Wellsville (RG). **IRON**: Cedar Breaks Nat Mon, Cedar City (F), Newcastle (I59). **KANE**: Kanab (C42), Navajo Lake (I59). **RICH**: Laketown, Randolph (KU). **SALT LAKE**: Alta (U), Wasatch (RG). **SAN JUAN**: La Sal Mts (U), Montezuma Crk (BAD). **SANPETE**: Ephraim Cyn (KU). **SEVIER**: Venice (F). **SUMMIT**: Wasatch (RG). **TOOELE**: Clover (F). **UINTAH**: Bonanza (KU), Ft Duchesne (F), Jensen 17 mi SW (C42), Lapoint (F), Neola 2.7 mi E (A), Paradise Park (U), Vernal, White-rocks (F). **UTAH**: Goshen (F), Lehi (BAD). **WEBER**: Beaver Crk (KU).

Smith (1979:1452) lists this species from midwest to western United States, including Utah, Colorado, Arizona, Idaho, and Wyoming, nesting in open or wooded areas in soil, sometimes with a low mound. Gregg (1963:511) lists it from Colorado between 3500 and 11,000 ft under rocks, wood, and in thatched hummocks predominantly in meadow situations. Allred and Cole (1971:239) found it rarely in associations of sagebrush-grass in Idaho. La Rivers (1968:9) lists it from Nevada. Wheeler and Wheeler (1977) found it frequently in earthen mounds, also commonly under rocks in North Dakota. Cole (1942:383) indicates its habitats as under stones or flat earthen mounds in open areas in Utah. Ingham (1959) found it in southern Utah under stones in sagebrush, aspen, fir, and spruce. Knowlton (1975:2) found it associated with rabbitbrush in northern Utah.

Forty ants in one collection were taken from the ground in grass near an irrigated field. In 38 recorded Utah habitats 13 were in montane forest. In 29 recorded elevations

between 4495 and 10,399 ft, 18 were under 6000 and 7 were over 9000.

### *Formica ciliata* Mayr

- F. ciliata* Mayr, 1886, Verh. Zool.-Bot. Ges. Wien 36:428; Rees and Grundmann 1940:9; Cole 1942:379; Creighton 1950:483; Grundmann 1958:165; Gregg 1963:546; Smith 1979:1457.

Records: **GRAND**: Warner Ranger Sta (Gr63). **SAN JUAN**: Blanding (RG), between Blanding and Vedura (C42) (? = Verdure). **SANPETE**: Wales 3.3 mi W (A).

Smith (1979:1457) lists this as a species of western United States, including Utah, Colorado, and Wyoming, with nests (sometimes thatched) in meadows or open woods. Gregg (1963:546) lists it between 5354 and 11,000 ft under rocks and logs principally in conifer habitats in Colorado, and lists a record for Utah. Wheeler and Wheeler (1963) found it only under rocks in North Dakota. Cole (1942:379) indicates its habitats as under stones or logs in Utah. Nests of this species are usually low, thatched mounds in meadows and open woods (Grundmann 1958:165). Seven ants in one collection in Utah were taken from under a rock in sagebrush and rabbitbrush near a meadow. One recorded elevation in Utah is 6103 ft.

### *Formica comata* Wheeler

- F. comata* Wheeler, 1909, J. New York Ent. Soc. 17:85; Rees and Grundmann 1940:9; Cole 1942:379.

Records: **GARFIELD**: Carcass Crk (on Boulder Mt) (U). **SALT LAKE**: Mill Crk Cyn (RG). **SAN JUAN**: La Sal Mts (U).

Smith (1979:1457) lists this species as western United States, including Colorado, nesting under stones banked with thatch. Gregg (1963:550) lists it between 6000 and 7704 ft in sagebrush, chaparral, and grass habitats in Colorado. Cole (1942:379) indicates its habitats in Utah as under stones or logs, generally banked or covered with detritus. Two Utah collections were taken at 9000 ft.

### *Formica criniventris* Wheeler

- F. crinita* Wheeler, 1909, J. New York Ent. Soc. 17:87.  
*F. criniventris*: Rees and Grundmann 1940:9.  
*F. criniventris*: Cole 1942:379; Beck et al. 1967:69; Smith 1979:1457.

Records (Map 8): **BOX ELDER**: Garland (KU). **CACHE**: Blacksmith Fk Cyn (KU). **SALT LAKE**: Big Cottonwood Cyn, Brighton (U). **SEVIER**: Paradise Valley (BAD). **COUNTY UNKNOWN**: Boulton (RG) (? = Boulter in Juab Co).

Smith (1979:1457) lists this species as western United States, including Utah and Colorado, nesting under stones banked with thatch in meadows and open forests. Gregg (1963:550) lists it between 5100 and 5900 ft under rocks predominantly in gardens and open meadows in Colorado. Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota. Cole (1942:379) indicates its habitat in Utah as under stones banded with detritus. Knowlton (1975:2) found it associated with rabbitbrush in northern Utah.

In six recorded Utah habitats it was taken four times in montane forest. Three known elevations are 4340, 5000, and 8600 ft. Beck et al. (1967:69) found it feeding on dead rodents in one instance in Utah.

#### *Formica densiventris* Viereck

*F. fusca* var. *densiventris* Viereck, 1903, Trans. Amer. Ent. Soc. 29:74.

*F. rasilis spicata*: Creighton 1950:507.

*F. densiventris*: Smith 1979:1462.

Records (Map 8): **BOX ELDER**: Snowville (KU). **CACHE**: Bear River Mts, Leeds Cyn (KU). **RICH**: Bear River, Wasatch Mts (KU).

Smith (1979:1462) lists this species from western United States, including Utah and Colorado, nesting in forests under stones and logs, occasionally thatched. Hunt and Snelling (1975:23) list it from Arizona. Wheeler and Wheeler (1978:394) found it between 7200 and 10,000 ft in Nevada. One collection in Utah was taken at 4544 ft.

#### *Formica emeryi* Wheeler

*F. emeryi* Wheeler, 1913, Bull. Mus. Comp. Zool. 53:389.

Record: **CACHE**: Cowley Cyn (KU).

Smith (1979:1464) lists this species only from Colorado, where it associates with *F. neogagates*. Gregg (1963:606) lists it at 6000 ft in meadow habitats in Colorado.

#### *Formica fossiceps* Buren

*F. fossiceps* Buren, 1942, Iowa State Coll. J. Sci. 16:402.

Record: **BOX ELDER**: Tremonton (KU).

Smith (1979:1458) lists this species from midwestern United States (no intermountain state listed), where it nests under stones or logs banked with thatch or in low earthen

mounds covered with thatch or grass. Wheeler and Wheeler (1963) found it under rocks and in earthen mounds in North Dakota. One collection in Utah at 4315 ft is questionable.

#### *Formica fusca* Linnaeus

*F. fusca* Linnaeus, 1758, Syst. Nat. (10 ed.) 1:580; Cole 1942:381, 382; Creighton 1950:532; Grundmann 1958:165; Ingham 1959:81; Beck et al. 1967:69; Knowlton 1970:209, 1975:2.

*F. fusca subaenescens*: Rees and Grundmann 1940:9; Cole 1942:382.

*F. fusca subsericea*: Cole 1942:382.

*F. marcidula*: Creighton 1950:534; Ingham 1959:82.

Records (Map 8): **BEAVER**: Beaver 5.5 mi E (U). **BOX ELDER**: Brigham (C42), Cedar Hill (K75), Clear Crk Cyn (KU), Hardup (K75), Kelton Pass (K70), Mantua, Portage (KU), Snowville (K70), Wellsville Mts (KU), Wildcat Hills (K75), Willard Basin (F). **CACHE**: Ant Valley, Antelope Valley, Bear River Mts, Beaver Crk, Blacksmith Fk Cyn, Elk Valley, Franklin Basin, Green Cyn, Hodges Cyn, Leeds Cyn, Logan (KU), Logan Cyn (C42), Mendon Cold Spngs, River Heights, Millville, Rock Crk, Tony Grove (KU). **EMERY**: Ferron (RG), Hideout Cyn nr Green River (U). **GARFIELD**: Boulder (U), Bryce Cyn Nat Park (WU), Carcass Crk (on Boulder Mt) (U). **IRON**: Cedar Breaks Nat Mon (F), Cedar City 19 mi E (A). **JUAB**: Indian Farm Cyn (U). **KANE**: Cedar City 24.3 mi E (A), Glendale (159), Kanab Cyn (C42). **RICH**: Garden City, Meadowville and 8 mi NW, Monte Cristo (KU). **SALT LAKE**: Big Cottonwood Cyn, Brighton, Butterfield Cyn, Mt Olympus, Red Butte Cyn (U), Salt Lake City (C42). **SAN JUAN**: Abajo Mts (G58), La Sal Crk (RG), Monticello (U). **SANPETE**: Bluebell Flats (KU), Ephraim Cyn (U), Pleasant Crk (BAD). **SUMMIT**: Kamas 21 mi E, Mirror Lake 1 and 6.4 mi N (A), Soapstone Ranger Sta (U), Wyoming brdr on U150 (A). **TOOELE**: Clover, Fisher Pass, Grantsville, Tooele (C42), S Willow Cyn (U). **UINTAH**: Ashley Crk nr Vernal (U), Dry Fk rd 15 and 22.8 mi N U121 (A). **UTAH**: American Fk Cyn (U), Aspen Grove (BY), Halls Fk rd 5.2 mi N from Hobble Crk rd (A), Provo (BY), Silver Lake Flat (A). **WASATCH**: Francis 8.1 mi E (A), Heber (U). **WASHINGTON**: Kolob (159), Pine Valley (City) (BAD). **WEBER**: Beaver Crk, Lime Spngs, Monte Cristo 6 mi S (KU), Ogden (C42). **COUNTY UNKNOWN**: Current Crk (C42) (? = Currant Crk either in Duchesne, Utah, or Wasatch Co).

Smith (1979:1452) lists this as an eastern to western species including Arizona, which nests in a variety of situations in soil and under rocks and logs in forests or open areas. Gregg (1963:517) lists it from Colorado between 5154 and 12,500 ft under rocks and logs and in thatched domes in a variety of habitats, predominantly in conifers, oak, and pinyon-juniper. Wheeler and Wheeler (1978:395) found it between 6100 and 11,500 ft in Nevada, and nesting frequently in wood in North Dakota (1977). Allred and Cole

(1971:239) found it in Idaho in an association of juniper-rabbitbrush-winterfat-sagebrush-grass. Grundmann (1958:165) designated it as a stream-side species in Utah between 4500 and 10,000 ft under stones or in low irregular mounds with numerous openings. Ingham (1959) found it under stones and logs in aspen, fir, spruce, and bristlecone pine in southern Utah. Cole (1966:23) found it in southern Nevada under stones restricted to pinyon-juniper, under stones and logs, and sometimes in craters or small earthen mounds at rather high elevations in Utah (1942:381). Knowlton (1975:2) found it associated with grass, sagebrush, shadscale, and rabbitbrush in northern Utah.

There were 122 ants in eight collections taken from under rocks. In one collection it was under the same rock with *Formica argentea*, once *F. gnava*, once *F. podzolica*, once *F. podzolica* and *Solenopsis molesta*, and once *F. gnava*, *Myrmica emeryana*, and *M. monticola*. In the association with *gnava* and *Myrmica*, when the rock was removed and the ants disturbed, some began pulling on the legs of others. In the association with *podzolica* and *Solenopsis*, the earth under the huge rock was divided into separate conspicuous dwelling levels in which the *Formica* occurred. The smaller *Solenopsis* were in a separate burrow. Thirty-eight ants in one collection were in a burrow with *Polygerus breviceps* under a log. Forty-one ants in three collections were found under logs, once under the same log with *Formica gnava* and *F. podzolica*, and once with *F. subnuda* and *Lasius alienus*. One ant was found in the open crawling on the ground. Six collections were in aspen: two in association with grass, sagebrush, and pine; one grass, herbs, and pine; and one pine. Three collections were in conifers; two in a grass, sedge, and herb meadow; one sagebrush; and one cottonwoods. In 82 recorded Utah habitats 49 were in montane areas. In 45 known elevations between 4288 and 10,500 ft, 20 were under 6000 and 3 were over 10,000. Beck et al. (1967:69) found it feeding on dead rodents in two instances in Utah.

#### *Formica gnava* Buckley

*F. gnava* Buckley, 1866, Proc. Ent. Soc. Phila. 6:156; Smith 1979:1453.

*F. foreliana*: Rees and Grundmann 1940:9; Cole 1942:380.

*F. rufibarbis gnava*: Rees and Grundmann 1940:10; Cole 1942:383; Creighton 1950:539; Ingham 1959:82; Allred and Cole 1979:98.

Records (Map 8): DUCHESNE: Avintaquin Cmpgnd (A). GARFIELD: Boulder Mt (U). GRAND: Dewey (U). IRON: Cedar City 19 mi E (A). KANE: Glen Cyn City (AC). MORGAN: Morgan (C42). PIUTE: Marysvale 4.1 mi S (A). RICH: Woodruff 18.4 mi W (A). SALT LAKE: Big Cottonwood Cyn (U). SAN JUAN: Rainbow Bridge Nat Mon (F). SANPETE: Orangeville 23.9 mi W, Skyline Drive 1 mi N Jct Orangeville and Ephraim rds (A). SUMMIT: Kamas 26.4 and 28.5 mi E, Mirror Lake 1 and 17.3 mi N (A), Park City (F). UINTAH: Red Cloud Loop rd 14 mi W U44 (A). UTAH: Halls Fk rd 5.2 mi N Hobble Crk rd (A), Lehi (RC), Nebo Loop rd 0.8 mi S Santaquin Cyn, Payson Cyn 12.3 mi up, Santaquin 6.7 mi E (A). WASATCH: Hanna 14.3 mi W (A). WASHINGTON: Snow Cyn (I59). WEBER: Ogden Cyn (C42).

Smith (1979:1453) lists this species from western United States, including Utah, Colorado, Arizona, and Nevada, nesting under rocks in desert areas or open woods. Gregg (1963:539) lists it between 5333 and 9000 ft under rocks and in thatched nests predominantly in pinyon-juniper-oak habitats in Colorado. Cole (1942) indicates its habitat in Utah as under stones or nests without craters in open areas. Ingham (1959, 1963) found it in soil-lacking mounds in sand sage in southern Utah. Allred and Cole (1979:98) found it in juniper-ephedra-grass and ephedra-grass habitats in southern Utah.

There were 281 ants in 11 collections taken from under logs. In one collection it was under the same log as *Formica fusca* and *F. podzolica*, once with *F. subnuda*, once *F. neoclara* and *Camponotus modoc*, once *C. modoc*, and once *Myrmica brevispinosa*. Ninety ants in 2 collections were taken from inside a log. There were 131 ants in 7 collections taken from under rocks. In one collection *gnava* was under the same rock as *F. fusca*; once with *fusca*, *Myrmica emeryana*, and *M. monticola*; once *F. podzolica*; and once *F. neogagates*, *F. obtusopilosa*, and *F. perpilosa*. When the rock covering *gnava* and *fusca* was removed, some ants were seen pulling others by their legs. The ants being pulled seemed not to demonstrate a defensive or aggressive behavior to the "pullers," suggesting a captive arrangement rather than fighting between different colonies. Ten ants in one collection were found under a slab of bark on the ground, and one ant was taken in

the open. Immatures were found under one rock. Eleven collections were in aspen: 4 in association with fir, 3 with other conifers, one sagebrush and conifers, and one grass, herbs, and fir. Six collections were in conifers, 4 grass-herb meadows, and one sagebrush. In 26 recorded Utah habitats it was taken 18 times in montane forest. In 10 known elevations between 2900 and 10,500 it was taken 6 times under 5000, once over 7000 ft.

### *Formica haemorrhoidalis* Emery

*F. rufa integra* var. *haemorrhoidalis* Emery, 1893, Arb. Zool. Jahrb. Syst. 7:644.

*F. truncicola integroides* var. *haemorrhoidalis*: Rees and Grundmann 1940:8.

*F. rufa haemorrhoidalis*: Cole 1942:381.

*F. integra haemorrhoidalis*: Creighton 1950:488; Beck et al. 1967:70.

*F. haemorrhoidalis*: Knowlton 1970:209, 1975:3.

Records (Map 9): **BOX ELDER**: Hansel (KU), Kelton (K70) and 9 mi N (KU), Snowville (K75), Trematon (KU) (? = Tremonton). **CACHE**: Avon, Bear River Mts, Green Cyn, Elk Valley, Leeds Cyn (KU), Hyde Park (C42), Logan Cyn, Smithfield Cyn (KU). **CARBON**: Myton rd 15 mi E US6 (A), Scofield (BAD). **DAGGETT**: Deep Crk (BAD). **DAVIS**: Kaysville (C42). **DUCHESTER**: Duchesne 12.4 mi S (A). **GARFIELD**: Bryce Cyn Nat Park (RC). **JUAB**: Callao 5 mi E(A). **RICH**: Chalk Crk (U). **SAN JUAN**: Blanding, Monticello (U). **SUMMIT**: Kamas 9.2 mi E (A). **TOOELE**: Mercur (BAD). **UTAH**: Eureka 0.5 mi E (A), Spanish Fk Cyn (KU). **WASATCH**: Midway 3.7 mi NW (A).

Smith (1979:1458) lists this species from midwest to western United States, including Colorado, nesting under logs or stones in areas of moderate to sparse cover. Gregg (1963:556) lists it between 5100 and 10,000 ft under rocks and logs in thatched nests predominantly in conifer habitats in Colorado. Allred and Cole (1971:239) found it in Idaho abundantly in an association of wild ryegrass, moderately so in rabbitbrush-sagebrush-grass, and rarely in rabbitbrush-sagebrush-grass-winterfat. La Rivers (1968:9) lists it from Nevada. Wheeler and Wheeler (1977) found it frequently in thatched mounds in North Dakota. Nests in Utah are under logs or stones, usually with a scattering of detritus on the periphery (Cole 1942:381). Knowlton (1975:3) found it associated with sagebrush in northern Utah.

Thirty-two ants in three collections were found under rocks. Once it was under the same rock as *Formica integroides*, and once

with *Solenopsis molesta*. In the latter case the burrows of the two species were separate. Forty ants were taken from a mound of soil covered with a layer of sticks. Three ants in two collections were taken in the open. When disturbed in their colony these ants frequently rear back on their 2nd and 3rd legs, tucking the abdomen underneath, leaving the front legs and mandibles in an upward, apparently defensive position. Four collections were in sagebrush: one in association with herbs; one grass and herbs; one grass, herbs, serviceberry, cliffrose, juniper, and pinyon; and one aspen and conifers. One collection was in greasewood, and one in oak. In 28 recorded Utah habitats it was taken 13 times in montane forest. In eight known elevations between 4225 and 7977 ft it was found most frequently below 5000 and above 6000. Beck et al. (1967:70) found it feeding on dead rodents in four instances in Utah.

### *Formica hewitti* Wheeler

*F. hewitti* Wheeler, 1917, Proc. Amer. Acad. Arts Sci. 52:552; Creighton 1950:533; Smith 1979:1453.

Records: **BOX ELDER**: Locomotive Spngs (KU). **CACHE**: W Hodges Cyn (KU). **GRAND**: Warner Ranger Sta (F).

Smith (1979:1453) lists this species from eastern to western United States, including Utah, nesting under rocks or wood in woods and forests. Gregg (1963:526) lists it from Colorado between 5354 and 10,000 ft under rocks and logs predominantly in conifer habitats. Wheeler and Wheeler (1978:395) found it between 6700 and 11,600 ft in Nevada. Allred and Cole (1971:239) found it in Idaho in an association of rabbitbrush-sagebrush-grass-winterfat. One collection in Utah was at 9750 ft.

### *Formica integroides* Emery

*F. rufa obscuriventris* var. *integroides* Emery, 1893, Zool. Jahrb. Syst. 7:644.

*F. truncicola integroides*: Rees and Grundmann 1940:8.

*F. truncicola integroides* var. *coloradensis*: Rees and Grundmann 1940:8.

*F. integroides*: Rees and Grundmann 1940:8.

*F. rufa coloradensis*: Cole 1942:381.

*F. integroides coloradensis*: Creighton 1950:489; Ingham 1959:79; Smith 1979:1458.

*F. integroides planipilis*: Knowlton 1970:209, 1975:5.

*F. integroides propinqua*: Smith 1979:1459.

Records (Map 9): **BOX ELDER**: Hansel Mts, Locomotive Spngs, Snowville, Wellsville Mts, Willard Basin

(KU). **CACHE:** Bear River Mts, Blacksmith Fk Cyn, Franklin Basin, Leeds Cyn (KU), Logan Cyn (RG), Mendon Cold Spng, Monte Cristo (KU), Providence (C42), Tony Grove Cyn, W Hodges Cyn (KU). **CARBON:** Myton rd 15 mi E US6 (A). **GRAND:** Warner Ranger Sta (Gr63). **JUAB:** Eureka 0.5 mi E (A), McClellan Lake, NE Nephi (KU). **KANE:** Duck Crk Ranger Sta (C42). **MILLARD:** Swasey Spngs (RC). **RICH:** Randolph, Sage Crk (KU), Utah-Wyoming brdr 0.5 mi S on U16 (A). **SALT LAKE:** Big Cottonwood Cyn (U). **SANPETE:** Wales 3.3 mi W (A). **UINTAH:** Dry Fk rd 22.8 mi N U121 (A), Paradise Park 11 mi S (U). **UTAH:** Thistle 14.6 and 20.4

mi E, Tibble Fk Cyn (A). **WASATCH:** Daniels Cyn (RC). **WASHINGTON:** Kolob (I59). **WEBER:** Hooper, Slaterville (C42).

Creighton (1950) lists six and Smith (1979:1458) five subspecies from western United States, including Utah, Colorado, Nevada, and Idaho, nesting under logs that are usually thatched. The four that have been recorded from Utah may be separated by the following key.

- 1. Erect hairs other than double row on middle and hind tibiae abundant ..... 2
- Erect hairs consist only of a double row on flexor surface ..... 3
- 2(1). Head and thorax clear red, legs about same color as thorax ..... *coloradensis*
- Head and thorax of smaller workers marked with brown, legs brownish black ...  
..... *planipilis*
- 3(1). Occipital angles of head with erect hairs ..... *integroides*
- Occipital angles of head lack erect hairs ..... *propinqua*

Gregg (1963) lists this species between 5354 and 12,000 ft under rocks, logs, and in thatched nests predominantly in conifer habitats in Colorado, and lists a record for Utah. Cole (1966:23) found it in southern Nevada only in pinyon-juniper, nesting in thatched mounds adjacent to shrubs. It also nests under logs with an adjacent thatching of detritus, resulting in dome-shaped mounds in Utah (Cole 1942:381). Wheeler and Wheeler (1978:394) found it between 5600 and 10,200 ft in Nevada. Ingham (1959) found it in mounds of detritus in sagebrush and oak in southern Utah. Knowlton (1975:5) found it in thatched nests in northern Utah.

Fifty ants in four collections were taken from mounds of sticks, one of them mixed with soil next to a log. In this latter case, ants of *Formica obscuripes* and *F. obscuriventris* were also present. In two other mounds ants of *F. oreas* were present. Ninety ants in three collections were taken from under rocks, once under the same rock with *F. laeviceps* and once with *F. haemorrhoidalis*. Four ants in one collection were found crawling in the open. Immature stages were found under two rocks in late June and early July. Six collections were in sagebrush: one in association with grass; one grass and herbs; one grass, herbs, and rabbitbrush; one grass, clover, and Russian thistle; one grass, shrubs, juniper, and

pinyon; and one herbs, rabbitbrush, maple, and oak. One collection was in aspen. In 35 recorded Utah habitats it was taken 19 times in montane areas. In 14 known elevations between 4240 and 8555 ft it was collected most frequently under 5000 and over 8000.

*Formica laeviceps* Creighton

*F. rufa laeviceps* Creighton, 1940, Amer. Mus. Nat. Hist. Nov. 1055:7; Cole 1942:380.

*F. laeviceps:* Creighton 1950:491; Smith 1979:1459.

Records (Map 9): **BOX ELDER:** Snowville (US). **CACHE:** Hyde Park (KU). **DAVIS:** Kaysville (US). **GRAND:** Warner Ranger Sta (C42). **JUAB:** Nebo Loop rd 9.9 mi S Santaquin Cyn (A). **SALT LAKE:** Big Cottonwood Cyn, Mt Dell Res (U). **SANPETE:** Wales 3.3 mi W (A). **SUMMIT:** Chalk Crk (U). **TOOELE:** Tooele Cyn (U). **WASHINGTON:** Pine Valley (City) (US). **WEBER:** Slaterville (US).

Smith (1979:1459) lists this species from midwest and western United States, including Utah and Colorado, nesting under stones and logs with little debris in open areas. Gregg (1963:564) lists it between 5200 and 8500 ft in sagebrush and grass habitats in Colorado. Cole (1942:380) indicates that it nests under stones and logs in areas of moderate to sparse cover in Utah.

Ten ants in one collection were taken from under a rock in association with *Formica integroides*. Twenty ants in two collections were taken crawling on the ground in open

areas. Three collections were in sagebrush, two in association with rabbitbrush. In 12 recorded Utah habitats it was taken 7 times in montane forest. In 8 recorded elevations between 4240 and 9750 ft it was taken most frequently under 5000, once over 8000.

### *Formica lasioides* Emery

*F. lasioides* Emery, 1893, Zool. Jahrb. Syst. 7:646.

*F. neogagates lasioides* var. *vetula*: Rees and Grundmann 1940:10; Cole 1942:384.

Records (Map 9): **BOX ELDER**: Wellsville Mts (KU). **CACHE**: Ant Valley, Antelope Valley, Beaver Mt, Blacksmith Fk Cyn, Elk Basin, Franklin Basin, Green Cyn, W Hodges Cyn, Hyrum, Leeds Cyn, Logan Cyn, Millville, Monte Cristo, Pole Crk Spng, Ricks Spng, Tony Grove (KU). **EMERY**: Ferron Res, Green River, Gunnison Butte (RG). **GRAND**: Warner Ranger Sta (C42). **JUAB**: Deep Crk Mts (U). **RICH**: Garden City (KU), Randolph, and 8 and 10 mi S, Sage Crk (KU). **SALT LAKE**: Big Cottonwood Cyn (U). **SANPETE**: Ephraim Cyn, Majors Flats (KU). **SUMMIT**: Mirror Lake 11.6 mi N (A). **UINTAH**: Bonanza, Elk Basin, Hyrum, Millville (KU). **UTAH**: Nibley (KU), Payson Cyn 7.3 mi up (A). **WASATCH**: Strawberry Res 4 mi S (A). **WASHINGTON**: Pine Valley Cmpgnd (KU). **WEBER**: Beaver Crk (KU), Wolf Crk (U). **COUNTY UNKNOWN**: Beaver Head (KU).

Smith (1979:1449) lists this species from midwest to western United States, including Colorado and Arizona, nesting under stones or in soil or small craters. Gregg (1963:500) lists it between 4800 and 10,505 ft under rocks and wood in a variety of habitats in Colorado. Cole (1966:23) found its nests in southern Nevada under stones in pinyon-juniper, and indicated that some ants construct small craters in Utah (1942:384). Wheeler and Wheeler (1978:393) found it between 6200 and 10,900 ft in Nevada, and frequently under rocks in North Dakota (1963). Allred and Cole (1971:239) found it in Idaho in associations of wild rye-grass and rabbitbrush-sagebrush.

Twenty ants in two collections were taken from under rocks, once under the same rock with *Formica argentea* and once with *F. obscuriventris*. Four ants in one collection were taken singly in the open. Three collections were in sagebrush: one in association with legumes and two with aspen and conifers. In 39 recorded Utah habitats it was taken 26 times in montane forest. In 13 known elevations between 4087 and 11,000 ft it was taken most frequently under 6000, once over 10,000.

### *Formica limata* Wheeler

*F. limata* Wheeler, 1913, Bull. Mus. Comp. Zool. 53:400; Creighton 1950:458; Beck et al. 1967:70; Smith 1979:1450.

Records (Map 10): **BOX ELDER**: Raft River Mts (U). **KANE**: Adairville (BAD). **SAN JUAN**: Pack Crk (KU). **SEVIER**: Fremont 9.7 mi N (A), Koosharem (BAD), Richfield 2.3 mi S (A). **TOOELE**: Dugway 11.9 mi E (A). **WASATCH**: Francis 8.1 mi E (A). **WEBER**: Woodruff 34.8 mi W (A).

Smith (1979:1450) lists this species from midwest and western United States, including Utah, Colorado, and Nevada, nesting under stones or in craters in grasslands. Gregg (1963:502) lists it between 5000 and 9700 ft under rocks and logs in a variety of habitats in Colorado. Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota. Cole (1966:24) found its nests under stones in pinyon-juniper in southern Nevada.

Sixty ants in three collections were taken from under rocks. In one case they were under the same rock with *Formica neoclara*, once *F. occulta*, and once *F. podzolica*. Nine ants in two collections were taken in the open on the ground. Immatures were found under one rock in early August. Two collections were in sagebrush, one associated with matchbrush. One collection was in Russian thistle, one cottonwoods, and one juniper and pinyon. In nine recorded Utah habitats it was found four times in montane forest. In three collections it was taken at 5350, 5375, and 6850 ft. Beck et al. (1967:70) found it feeding on dead rodents in two instances in Utah.

### *Formica manni* Wheeler

*F. manni* Wheeler, 1913, Bull. Mus. Comp. Zool. 53:389; Rees and Grundmann 1940:8; Cole 1942:378; Ingham 1959:77; Knowlton 1970:209; 1975:3; Smith 1979:1450.

Records (Map 10): **BOX ELDER**: Cedar Hill (US), Curlew Jct (K70), Hansel Mts (K75), Hardup (C42), Kelton (K75), 5 mi N (US) and 9 mi NW (KU), Kelton Pass (K70), Lampe (C42) (? = Lampo), Locomotive Spngs (K75), Promontory (KU), Snowville (K70), 6 mi W (KU) and 17 mi SW (KU), Wildcat Hills (US), Willard (C42). **CACHE**: Green Cyn (KU), Logan (C42). **MILLARD**: Tile Spngs (C42). **RICH**: Allen Cyn (KU). **SALT LAKE**: Wasatch Mts (RG). **TOOELE**: Stansbury Island (C42). **UTAH**: Jordan Narrows (C42), Silver Lake Flat (A). **WASATCH**: Kamas 11 mi SE (U). **WASHINGTON**: Leeds (RG), St George (KU).

Smith (1979:1450) lists this species from western United States, including Utah, Nevada, and Idaho, nesting under stones in

desert areas. Allred and Cole (1971:239) found it in Idaho in an association of sagebrush-grass, rarely in other shrub types. Cole (1942:379) indicates its habitat as under stones in Utah. Ingham (1963) found it in juniper, sagebrush, galletagrass, rabbitbrush, winterfat, shadscale, and greasewood in southern Utah. Knowlton (1975:3) found it associated with rabbitbrush in northern Utah.

One specimen was taken from under a log in grass of an open area of aspen. Twenty-one ants of *Formica subnuda* were under the same log. In 27 recorded Utah habitats it was taken five times in montane areas. In 13 known elevations between 2750 and 9000 ft it was taken most frequently between 4000 and 5000, twice over 5000.

#### *Formica microgyna* Wheeler

*F. microgyna* Wheeler, 1903, Bull. Amer. Mus. Nat. Hist. 19:645; Creighton 1950:504; Gregg 1963:586; Knowlton 1975:3; Smith 1979:1462.

Records: **BOX ELDER:** Hansel Mts (KU), Snowville (K75). **CACHE:** Leeds Cyn (KU). **GRAND:** Warner Ranger Sta (Gr63).

Smith (1979:1462) lists this species from western United States, including Utah, Colorado, Nevada, and Wyoming, nesting under thatched stones in meadows and open forest. It is frequently associated with *Formica argentea*, *F. lasioides*, and *F. neogagates*. Gregg (1963:586) lists it between 5800 and 9400 ft under rocks and logs and in thatched nests predominantly in conifer habitats in Colorado, and gives a record for Utah. Cole (1966:24) found one worker in pinyon-juniper in southern Nevada. One collection in Utah was taken at 4544 ft.

#### *Formica mucescens* Wheeler

*F. truncicola mucescens* Wheeler, 1913, Bull. Mus. Comp. Zool. 53:392; Creighton 1950:491.

*F. rufa mucescens:* Cole 1942:380.

*F. mucescens:* Smith 1979:1460.

Records: **GARFIELD:** Bryce Cyn Nat Park (C42). **SANPETE:** Wales 3.3 mi W (A).

Smith (1979:1460) lists this species from Utah and Colorado nesting under stones in open areas. Gregg (1963:566) lists it between 5500 and 8750 ft under rocks and in thatched nests in grass in conifer habitats in Colorado. Cole (1942:380) indicates its habitats in Utah as under stones and logs.

Four ants in one collection were taken under a rock in an association of sagebrush, rabbitbrush, maple, and oak. In one collection it was taken at 7977 ft.

#### *Formica neoclara* Emery

*F. fusca* var. *neoclara* Emery, 1893, Arb. Zool. Jahrb. Syst. 7:646; Cole 1942:383.

*F. neoclara:* Creighton 1950:535; Beck et al. 1967:70; Knowlton 1970:209, 1975:3; Francoeur 1973:92.

*F. pruinosa:* Beck et al. 1967:70; Knowlton 1970:210, 1975:4.

Records (Map 10): **BEAVER:** Beaver (U), Beaver Cyn (F). **BOX ELDER:** Bear River City, Brigham, Corinne, Garland (US), Hansel Mts (US), Hardup, Kelton (K70) and 6 mi N (KU), Lucin (BAD), Mantua (F), Morton Cold Spngs (KU), Newton (F), Riverside (US), Snowville (K70), Tremonton (F), Willard (US), Willard Basin (KU). **CACHE:** Amalga (US), Ant Valley, Blacksmith Fk Cyn, Carter Crk, Clarkston, Franklin Basin, W Hodges Cyn (KU), Hyde Park (F), Lewiston, Logan (C42), Logan Cyn (KU), Mendon, Millville, Monte Cristo, Newton (KU), Paradise (US), Providence (KU), Smithfield (C42), Smithfield Cyn, Tony Grove (KU), Trenton (F), Wellsville (C42). **CARBON:** Clear Crk Cyn, Price (F) and 2 mi S (U). **DAVIS:** Farmington (F), Kaysville (US), Layton (F). **DUCHESNE:** Lake Atwood, Roberts Pass (BY). **EMERY:** Hideout Cyn nr Green River (U), Huntington (KU). **IRON:** Paragonah (U). **JUAB:** Topaz Mt (KU). **KANE:** Alton, Orderville (F). **MORGAN:** Morgan (BAD), Porterville (KU). **RICH:** Allen Cyn (KU), Chalk Crk (U), Laketown, Monte Cristo (KU). **SALT LAKE:** Brighton (C42), Hunter, Murray (US), Salt Lake City (C42). **SANPETE:** Orangeville 23.9 mi W (A), Palisade (KU). **SEVIER:** Aurora (F), Richfield 2.3 mi S (A). **SUMMIT:** Kamas 11 mi E (U), Park City (F), Wanship (US). **TOOELE:** Grantsville (US). **UINTAH:** Bonanza (KU). **UTAH:** Lehi (F), Provo (A), Thistle (F), and 7.7 mi E (A), Utah Lake (F). **WASATCH:** Bald Mt (KU), Francis 8.1 mi E, Hanna 3.6 mi W (A), Heber (F). **WASHINGTON:** locality unknown (F). **WAYNE:** Hanksville (BAD). **WEBER:** Ogden (F), Riverdale (US), Slaterville (F).

Smith (1979:1454) lists this species as eastern and western United States (no intermountain state is listed), where it nests in the soil, sometimes with loose mounds of soil and detritus, grasslands, and open woods. Hunt and Snelling (1975:23) list it from Arizona. Gregg (1963:529) lists it from Colorado between 3500 and 9000 ft under rocks and logs in a variety of habitats, predominantly in cottonwood-willow areas. La Rivers (1968:10) lists it from Nevada. Wheeler and Wheeler (1977) found it frequently in earthen mounds, also under rocks and wood in North Dakota. Cole (1942:383) indicates its habitat in Utah as soil, with numerous entrances in crude, flat, confluent craters. Knowlton (1975:3) found it associated with sagebrush and rabbitbrush in northern Utah.



Eighty ants in four collections were taken from under rocks. In one case they were under the same rock with *Formica pallidefulva* and once with *F. limata*. Ten ants in one collection were taken under the same log with *F. gnava* and *Camponotus modoc*. Fifteen ants in three collections were taken singly in open areas. Eggs were found under one rock in early July, and in mid-July many winged forms were found under a rock. These tried to hide and escape when disturbed. Two collections were in cottonwoods; one grass, herbs, and sagebrush; one herbs adjacent to a cultivated area; one Russian thistle; and one aspen and conifers. In 87 recorded Utah habitats it was taken 26 times in montane areas. In 49 recorded elevations between 4125 and 11,000 ft it was taken most frequently (44 times) under 6000. Beck et al. (1967:70) found it feeding on dead rodents in one instance in Utah.

### *Formica neogagates* Emery

*F. fusca subpolita* var. *neogagates* Emery, 1893, Zool. Jahrb. Syst. 7:646.

*F. neogagates*: Rees and Grundmann 1940:10; Cole 1942:384; Hayward 1945:120; Creighton 1950:459; Ingham 1959:76; Knowlton 1970:209, 1975:3.

Records (Map 11): **BOX ELDER**: Beaver Dam (KU), Cedar Crk (City) (K70), Cedar Hill (KU), Curlew Jct (US), Hansel Mts (K75), Hardup (US), Kelton (K75), Kelton Pass, Locomotive Spngs (K70), Promontory Pt (C42), Snowville (K70) and 17 mi SW (KU), Taylor Farms (K75), Wildcat Hills (US). **CACHE**: Avon, Blacksmith Fk Cyn, Clarkston, Elk Valley, Green Cyn (KU), Logan, Logan Cyn (C42), Monte Cristo, Paradise, Petersboro, Providence, Tony Grove (KU). **CARBON**: Helper (KU). **EMERY**: Hideout Cyn nr Green River (U). **GARFIELD**: Boulder (U), Jct U12 and U63 0.5 mi E(A), Mt Nebo, Topaz Mt (KU). **MILLARD**: Tule Spngs, White Valley (C42). **PIUTE**: Marysvale 4.1 mi S (A). **RICH**: Monte Cristo, Randolph 10 mi SW (KU), Sage Crk Jct 5.1 mi W, Woodruff 4 mi W, Wyoming brdr 0.5 mi S on U16 (A). **SALT LAKE**: Alta, Cottonwood Cyn (C42), Red Butte Cyn (U), Salt Lake City (C42). **SANPETE**: Orangeville 19.5 mi W (A). **SEVIER**: Salina, Salina Cyn nr Fremont Jct (U), Sevier (C42). **TOOELE**: Lake Point (C42). **UTAH**: Aspen Grove (BY), Nibley, Spanish Fk Cyn (KU). **WASATCH**: Provo River N Fk (U). **WASHINGTON**: Hurricane (US), Kolob (I59), La Verkin (US), Rockville (KU), Santa Clara (US), St George (KU), Virgin River E Fk (I59). **WEBER**: Beaver Crk, Monte Cristo 6 mi S, Thomas Spng (KU).

Smith (1979:1450) lists this species from midwest to western United States, including Arizona, nesting under stones or in the open

with or without a mound or crater in grasslands and dry situations. Gregg (1963:505) lists it from Colorado between 3500 and 9700 ft under rocks and in soil hummocks in a variety of habitats. Allred and Cole (1971:239) found it in Idaho in associations of wild rye-grass and rabbitbrush-sagebrush-grass-winterfat. In southern Nevada Cole (1966:26) found its nests under rocks in pinyon-juniper, and in Utah in small craters (1942:384). Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota. Ingham (1959, 1963) found it under rocks and in small craters in open areas in oak, sagebrush, cultivated areas, shadscale, and greasewood in southern Utah. Knowlton (1975:3) found it associated with sagebrush, rabbitbrush, and sunflowers in northern Utah.

Seventy-eight ants in three collections were taken from moundless burrows. Twenty-one ants in two collections were taken from under rocks, once under the same rock with *Formica gnava*, *F. obscuripes*, and *F. perpilosa*. Nineteen ants in two collections were taken in the open. Five collections were in sagebrush: one in association with grass, one grass and herbs, and one grass and rabbitbrush. One collection was in grass and one in greasewood. In 65 recorded Utah habitats it was found 19 times in montane forest. In 32 recorded elevations between 2625 and 8585 ft it was taken most frequently between 4000 and 5000.

### *Formica neorufibarbis* Emery

*F. fusca* var. *neorufibarbis* Emery, 1893, Zool. Jahrb. Syst. 7:646; Rees and Grundmann 1940:9; Cole 1942:382.

*F. fusca gelida*: Rees and Grundmann 1940:9; Cole 1942:382; Hayward 1945:120.

*F. neorufibarbis*: Grundmann 1958:166; Knowlton 1970:209, 1975:3; Francoeur 1973:225, 244.

*F. neorufibarbis gelida*: Beck et al. 1967:70.

Records (Map 11): **BOX ELDER**: Bear River City, Brigham, Collinston, Corinne, Curlew, Fielding, Garland, Hardup, Park Valley (City), Promontory Ridge, Riverside (= Belmont), Snowville, Thatcher, Tremonton, Willard (C42), Willard Basin (KU). **CACHE**: Amalga (C42), Franklin Basin (KU), Hyde Park, Lewiston, Logan, Logan Cyn (C42), Mendon, Monte Cristo (KU), Newton, Paradise, Petersboro, Richmond (C42), Ricks Spng (KU), Sardine Cyn, Smithfield (C42), Tony Grove Lake (KU), Trenton (C42), Wellsville (RG). **DAGGETT**: Green Lake (RG). **DAVIS**: Farmington, Farmington Cyn (KU), Kaysville (C42), Woods Cross (RG). **DUCHESNE**: Fruitland 4 mi W (U), Mirror Lake (KU).

**GARFIELD:** Osiris (U). **GRAND:** Moab (G58). **IRON:** Cedar City, Parowan, Summit (C42). **JUAB:** Callao (BAD). **KANE:** Orderville (G58). **MILLARD:** Holden, Leamington (C42). **RICH:** Allen Cyn (KU), Laketown (C42), Monte Cristo (KU). **SALT LAKE:** Butterfield Cyn, Hunter, Little Cottonwood Cyn, Mill Crk Cyn, Mt Dell Res (U), Murray (C42), Parleys Cyn (RG), Red Butte Cyn (U), Salt Lake City (C42). **SAN JUAN:** Angels Pk (KU), Blanding (G58), Geyser Pass (BAD), Monticello (G58). **SANPETE:** Ephraim (RG), Ephraim Cyn (KU). **SEVIER:** Salina (C42). **SUMMIT:** Henrys Fk Basin (RG), Kamas (C42), Park City (F), Wanship (C42). **TOOELE:** Fisher Pass, Grantsville, Josepa, Orrs Ranch, St Johns (C42). **UINTAH:** Gusher (C42), Ouray (C42), Paradise Park, Vernal (U). **UTAH:** American Fk Cyn (U), Emerald Lake (BAD), Hobbie Crk, Lehi, Orem, Provo (C42). **WASATCH:** Daniels Cyn, Deer Crk Res, Heber (U), Lost Lake (BY), Midway (U), Soapstone Cyn (RG). **WEBER:** Hooper, Ogden, Riverdale, Roy (C42). **COUNTY UNKNOWN:** Sharon (C42).

Smith (1979:1454) lists this species from midwest to western United States, including Arizona, nesting in rotting wood or under rocks in montane forest. Gregg (1963) lists it from Colorado between 6900 and 11,542 ft under rocks and logs and in hummocks predominantly in conifer habitats. Cole (1966:26) found its nests in southern Nevada under stones in pinyon-juniper, also in logs in wooded areas in Utah (1942:382). Wheeler and Wheeler (1978:395) found it between 6200 and 12,200 ft in Nevada, frequently in earthen mounds and under rocks and wood in North Dakota (1963). Grundmann (1958:166) indicates it as an inhabitant of cultivated and stream side areas usually below 5000 ft in Utah.

In 100 recorded Utah habitats 27 were in montane forest. In 71 elevations between 4042 and 11,300 ft, 52 were under 6000, 14 between 6000 and 8000, and one over 11,000. Beck et al. (1967:70) found it feeding on dead rodents in three instances in Utah.

### *Formica obscuripes* Forel

*F. rufa obscuripes* Forel, 1886, Ann. Ent. Soc. Belg. 30:39; Rees and Grundmann 1940:8; Cole 1942:380.

*F. rufa aggerans*: Rees and Grundmann 1940:8.

*F. rufa melanotica*: Cole 1942:380.

*F. obscuripes*: Ingham 1959:80; Gregg 1963:570; Beck et al. 1967:70; Knowlton 1970:210, 1975:3; Smith 1979:1460.

Records (Map 12): **BOX ELDER:** Bear River City, Bear River Cyn, Brigham, Collinston, Garland, Honeyville (C42), Hansel Mts, Hardup, Kelton, Kelton Pass (K70), Promontory Pt, Raft River Mts (U), Snowville

(K70), Wellsville Mts, Wildcat Hills (KU). **CACHE:** Amalga (C42), Ant Valley, Blacksmith Fk Cyn, Franklin Basin, W Hodges Cyn (KU), Logan, Logan Cyn (C42), Monte Cristo (KU), Providence, Smithfield (C42), Tony Grove Lake (KU). **DAGGETT:** Green Cyn (RG), Radsoovich Ranch (BAD). **DAVIS:** Farmington, Layton (C42). **EMERY:** Carter Crk nr Green River (U). **GRAND:** La Sal Mts (BY), Warner Ranger Sta (Gr63). **JUAB:** McClellan Lake (KU), Nebo Loop rd 9.9 mi S Santaquin Cyn (A), Trout Crk (City) (C42). **MILLARD:** Swasey Spngs (RG). **MORGAN:** Morgan (C42). **PIUTE:** Marysvale 4.1 mi S (A). **RICH:** Meadowville 8 mi NW (KU), Monte Cristo Ranger Sta, Randolph (BAD) and 10 mi SW, Sage Crk (KU). **SALT LAKE:** Big Cottonwood Cyn (U), Holladay, Midvale, Murray, Parleys Cyn (C42), Red Butte Cyn (U). **SANPETE:** Fountain Green (C42), Wales (RG). **SEVIER:** Monroe Mt (BAD). **TOOELE:** Stansbury Island (C42), S Willow Cyn (U). **UINTAH:** Paradise Park 11 mi S (U). **UTAH:** Aspen Grove (BY), Lehi (RG), Provo (C42), Spanish Fk (BY), Spanish Fk Cyn (KU), Tibble Fk Cyn (A). **WASATCH:** Kamas 8 mi S (U). **WASHINGTON:** Harrisburg (C42), Pine Valley (City) (KU). **WAYNE:** Capitol Reef Nat Park (U). **WEBER:** Harrisville, Hooper, Huntsville, Ogden, Slaterville (C42), Woodruff 34.8 mi W (A).

Smith (1979:1460) lists this species from midwest to western United States, including Utah, nesting in large mounds of detritus in open areas. It is a known predator of the pine sawfly. Gregg (1963:570) lists it from Colorado between 3500 and 9500 ft under rocks and logs and in thatched domes in a variety of habitats, and gives a record for Utah. La Rivers (1968:10) lists it from Nevada, where Wheeler and Wheeler (1978:394) found it between 6400 and 10,500 ft. They found it frequently in thatched and duff mounds in North Dakota (1963). Cole (1942:380) indicates that its nests in Utah are domed mounds of detritus in open areas usually next to a shrub at lower elevations, or of mounds of detritus in areas of moderate to dense cover in aspen areas. Ingham (1959, 1963) found it in mounds of detritus in juniper in southern Utah. Knowlton (1975:3) found it associated with sagebrush, rabbitbrush, and sunflowers in northern Utah.

Four ants in one collection were taken from a mound of small sticks and soil next to a log in association with *Formica integroides* and *F. obscuriventris*. Ten ants in one collection were taken from a mound of sticks, and six ants in one collection were taken from under a rock where *F. gnava*, *F. neogagates*, and *F. perpilosa* also were found. Twenty-nine ants in three collections were taken in the open. Four collections were in sagebrush

and two in aspen and fir. In 71 recorded Utah habitats it was taken 24 times in montane forest. In 40 recorded elevations between 3000 and 9100 ft it was taken most frequently between 4000 and 5000 (25 times) and 6000 and 9000 (14 times). Beck et al. (1967:70) found it feeding on dead rodents in four instances in Utah.

*Formica obscuriventris* Mayr

*F. truncicola* var. *obscuriventris* Mayr, 1870, Verh. Zool.-Bot. Ges. Wien 20:951.

*F. truncicola obscuriventris*: Rees and Grundmann 1940:8.

*F. truncicola obscuriventris* var. *aggerans*: Rees and Grundmann 1940:8.

*F. rufa clivia*: Cole 1942:380.

*F. obscuriventris*: Ingham 1959:80.

*F. obscuriventris clivia*: Smith 1979:1460.

Records (Map 11): **BOX ELDER**: Clear Crk (in Raft River Mts) (U), Mantua (KU), Promontory Pt (RG), Wellsville Mts, Willard Basin (KU). **CACHE**: Ant Valley, Blacksmith Fk Cyn, Hyrum (KU), Logan (C42), Logan Cyn, Mendon Cold Spngs, Millville, Providence, Rock Crk, Smithfield Cyn, Tony Grove (KU). **GRAND**: Moab (U). **IRON**: Cedar City (RAU). **KANE**: Long Valley Jct 11 mi W (I59). **RICH**: Meadowville Summit 8 mi W (KU). **SALT LAKE**: locality unknown (RG). **SANPETE**: Majors Flats (KU). **UINTAH**: Whiterocks (KU). **UTAH**: Payson Cyn 7.3 and 10.3 mi up, Santaquin 7.7 mi E, Tibble Fk Cyn (A). **WASATCH**: Francis 18.5 mi E, Hanna 14.3 mi W (A). **WEBER**: Slaterville (US).

Creighton (1950) and Smith (1979:1460) list two races of this species, *obscuriventris* and *clivia*, from eastern to western United States, including Utah and Colorado, nesting under logs and stones in grasslands, woods, and forests. Although both races have been recorded from Utah, the records probably are of *clivia*. Gregg (1963:572) lists the species between 5354 and 10,000 ft under rocks, logs, and in thatched domes in conifers, canyons, and pinyon-juniper-oak habitats in Colorado. Wheeler and Wheeler (1979:394) found it between 6300 and 10,000 ft in Nevada, and frequently in wood in North Dakota (1963). Cole (1942:380) indicates its habitats in Utah as under logs and stones in sparse to moderate cover. Ingham (1959) found it under logs in fir, aspen, and ponderosa pine in southern Utah.

Forty-nine ants in four collections were taken from under rocks, once under the same one with *F. subnitens*, once *F. lasioides*, and once *Lasius alienus* and *L. niger*. Eight ants in one collection were taken from a mound

of small sticks and soil by a log in association with *F. integroides* and *F. obscuripes*. One ant was taken under the same log with *Campotonotus modoc*, *F. podzolica*, and *F. subnitens*. Twenty-five ants were taken in the open. Six collections were in aspen: three in open meadows in association with fir, one with fir, and one with grass and herbs. One collection was in an association of herbs, oregon grape, shrubs, and fir. In 30 recorded Utah habitats it was taken 18 times in montane areas. In 11 known elevations between 4217 and 8100 ft it was taken most frequently under 5000, twice over 7000.

*Formica obtusopilosa* Emery

*F. sanguinea obtusopilosa* Emery, 1893, Zool. Jahrb. Syst. 7:643.

*F. obtusopilosa*: Cole 1942:377; Ingham 1963:104; Gregg 1963:610; Knowlton 1970:210, 1975:4; Allred and Cole 1979:98; Smith 1979:1450.

Records (Map 12): **BOX ELDER**: Bear River City, Blue Crk (City) (C42), Cedar Crk (City), Cedar Hill (K75), Curlew Jct (K70), Fielding, Garland (C42), Hansel Mts (K75), Hardup (C42), Kelton (US), Kelton Pass (K70), Portage (KU), Snowville (K70), Tremonton (C42). **CACHE**: Cache Jct, Green Cyn (C42), Hyde Park (KU), Logan (C42), Providence (KU), Richmond (US). **CARBON**: Helper (KU). **DUCHESNE**: Bonita (= Boneta), Duchesne (C42) and 2 mi N (A), Fruitland (C42). **EMERY**: Orangeville 14.3 mi W (A). **GRAND**: Thompson (C42). **IRON**: Cedar Valley (I59), Modena 5.3 mi W (A). **JUAB**: Ferno Valley (C42). **KANE**: Glen Cyn City (AC). **RICH**: Randolph 8 and 10 mi SW (KU). **SALT LAKE**: Dry Cyn, Salt Lake City (C42). **SAN JUAN**: La Sal Jct 1.6 mi S (A). **SANPETE**: Fairview 2 mi N (A). **TOOELE**: Gold Hill, Skull Valley, Stansbury Island, Timpie (C42). **UINTAH**: Bonanza 14 mi S (A), Dinosaur Nat Mon (Gr63), Lapoint (C42), Whiterocks (KU). **UTAH**: Lehi (C42), Spanish Fk Cyn (KU). **WEBER**: Jet U39 and U166 3.3 mi E (A). **COUNTY UNKNOWN**: Uinta (C42) (? = Uintah in Weber Co).

Smith (1979:1450) lists this species from midwest to western United States, including Utah and Nevada, nesting under stones or in open areas with irregular mounds or craters. Gregg (1963:610) lists it from Colorado between 4800 and 9500 ft under rocks and predominantly in grass and sagebrush habitats, and gives a record for Utah. Cole (1966:26) found its nests in southern Nevada in soil without mounds in desert shrub habitats. Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota. Allred and Cole (1979:98, 1971:239) found it in southern Utah and Idaho in associations of

ephedra-grass, sagebrush-grass, and goosefat-winterfat. Cole (1942:378) indicates that in Utah it nests in obscure craters, under stones, or in soil without craters in grassy areas. Ingham (1963) found it in juniper, sagebrush, and greasewood in southern Utah. Knowlton (1975:4) found it associated with rabbitbrush, sunflowers, and shadscale in northern Utah.

There were 109 ants in five collections taken from small crater mounds about one inch high and six inches in diameter. Twenty ants in one collection were taken from under a rock, and 5 ants in one collection singly in an open area. One of the mound colonies contained eggs, larvae, and pupae in late July. Five collections were in sagebrush: two in association with grass and one with herbs. One collection was in a grass, juniper, and pinyon association. In 48 recorded Utah habitats it was taken only 4 times in montane areas. In 25 recorded elevations between 3250 and 7000 ft it was taken most frequently between 4000 and 6000.

#### *Formica occulta* Francoeur

*F. occulta* Francoeur, 1973, Soc. Ent. du Quebec, Mem. 3, p. 94; Smith 1979:1454.

Records (Map 11): **BOX ELDER**: Willard Basin (KU). **CACHE**: Ant Valley, Antelope Valley, Blacksmith Fk Cyn L Fk, Franklin Basin, Tony Grove, Logan Cyn (KU). **EMERY**: Joes Valley (U). **RICH**: Randolph 10 mi SW, Sage Crk, Sage Crk Jct (KU). **SEVIER**: Fremont 9.7 mi N (A). **SUMMIT**: Wyoming brdr on U150 (A). **WASATCH**: Hanna 9.2 mi W (A).

Smith (1979:1454) lists this species from western United States, including Utah, Colorado, Arizona, and Wyoming.

Thirty-five ants in three collections were found under rocks, once in association with *F. limata*. Three collections were in sagebrush, once in association with matchbrush. In 14 recorded Utah habitats it was taken in montane areas nine times. Five recorded elevations were between 6260 and 9300 ft, mostly above 8000.

#### *Formica opaciventris* Emery

*F. exsectoides* var. *opaciventris* Emery, 1893, Zool. Jahrb. Syst. 7:643.

Records: **CACHE**: Blacksmith Fk Cyn, Elk Valley, Franklin Basin, Tony Grove Lake (KU).

Smith (1979:1456) lists this species from midwest to western United States, including Colorado and Wyoming, nesting in earthen

or thatched mounds. Gregg (1963:601) lists it between 5160 and 10,500 ft in thatched domes from sagebrush to conifer habitats in Colorado.

#### *Formica oreas* Wheeler

*F. oreas* Wheeler, 1903, Bull. Amer. Mus. Nat. Hist. 19:643; Rees and Grundmann 1940:9; Cole 1942:379; Ingham 1959:80; Knowlton 1975:4.

*F. oreas comptula*: Rees and Grundmann 1940:9; Cole 1942:380; Smith 1979:1461.

*F. oreas oreas*: Smith 1979:1461.

Records (Map 12): **BOX ELDER**: Bear River, Clear Crk, Hansel Mts (KU), Kelton (US), Kelton Pass (K75), Snowville, Willard Basin (KU). **CACHE**: Avon, Beaver Crk (KU), Blacksmith Fk (RG), Carter Crk (KU), Cornish (RG), Cove (C42), Franklin Basin, High Crk, Leeds Cyn (KU), Logan (C42), Logan Cyn, Tony Grove Cyn (KU). **DUCHESNE**: Wolf Crk (RG). **KANE**: Duck Crk on Cedar Mt (I59). **RICH**: Allen Cyn, Sunrise Cmpgnd (KU). **SALT LAKE**: Big Cottonwood Cyn, Butterfield Cyn, Red Butte Cyn, Rose Cyn (U). **SAN JUAN**: Hole-in-the-Rock Cyn (U). **UINTAH**: Dry Fk rd 15 mi N U121 (A). **UTAH**: Diamond Fk Cyn, Spanish Fk Cyn (KU), Thistle 14.6 and 20.4 mi E (A). **WASATCH**: Soldier Summit 1 mi E (A). **WASHINGTON**: St George (RG). **COUNTY UNKNOWN**: Duck Crk in Cedar Mts (RG).

Creighton (1950) and Smith (1979:1461) list two races of this species from midwest to western United States, including Utah, Colorado, and Wyoming, nesting under logs or stones banked with detritus in open woods, meadows, or grasslands. Both races have been recorded from Utah. They may be separated by the color of the head and thorax, which in *oreas* are clear red, and in *comptula* are deep brown. Gregg (1963:577) lists this species between 5200 and 10,505 ft under rocks in a variety of habitats in Colorado. Wheeler and Wheeler (1978:394) found it between 6400 and 8800 ft in Nevada, frequently in wood and commonly in duff-covered mounds in North Dakota (1963). Allred and Cole (1971:239) found it in Idaho in associations of rabbitbrush-sagebrush-grass and wild rye-grass. Cole (1942:379) indicates its habitat in Utah as under stones banked with detritus in open sunny areas. Ingham (1959) found it in mounds of detritus in southern Utah. Knowlton (1975:4) found it associated with rabbitbrush in northern Utah.

Fifty ants in two collections were taken from low mounds of sticks, both times in association with *F. integroides*. Twenty ants in two collections were taken singly in open

areas. Four collections were in sagebrush: one in association with herbs; one grass and rabbitbrush; one grass, clover, and Russian thistle; and one grass, aspen, and pine. In 36 recorded Utah habitats it was taken 23 times in montane forest. In 15 recorded elevations between 2760 and 9300 ft it was taken most frequently between 4000 and 5000 ft.

### *Formica pallidefulva* Emery

*F. pallide-fulva nitidiventris* Emery, 1893, Zool. Jahrb. Syst. 7:645; Rees and Grundmann 1940:10.

*F. pallidefulva nitiventris*: Ingham 1959:85.

*F. pallidefulva*: Knowlton 1975:4.

Records (Map 12): **BOX ELDER**: Wildcat Hills (K75). **GRAND**: La Sal Mts (KU). **JUAB**: Nebo Loop rd 9.9 mi S Santaquin Cyn (A). **SALT LAKE**: Parleys Cyn (RG). **UINTAH**: Red Cloud Loop rd 9.2 mi W U44 (A). **WASATCH**: Francis 8.1 mi E (A). **WASHINGTON**: Zion Nat Park (I59).

Creighton (1950) and Smith (1979:1451) list two forms of this species from eastern to western United States, including Colorado and Wyoming. The Utah subspecies probably is *nitidiventris*, which can be distinguished from *pallidefulva* by the clear golden yellow color of *pallidefulva* as contrasted with the yellowish to blackish brown of *nitidiventris*. Gregg (1963:627) lists this species between 3500 and 8000 ft under rocks in a variety of habitats in Colorado. Ingham (1959) found it under rocks in ash, oak, poplar, and poison ivy in southern Utah. Knowlton (1975:4) found it associated with sagebrush in northern Utah.

Fifty ants in two collections were taken from under rocks, once under the same one with *F. neoclara*, and once with *F. argentea* and *Pheidole desertorum*. Three ants in one collection were taken singly in an open area. One collection was in sagebrush, one cottonwoods, and one a grassy meadow. In seven recorded Utah habitats five were in montane areas. One recorded elevation is 4500 ft.

### *Formica pergandei* Emery

*F. pergandei* Emery, 1893, Zool. Jahrb. Syst. 7:643.

Record: **UINTAH**: Whiterocks Cyn (KU).

Smith (1979:1464) lists this species from eastern to western United States, including Colorado, frequently associated with *F. fusca* and *F. pallidefulva*.

### *Formica perpilosa* Wheeler

*F. fusca subpolita* var. *perpilosa* Wheeler, 1902, Mem. Revist. Soc. Sci. Ant. Alzate 17:141.

*F. perpilosa*: Rees and Grundmann 1940:8; Cole 1942:378; Grundmann 1958:166; Ingham 1959:77; Beck et al. 1967:70.

Records (Map 13): **EMERY**: San Rafael River (BAD). **KANE**: Cottonwood Cyn (BAD), Glendale, Kanab, Orderville (C42). **MILLARD**: Sutherland (US). **PIUTE**: Marysvale 4.1 mi S (A). **SALT LAKE**: Salt Lake City (RG). **TOOELE**: Stansbury Island (RG). **UINTAH**: Jensen (U). **WASHINGTON**: Grafton (I59), Hurricane (RG), Rockville (I59), Santa Clara (C42), Springdale (I59), St George (C42), Washington (KU). **WAYNE**: Pleasant Crk (BAD).

Smith (1979:1450) lists this as a mid-western and western species, including Colorado and Wyoming, which usually constructs crater nests in grasslands and open fields. Hunt and Snelling (1975:23) list it from Arizona. Gregg (1963:611) lists it between 3500 and 6000 ft under wood and in dome nests in a variety of habitats in Colorado. La Rivers (1968:10) lists it from Nevada. Cole (1942:378) states that in Utah its nests are obscure craters or low domes around the roots of trees and shrubs, particularly in irrigated areas and dry river beds. Grundmann (1958:166) indicates that its nests in Utah are obscure and difficult to find, consisting of mounds around the bases of shrubs and trees along stream banks. Ingham (1959, 1963) found it in southern Utah under wood, in small half-moon-shaped mounds, and in clumps of grass in willow, tamarix, poplar, and alkali flats.

One ant was collected from under a rock in sagebrush. Ants of *F. gnava*, *F. neogagates*, *F. obtusopilosa*, and *F. perpilosa* were under the same rock. In 18 recorded Utah habitats only one was in a montane area. Twenty-one collections at known elevations were about equally distributed between 2625 and 6600 ft. Beck et al. (1967:70) found it feeding on dead rodents in three instances in Utah.

### *Formica podzolica* Francoeur

*F. podzolica* Francoeur, 1973, Ent. Soc. Quebec, Mem. 3:167.

Records (Map 13): **BEAVER**: Beaver (F). **BOX ELDER**: Cedar Hill (US), Clear Crk (in Raft River Mts) (U), Snowville (US), Willard Pk (KU). **CACHE**: Ant Valley, Bear River Mts, Blacksmith Fk Cyn, Franklin Basin, Green Cyn, Hodges Cyn, Hyrum, Logan (KU), Logan Cyn (US), Millville, Providence, Tony Grove (KU), Wellsville Mts (US). **CARBON**: Clear Crk Cyn (F),

Scofield 5.2 mi SW, Scofield Res 4 mi S, Wellington 12 mi NE (A). DAVIS: Farmington (KU), Farmington Cyn (US). IRON: Upper Bear Crk, Cedar City (RAU) and 19 mi E (A), Summit Crk (RAU). JUAB: Lynndyl 11.5 mi N (A), Toms Crk (in Deep Crk Mts) (U). RICH: Allen Cyn (F), Meadowville, Monte Cristo, Pickleville (KU). SAN JUAN: Elk Ridge, Kigalia Ranger Sta (F). SUMMIT: Mirror Lake 11.6 and 17.3 mi N (A). TOOELLE: Dugway 11.9 mi E (A), Willow Cyn (F). UINTAH: Dry Fk rd 15 mi N U121, Red Cloud Loop rd 4.2 and 9.2 mi W U44 (A), Whiterocks (F). UTAH: Mt Nebo (F), Payson Cyn 12.3 mi up, Santaquin Cyn 4.5, 6.7, 7.1 and 7.7 mi up (A), Thistle (F), Tibble Fk Cyn, Tibble Fk Lake 2.3 mi W (A). WASATCH: Francis 8.1 and 18.5 mi E, Hanna 14.3 mi W, Midway 3.7 mi NW, Soldier Summit 1 mi E and 10.1 mi N (A). WEBER: Beaver Crk (KU). COUNTY UNKNOWN: Beaver Head (KU), Chalk Crk (F) (in either Millard or Summit Co).

Smith (1979:1455) lists this species from eastern to western United States, including Arizona, nesting in soil mounds in montane forest.

There were 123 ants in 10 collections taken from under rocks, once under the same one with *F. gnava*, once *F. fusca*, once *F. moki*, once *F. limata*, and once *F. fusca* and *Solenopsis molesta*. There were 171 ants in 6 collections taken from ground burrows, only 2 of which had low mounds. Twenty-three ants in 4 collections were taken from under logs, once under the same log with *F. fusca* and *F. gnava*, once *Camponotus modoc*, and once *C. modoc*, *F. obscuriventris*, and *F. subnitens*. Thirty ants in one collection were taken from inside a log. Forty-nine ants in 6 collections were taken singly in open areas. Immatures were found in a burrow in late June and under a rock in early August. Sixteen collections were from aspen: 4 in association with grass, herbs, and shrubs; three sagebrush and conifers; one grass; one herbs in an open meadow; one chokecherry; one chokecherry and fir; one maple, oak, and fir; and one pine. Two collections were in grass and herbs, one juniper and pinyon, two fir, one oak, and one sagebrush and herbs. In 62 recorded Utah habitats 41 were in montane forest. In 15 recorded elevations between 4302 and 9300 ft it was taken 11 times under 6000. In one instance, when a cover rock was removed to expose the ants, they ran rapidly and tried to escape. In another case, when the burrow was excavated, the ants scurried around but did not leave the area. Many of them worked furiously to remove the few exposed pupae.

### *Formica puberula* Emery

*F. sanguinea puberula* Emery, 1893, Zool. Jahrb. Syst. 7:643; Rees and Grundmann 1940:8; Cole 1942:378; Knowlton 1970:210.

*F. puberula*: Creighton 1950:468; Gregg 1963:614; Knowlton 1975:4.

Records (Map 13): BOX ELDER: Snowville (K75). GRAND: Warner Ranger Sta (Gr63). PIUTE: Fish Lake Jet 1 mi S (U). SAN JUAN: La Sal Mts (RG). SANPETE: Ephraim Cyn (KU), Wales (RG). TOOELLE: Stockton (RG). UINTAH: Paradise Park 11 mi S (U).

Smith (1979:1465) lists this species from midwest and western United States, including Colorado and Wyoming, where it frequently associates with as many as 12 species of *Formica*. Gregg (1963:614) lists it between 5100 and 10,000 ft under rocks and logs predominantly in conifer habitats in Colorado, and gives a record for Utah. La Rivers (1968:10) lists it from Nevada, where Wheeler and Wheeler (1978:396) found it between 6400 and 8200 ft. Cole (1942:378) indicates that it nests under stones in Utah. In seven recorded Utah habitats it was found three times in montane areas. Three known elevations are 4544, 5069, and 8000 ft.

### *Formica querquetulana* Kennedy and Dennis

*F. querquetulana* Kennedy and Dennis, 1937, Ann. Ent. Soc. Amer. 30:536.

Record: CACHE: Leeds Cyn (KU).

Smith (1979:1463) lists this species from eastern United States. Its occurrence in Utah is questionable.

### *Formica rasilis* Wheeler

*F. microgyna* var. *rasilis* Wheeler, 1903, Bull. Amer. Mus. Nat. Hist. 19:648.

*F. microgyna rasilis*: Rees and Grundmann 1940:9; Cole 1942:381.

*F. rasilis*: Creighton 1950:506; Gregg 1963; Knowlton 1975:5; Smith 1979:1463.

Records (Map 13): BOX ELDER: Snowville (K75). CACHE: Bear River Mts (KU). GARFIELD: Bryce Cyn Nat Park (Cr). GRAND: Warner Ranger Sta (Gr63). SALT LAKE: Butterfield Cyn, Red Butte Cyn (U). SAN JUAN: La Sal Mts (RG).

Smith (1979:1463) lists this species from western United States, including Utah and Colorado, nesting under stones in open areas. Gregg (1963) lists it between 5400 and 11,542 ft under rocks and logs and in thatched nests predominantly in conifer habitats in Colorado, and gives a record for Utah.

La Rivers (1968:10) lists it from Nevada. Cole (1942:381) indicates its habitat in Utah as under stones frequently banked with detritus. In six recorded Utah habitats five were in montane areas. Six recorded elevations were between 4544 and 8000 ft.

### *Formica subintegra* Emery

*F. sanguinea rubicunda* var. *subintegra* Emery, 1893, Zool. Jahrb. Syst. 7:643.

Records: **BOX ELDER**: Hansel Mts (KU). **RICH**: Monte Cristo (KU). **SANPETE**: Ephraim Cyn (KU).

Smith (1979:1465) lists this species from eastern to midwestern United States. No intermountain state is listed, and its occurrence in Utah is questionable.

### *Formica subnitens* Creighton

*F. rufa subnitens* Creighton, 1940, Amer. Mus. Nat. Hist. Nov. 1055:7.

*F. subnitens*: Knowlton 1970:210, 1975:5.

*F. subaenescens*: Knowlton 1975:5.

Records (Map 14): **BOX ELDER**: Hardup, Snowville (K70) and 9 mi W (US). **CACHE**: Elk Valley, Leeds Cyn, Logan Cyn, Rock Crk (in Blacksmith Fk Cyn), Tony Grove Cyn (KU). **IRON**: Upper Bear Crk (RAU). **RICH**: Sage Crk Jct 5.1 mi W (A). **UINTAH**: Dry Fk rd 15 mi N U121, Red Cloud Loop rd 4.2 mi W U44 (A). **UTAH**: Halls Fk rd 8.8 mi N Hobble Crk rd, Payson Cyn 10.3 mi up, Santaquin Cyn 7.7 mi up (A). **WASATCH**: Midway 5.7 and 11.6 mi W, Soldier Summit 3.3 mi N, Strawberry Res 4 mi S (A).

Smith (1979:1461) lists this species from midwest to western United States, including Colorado and Wyoming, nesting under stones or in mounds of thatch. Gregg (1963:581) lists it at 6100 ft in thatched nests in pinyon-juniper in Colorado. Wheeler and Wheeler (1963) found it in thatched mounds in North Dakota.

Seventy-five ants in three collections were taken from mounds of sticks, once next to a boulder and once at the base of a stump. One ant was taken from under the same log as *F. obscuriventris*, *F. podzolica*, and *Camponotus modoc*. Eleven ants in two collections were taken from under rocks, once under the same rock with *F. obscuriventris*. Thirteen ants in four collections were taken singly in open areas. Eggs were found in one mound in late July. Five collections were in aspen: one in association with grass and herbs; one grass, herbs, shrubs, and fir; one grass, sagebrush, and pine; one chokecherry; and one fir. Two

collections were in grass, herbs, and sagebrush; one legumes and sagebrush; one matchbrush and sagebrush; and one oak and fir. In 19 recorded Utah habitats it was taken 15 times in montane areas. One recorded elevation was 4544 ft. Ants on a mound of thatched soil were highly defensive, rearing back in a position of defense to await an invader.

### *Formica subnuda* Emery

*F. sanguinea rubicunda* var. *subnuda* Emery, 1895, Zool. Jahrb. Syst. 8:335.

*F. sanguinea subnuda*: Rees and Grundmann 1940:8; Cole 1942:378; Hayward 1945:120; Creighton 1950:469.

*F. subnuda*: Ingham 1959:79; Gregg 1963:620.

Records (Map 14): **BOX ELDER**: Snowville (C42). **CACHE**: Tony Grove (KU). **CARBON**: Scofield 4 mi S (A). **GARFIELD**: Boulder Mt (U), Bryce Cyn Nat Park (WU). **GRAND**: Warner Ranger Sta (Gr63). **IRON**: Cedar Breaks Nat Mon (I59), Cedar City 14 mi E (A). **KANE**: Cedar City 24.3 mi E (A). **SALT LAKE**: Big Cottonwood Cyn, Red Butte Cyn (U). **SAN JUAN**: La Sal Mts (C42), Monticello 5 mi W (U). **SANPETE**: Orangeville 23.9 mi W (A), Wales (C42). **SUMMIT**: Kamas 11 mi E (U), Kamas 21 and 28.5 mi E (A), Soapstone Cyn (RG). **TOOELE**: Grantsville, Stockton, Tooele (C42). **UINTAH**: East Pk Res rd 2 mi W U44 (A), Trial Lake (U). **UTAH**: Aspen Grove, Provo Cyn (U), Silver Lake Flat (A). **WASATCH**: Horse Crk (C42), Midway 11.6 mi W, Soldier Summit 7.9 mi N (A). **WAYNE**: Capitol Reef Nat Park (U), Henrys Fk Basin (RG). **COUNTY UNKNOWN**: Pallsade Park (in Ashley Nat Forest) (RG).

Smith (1979:1465) lists this species from eastern to western United States, including Colorado and Arizona, frequently associated with *F. altipetens*, *F. fusca*, *F. neorufibarbis*, and *F. subpolita*. Gregg (1963:620) lists it between 5000 and 13,000 ft under rocks and logs and in thatched nests in a variety of habitats in Colorado, and gives a record for Utah. La Rivers (1968:11) lists it from Nevada, where Wheeler and Wheeler (1978:396) found it between 8200 and 11,000 ft. They found it frequently in wood, also common under rocks and in earthen mounds in North Dakota (1963). Cole (1942:378) indicates it nests under stones and logs in Utah. Ingham (1959) found it under stones and logs in fir, spruce, aspen, and pine in southern Utah.

There were 244 ants in nine collections found under logs, once under the same one with *F. fusca*, once *F. gnava*, and once *F. manni*. Fifteen ants in one collection were

found inside a decaying log. These tried to escape when disturbed, crawling under debris. One ant next to the log had a struggling carabid beetle in its jaws, carrying it toward the log. Sixteen ants in one collection were taken singly in an open area. Eggs were found under one log in mid-July. Ants associated with these eggs held firmly onto the substrate and reared back in a biting position when disturbed. Eight collections were in aspen: one in association with grass; one grass, herbs, and pine; two conifers; and one chokecherry. Three collections were in conifers. In 32 recorded Utah habitats it was taken 26 times in montane forest. In 15 recorded elevations between 4304 and 10,500 ft it was taken more frequently above 7000.

#### *Formica subpolita* Mayr

*F. fusca* var. *subpolita* Mayr, 1886, Verh. Zool.-Bot. Ges. Wien 36:426.

*F. subpolita cemponiticeps*: Rees and Grundmann 1940:10; Cole 1942:384; Ingham 1959:84; Knowlton 1970:210, 1975:5.

*F. subpolita*: Cole 1942:383; Ingham 1959:83.

*F. subpolita ficticia*: Creighton 1950:542.

Records (Map 14): **BOX ELDER**: Bear River City, Blue Crk (City), Cosmo (? = Kosmo), Hardup, Kelton, Locomotive Spngs, Park Valley, Penrose, Rosette, Snowville, Willard (C42). **CACHE**: Logan, Logan Cyn, Trenton (C42). **EMERY**: San Rafael Swell (US). **GRAND**: Moab (RG). **JUAB**: Diamond Cyn, Nephi (C42). **MILLARD**: Delta (C42), Swasey Spngs (RG). **SALT LAKE**: Ft Douglas (C42). **SAN JUAN**: Blanding (C42), La Sal Mts (U). **TOOELE**: Clover, Fisher Pass, Flux, Grantsville, Iosepa, Orrs Ranch, Stansbury Island (C42). **UTAH**: Provo (C42). **WASHINGTON**: Hurricane (RG), Pine Valley (City) (I59), St George (C42). **WEBER**: Ogdan (C42). **COUNTY UNKNOWN**: Rosebud, Showell, Westpoint (C42).

Smith (1979:1455) lists this species from western United States, including Nevada and Idaho, nesting in mounds or craters in semi-desert areas. Gregg (1963:541) lists it from Colorado between 5300 and 7800 ft. Wheeler and Wheeler (1978:396) found it between 6000 and 10,800 ft in Nevada. Allred and Cole (1971:239) found it in Idaho in associations of a variety of shrubs. Cole (1966:26) found its nests in southern Nevada under stones commonly in pinyon-juniper; also in grassy areas in Utah (1942:384). Ingham (1959, 1963) found it under stones in juniper and sagebrush in southern Utah. Knowlton (1975:5) found it in northern Utah.

In 38 recorded Utah habitats it was taken only 3 times in montane areas. In 28 recorded elevations between 2700 and 9000 ft it was taken most frequently between 3000 and 4000, twice over 7000.

#### *Formica subsericea* Say

*F. subsericea* Say, 1836, Boston J. Nat. Hist. 1:289.

Records: **CACHE**: Logan Cyn, Wellsville (US). **SEVIER**: Richfield (US).

Smith (1979:1455) lists this species from eastern to midwestern United States, but does not include an intermountain one. Wheeler and Wheeler (1978:396) found it between 7000 and 11,500 ft in Nevada, and frequently in earthen mounds, under rocks, and in and under wood in North Dakota (1977). Utah records of this species were taken at 4495 and 5340 ft. According to Snelling (pers. comm.) these Utah records are probably based on misidentifications.

#### *Formica transmontanis* Francoeur

*F. transmontanis* Francoeur, 1973, Soc. Ent. du Quebec, Mem. 3:35.

Record: **SAN JUAN**: Monticello (KU).

Smith (1979:1455) lists this species from western United States, including Idaho.

#### *Formica wheeleri* Creighton

*F. wheeleri* Creighton, 1935, Amer. Mus. Nat. Hist. Nov. 773:1; Rees and Grundmann 1940:10; Cole 1942:378; Creighton 1950:472; Grundmann 1958:166; Smith 1979:1466.

Records: **GRAND**: Warner Ranger Sta (RG). **SAN JUAN**: Blue Mts (C42) (? = Abajo Mts).

Smith (1979:1466) lists this species from midwest and western United States, including Utah, Colorado, and Arizona, associated with *F. altipetens*, *F. fusca*, *F. lasioides*, *F. neogagates*, and *F. neorufibarbis*. Gregg (1963:623) lists it between 5500 and 9500 ft under rocks in several habitats in Colorado. Wheeler and Wheeler (1963) found it under rocks and in earthen mounds in North Dakota. Cole (1942:378) states that it nests under stones on open hillsides in aspen forests in Utah, where it takes *F. lasioides* as a slave species (Grundmann 1958:166).

#### *Formica whymperei* Wheeler

*F. adamsi* var. *alpina* Wheeler, 1909, J. New York Ent. Soc. 17:85.



*F. whymperi alpina*: Creighton 1950:509; Gregg 1963:593; Smith 1979:1463.

Record: **GRAND**: Warner Ranger Sta (Gr63).

Creighton (1950) and Smith (1979) list four races of this species from midwest to western United States, including Utah, Colorado, and Idaho, nesting under stones or logs in forest areas, where it associates with *F. neoclara* and *F. neorufibarbis*. The subspecies in Utah is likely *alpina*. Gregg (1963:593) lists it between 8500 and 12,500 ft under rocks and logs and in thatched nests in conifer habitats in Colorado, and gives a record for Utah. Allred and Cole (1971:239) found it in associations of rabbitbrush-sagebrush-grass-winter-fat in Idaho.

### *Formica xerophila* M. R. Smith

*F. moki xerophila* Smith, 1939, Ann. Ent. Soc. Amer. 32:583.

*F. moki*: Rees & Grundmann 1940:10; Ingham 1959:84.

*F. xerophila*: Francoeur 1973:262; Smith 1979:1455.

Records (Map 14): **BEAVER**: Milford (RG). **DAVIS**: Farmington Cyn (KU). **SALT LAKE**: Big Cottonwood Cyn, Mt Olympus (U), Parleys Cyn (Cr). **SAN JUAN**: Blanding, Bluff (RG). **UINTAH**: Red Cloud Loop rd 4.2 mi W U44 (A). **WASHINGTON**: Big Plains, Central, Zion Nat Park (I59).

Smith (1979:1455) lists this species from western United States, including Utah and Arizona. In 12 recorded Utah habitats 5 were in montane areas. Fourteen recorded elevations were between 4000 and 7000 ft, 6 under 5000.

### *Formicoxenus chamberlini* (Wheeler)

*Symmyrmica chamberlini* Wheeler, 1904, Bull. Amer. Mus. Nat. Hist. 20:5; Rees and Grundmann 1940:6; Cole 1942:370; Creighton 1950:281; Smith 1979:1398.

Records: **SALT LAKE**: Salt Lake City (RG). **SAN JUAN**: Blanding 8 mi N (U).

Smith (1979:1398) lists this species as Utah and Oregon, nesting with *Manica mutica*.

### *Hypoconerops opaciceps* (Mayr)

*Ponera opaciceps* Mayr, 1887, Verh. Zool.-Bot. Ges. Wien 37:536; Grundmann 1958:161; Ingham 1963:39.

Records: **SALT LAKE**: Salt Lake City (U). **WASHINGTON**: St George (I59).

According to Smith (1979:1343), this is primarily an eastern species ranging westward to Arizona and Colorado. Gregg (1963:284)

found it between 5354 and 5400 ft in cottonwood-willow habitats in Colorado. La Rivers (1968:2) listed it from Nevada. Grundmann (1958:161) indicates that in Utah it ranges up to 4000 ft in dry desertlike areas where there is moisture, and nests under stones among willows. Four known elevations in Utah are from 2700 to 4453 ft.

### *Hypoconerops opacior* (Forel)

*Ponera trigona* var. *opacior* Forel, 1893, Trans. Ent. Soc. London, p. 363; Cole 1942:359.

Records: **SALT LAKE**: Salt Lake City (U). **UTAH**: Springville (C42).

Smith (1979:1343) lists this species from eastern to western United States, including Colorado. Hunt and Snelling (1975:20) list it from Arizona. Gregg (1963:286) lists it between 4000 and 5400 ft under rocks in grassy habitats in Colorado. One Utah collection was taken at 4253 ft.

### *Iridomyrmex humilis* (Mayr)

*Hypoclinea humilis* Mayr, 1868, Soc. Nat. Modena, Ann. 3:164.

Records: **GRAND**: Moab (U). **SAN JUAN**: Goulding Trading Post (U).

Smith (1979:1418) lists this species from eastern to western United States, including Arizona, nesting in soil, rotting wood, or debris. La Rivers (1968:6) lists it from Nevada. Elevation of two recorded Utah collections was 4000 ft.

### *Iridomyrmex pruinosus* (André)

*Tapinoma anale* André, 1893, Rev. Ent. de France 12:148.

*I. pruinosus*: Rees and Grundmann 1940:7; Cole 1942:373; Allred and Cole 1979:98.

*I. analis*: Rees and Grundmann 1940:6.

*I. pruinosus analis*: Rees and Grundmann 1940:7; Cole 1942:373; Grundmann 1958:165; Ingham 1959:62; Beck et al. 1967:70.

*I. pruinosus testaceus*: Cole 1942:373.

Records (Map 15): **BOX ELDER**: Bovine (C42), Brigham (A), Lucin, Park Valley (City) (C42). **CACHE**: Green Cyn (KU), Logan Cyn (C42), Tony Grove (KU). **DUCHESNE**: Roosevelt (C42). **EMERY**: Greenriver (US), Wellington 46 mi S (A). **GRAND**: Dewey (U), Moab (C42). **JUAB**: Chicken Crk Res (KU). **KANE**: Castle Rock (U), Coral Pink Sand Dunes (I59), Glen Cyn City (AC), Kanab (C42). **MILLARD**: Deseret (C42). **SALT LAKE**: Big Cottonwood Cyn (C42), Butterfield Cyn (U), S Dry Cyn, Ft Douglas (C42), Mt Olympus (U),

Parleys Cyn (C42). **SAN JUAN:** Bluff (BAD), Johns Cyn (RG), La Sal (C42), Monticello (U), Montezuma Crk (BAD), Monument Valley (KU). **SEVIER:** Salina Cyn nr Fremont Jet (U). **TOOELE:** Clover, Josepa (C42). **UINTAH:** Gusher (C42). **UTAH:** Aspen Grove (BY), Pelican Pt (RG). **WASHINGTON:** Harrisburg (US), Harrisburg Jet (I59), Hurricane (US), La Verkin, Pintura, Rockville, Veyo, Virgin City (I59), Zion Nat Park (C42). **WAYNE:** Fruita 5 mi SE (U), Hanksville 17 mi S (KU). **COUNTY UNKNOWN:** Valley Jet, Willow Spngs (C42).

Snelling (pers. comm.) indicates that this is a *Forelius*, but for the present I am retaining it as indicated.

Creighton (1950) and Smith (1979:1419) indicate two races of this species as midwest and western in the United States, including Idaho, where nests are under objects or in craterlike mounds in open areas. The Utah population, probably the subspecies  *analis*, can be separated from  *pruinosis* by the dense pubescence on the head and thorax of  *pruinosis* that partially obscures its rough surface, whereas on  *analis* the pubescence is dilute and reveals the shining surface beneath. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:436) lists it from Colorado between 3500 and 6300 ft under rocks in a variety of habitats, predominantly pinyon-juniper and grass. Cole (1966:18) states that in southern Nevada it nests under stones, at the base of plants, and in mounds in open areas in a variety of desert shrub habitats. He found it in Utah in craterlike nests in sandy soil (1942:373). Wheeler and Wheeler (1963) found it in soil craters in North Dakota. Grundmann (1958:165) indicates that nests of these ants in Utah are difficult to locate, and occur most commonly in grass habitats near desert mountains. Ingham (1959, 1963) found it under stones and in small craters in creosote bush, sagebrush, pinyon-juniper, galleta-grass, rabbitbrush, winterfat, joshua trees, four-wing saltbush, and shadscale in southern Utah. Allred and Cole (1979:98) found it in southern Utah in a variety of desert shrub types, most commonly in sagebrush.

Sixty ants in two collections were taken from small mounds with a central top opening. These ants are rapid runners. One collection was in halogeton and one in sunflowers, sagebrush, and rabbitbrush. In 49 reported habitat localities this species was taken 10 times in montane areas. In 45 recorded elevations between 2500 and 8100 ft it was taken 29 times between 3000 and 5000, 14 times

between 5000 and 8000. Beck et al. (1967:70) found it feeding on dead rodents in three instances in Utah.

### *Lasius alienus* (Foerster)

*Formica aliena* Foerster, 1850, Hymenop. Studien (Ernst Ter Meer Publ. Aachen) 1:36.

*L. niger alienus* var. *americanus*: Rees and Grundmann 1940:7.

*L. niger* var. *americanus*: Rees and Grundmann 1940:7; Cole 1942:374; Knowlton 1970:210.

*L. alienus americanus*: Grundmann 1958:166; Ingham 1959:72; Knowlton 1970:210, 1975:5.

*L. alienus*: Beck et al. 1967:70.

Records (Map 15): **BOX ELDER:** Kelton, Kelton Pass (K70), Snowville (C42), Willard Basin (KU). **CACHE:** Ant Valley, Beaver Crk (KU), Blacksmith Fk Cyn, Cowley Cyn (C42), Franklin Basin, W Hodges Cyn (KU), Logan Cyn (C42), Tony Grove Lake (KU). **DUCHESNE:** Duchesne (C42). **EMERY:** Hideout Cyn nr Green River (U). **GARFIELD:** Boulder Mt, Henry Mts (G58), Osiris (U). **GRAND:** Thompson (KU). **IRON:** Coal Crk Cyn (I59). **KANE:** Kanab and 20 mi N (C42). **MILLARD:** locality unknown (RG). **RICH:** Allen Cyn (KU), Randolph 2.3 mi N, Sage Crk Jet 5.1 mi W (A). **SALT LAKE:** Alta, Big Cottonwood Cyn, Butterfield Cyn, City Crk Cyn, Holladay, Lake Blanche, Mill Crk Cyn (C42), Mt Olympus, Red Butte Cyn (U), Salt Lake City (C42). **SAN JUAN:** Abajo Mts (G58), La Sal (C42), Monticello 7.6 mi W (A), Nat Bridges Nat Mon (U). **SANPETE:** Fairview Summit (KU). **SUMMIT:** Mirror Lake 6.4 mi N, Wyoming brdr on U150 (A). **TOOELE:** Clover, Fisher Pass, Tooele (C42). **UINTAH:** Bonanza 25 mi S, Dry Fk rd 13.4 mi N U121 (A), Gusher (C42). **UTAH:** American Fk Cyn, Provo (C42), Silver Lake Flat (A). **WASATCH:** Francis 18.5 mi E, Hanna 14.3 mi W (A). **WASHINGTON:** Kolob (I59), Pine Valley (City), (BAD), Zion Nat Park (C42).

Smith (1979:1435) indicates this as an eastern to northwestern United States species, including Idaho and southern Arizona. It shows a preference for well-shaded woodlands, where it nests under stones and in rotting logs, only occasionally found in the open. Gregg (1963:456) lists it from Colorado between 3500 and 10,400 ft under rocks in a great variety of habitats, predominantly pinyon-juniper and grass. La Rivers (1968:8) lists it from Nevada, where Wheeler and Wheeler (1978:393) found it between 6400 and 9700 ft. They found it in wood and under bark in North Dakota (1963). Cole (1942:374) states that its habitat in Utah is under stones in open and grassy areas, some colonies at 6500 ft. In Utah it nests under stones on rocky, exposed mountain slopes up to 6000 ft (Grundmann 1958:166). Ingham (1959) found it in southern Utah under rocks and logs in oak and aspen.

There were 155 ants in five collections taken from under rocks. In one instance *Tapinoma sessile* was found under the same rock, and once *alienus* was under the same rock with *Formica obscuriventris* and *Lasius niger*. Sixty-nine ants in three collections were taken from under logs. In one case *F. fusca* was under the same log. One ant was taken from a burrow in the open. Four collections were in aspen: one in association with grass, herbs, and conifers and one with fir. Four collections were in sagebrush: two in association with grass and herbs and one with snowberry. One collection was in juniper and pinyon and one in conifers. In 56 recorded Utah habitats it was found 32 times in montane forest. In 32 elevational records it was about equally distributed between 4000 and 9300 ft, slightly more common between 4000 and 6000. Beck et al. (1967:70) found it feeding on dead rodents in one instance in Utah.

#### *Lasius crypticus* Wilson

*L. crypticus* Wilson, 1955, Bull. Mus. Comp. Zool. 113:1 (♂; Beck et al. 1967:70; Smith 1979:1436).

Records (Map 15): **BOX ELDER:** Brigham (KU). **CACHE:** Logan (KU). **CARBON:** Myton rd 15 mi E US6 (A). **GARFIELD:** Henry Mts (Wi). **IRON:** Cedar City 14 mi E (A). **KANE:** Long Valley Jct (Wi). **RICH:** Randolph 2.3 mi N (A), Woodruff (BAD). **SAN JUAN:** Geyser Pass, Mexican Water (BAD), Monticello 2 mi W (A). **SANPETE:** Orangeville 19.5 mi W (A). **SEVIER:** Salina Cyn nr Fremont Jct (U). **UINTAH:** Vernal 15 mi N (A). **UTAH:** Provo, Thistle 20.4 mi E (A), Wanrhodes Cyn (KU). **WASATCH:** Hanna 9.2 mi W (A). **WAYNE:** Pleasant Crk (BAD).

Smith (1979:1436) lists this species from midwest to western United States, including Utah and Idaho, nesting under stones or in craters. Cole (1966:20) found its nests under stones in open areas in pinyon-juniper in southern Nevada. Allred and Cole (1971:239) found it in Idaho in a variety of shrub types. Wheeler and Wheeler (1963) found it frequently under rocks, also commonly in soil craters in North Dakota.

Seventy-nine ants in seven collections were taken from under rocks. It was under the same rock with *L. humilis*, and once with *Myrmica americana*. Fifteen ants in one collection were taken from a small crater mound, and 11 in two collections singly in open areas. Five collections were in sagebrush: one in association with grass; one grass, herbs, and rabbitbrush; one herbs and

juniper; and one grass, legumes, shrubs, juniper, and pinyon. One collection was in grass, one grass and oak, one pine, and one a cultivated area. In 19 recorded Utah habitats it was taken 9 times in montane forest. Four recorded elevations were between 4307 and 10,750 ft. Beck et al. (1967:70) found it feeding on dead rodents in four instances in Utah.

#### *Lasius fallax* Wilson

*L. fallax* Wilson, 1955, Bull. Mus. Comp. Zool. 113:130; Smith 1979:1437.

Records (Map 15): **CACHE:** Bear River Mts, Logan Cyn (KU). **GRAND:** Warner Ranger Sta (Wi). **SAN JUAN:** Blue Mts (Wi) (? = Abajo Mts). **UINTAH:** Deep Crk (Wi), Red Cloud Loop rd 4.2 mi W U44 (A). **WASATCH:** Soldier Summit 3.3 mi N (A). **COUNTY UNKNOWN:** Bassets Spngs (Uinta Mts) (Wi).

Smith (1979:1437) lists this species from the western United States, including Utah, Colorado, Arizona, Idaho, and Wyoming, nesting under stones in forest clearings.

Fifty ants in two collections were taken from under rocks in sagebrush: one in association with grass and one with matchbrush. Eight collections whose recorded Utah habitats were known were in montane forest. One recorded elevation is 9750 ft.

#### *Lasius humilis* Wheeler

*L. humilis* Wheeler, 1917, Proc. Amer. Acad. Arts, Sci. 52:528.

Records: **IRON:** Cedar City 14 mi E (A). **JUAB:** Iba-pah (U). **KANE:** Cedar City 24.3 mi E (A). **UINTAH:** Bonanza (KU).

Smith (1979:1438) lists this species from the western United States, including Colorado and Nevada, nesting under stones in meadows and open woods. Gregg (1963:475) lists it between 5154 and 7000 ft under rocks in meadows in Colorado.

Forty-five ants in two collections were found under logs, one in grass, herbs, aspen, and pine, and one in pine. Ants of *L. subumbratus* were under the same log in one instance, and *L. crypticus* in the other. In two of four recorded Utah habitats it was found in montane forest. Two known elevations are 5288 and 5456 ft.

#### *Lasius nearcticus* Wheeler

*L. flavus nearcticus* Wheeler, 1906, Psyche 13:38; Rees and Grundmann 1940:7; Cole 1942:374; Grundmann 1958:166.

*L. flavus claripennis*: Cole 1942:375.

*L. flavus microps*: Ingham 1959:74.

Records (Map 17): **CACHE**: Logan (KU). **DUCHESNE**: Paradise Park 11 mi W (U). **PIUTE**: Fish Lake Jct 1 mi S (U). **SALT LAKE**: Big Cottonwood Cyn (U), Butterfield Cyn (RG), Red Butte Cyn (U). **SAN JUAN**: Bluff, La Sal Mts (RG). **UINTAH**: Bonanza (KU). **WASHINGTON**: Veyo, Zion Nat Park (159).

Smith (1979:1438) lists this species from eastern to western United States, including Colorado and Wyoming, where it nests under rocks or fallen logs in moist woodlands. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:471) lists it between 6250 and 9000 ft under rocks in conifers, pinyon-juniper, and oak habitats in Colorado. La Rivers (1968:8) lists it from Nevada, where Wheeler and Wheeler (1978:393) found it between 6200 and 10,400 ft. They found it frequently under rocks in North Dakota (1963). Cole (1942:374) indicates its habitat in Utah as under stones. In Utah it nests under stones or dead wood among cottonwoods (Grundmann 1958:166). Ingham (1959) found it under stones in ash, oak, poplar, and poison ivy in southern Utah.

In 10 recorded Utah habitats it occurred only 4 times in montane forest. In 10 elevation records between 4320 and 8900 ft it occurred 7 times under 5000, twice over 8000.

### *Lasius niger* (Linnaeus)

*Formica niger* Linnaeus, 1758, Syst. Nat. Ed. 10, 1:580.

*L. niger neoniger*: Rees and Grundmann 1940:7; Cole 1942:374; Hayward 1945:120; Grundmann 1958:166; Ingham 1959:72.

*L. niger*: Beck et al. 1967:70; Smith 1979:1436.

Records (Map 16): **BOX ELDER**: Kelton (US), Lucin (BAD), Snowville, Wellsville Mts, Willard Basin (KU). **CACHE**: Ant Valley (KU), Blacksmith Fk Cyn, Cowley Cyn (RG), Franklin Basin (KU), High Crk (US), W. Hodges Cyn (KU), Logan (RG), Logan Cyn, Tony Grove Cyn (KU). **EMERY**: Hideout Cyn nr Green River (U). **GARFIELD**: Escalante 20 mi E (U), Boulder Mt (G58), Osiris, Trachyte Ranch (U). **GRAND**: Moab 12 mi N (U). **KANE**: Coral Pink Sand Dunes (BAD), Kanab 10 mi N (159) and 20 mi N (C42), Zion Nat Park (159). **MILLARD**: Black Rock 8 mi N (KU). **SALT LAKE**: Alta, Big Cottonwood Cyn (RG), Brighton, Butterfield Cyn (U), City Crk Cyn, Lake Blanche (RG), Mt Olympus, Parleys Cyn, Red Butte Cyn (U), Salt Lake City (KU). **SAN JUAN**: Abajo Mts (G58), Blanding 15.6 mi N (A), Bluff (U), Mexican Hat 13 mi S (A), Nat Bridges Nat Mon (Wi), Red Mesa (BAD), White Cyn (Wi). **SANPETE**: Fairview Cyn (KU). **SUMMIT**: Kamas 14.7 mi E (A), Woodland (BAD). **TOOELE**: S Willow Cyn (U). **UINTAH**: Bonanza and 3 mi S (KU), Gusher, Jensen (U), Dry Fk rd 22.8 mi N U121 (A). **UTAH**: American Fk Cyn

(C42), Diamond Fk Cyn (KU), Provo Cyn (U), Santaquin Cyn 3.6 and 7.1 mi up, Tibble Fk Cyn, Tibble Fk Lake 0.5 mi W (A), Wanrhodes Cyn (KU). **WASATCH**: Cascade Spngs 3 mi N, Francis 14.4 and 18.5 mi E (A), Fruitland 4 mi W (U), Hanna 14.3 mi W (A), Heber (Wi), Midway, Soapstone Cyn (U), Soldier Summit (US). **WASHINGTON**: Grafton, Kolob, Rockville, Santa Clara Crk, Veyo, Virgin River E Fk (159), Zion Nat Park (WU). **WAYNE**: Elkhorn Ranger Sta, Pleasant Crk (BAD). **WEBER**: Beaver Crk (KU), Ogden (Wi).

Ants that run to *niger* in the key should be considered as "*niger* complex," for some specimens whose records are included here are lighter in color and/or larger than the "typical" *niger*, and may represent a different species.

Smith (1979:1436) lists this species from the western United States, including Utah, Colorado, Arizona, and Idaho, nesting under stones and rotten wood in forests or open situations. Gregg (1963:459) lists it from Colorado between 3500 and 12,400 ft under rocks and logs in a variety of habitats, predominantly conifers. La Rivers (1968:8) lists it from Nevada, where Wheeler and Wheeler (1978:393) found it between 7600 and 9000 ft. They found it frequently in soil craters, and, in North Dakota, also common under rocks (1963). Cole (1942:374) states that in Utah its habitat is under stones and logs at higher elevations to 10,000 ft. Grundmann (1958:166) indicates that in Utah it nests under stones and rotting wood alongside streams between 5000 and 10,000 ft. Ingham (1959, 1963) found it in southern Utah under stones and logs, and in flat craters in open areas in a variety of vegetative types.

There were 188 ants in 13 collections taken from under rocks. *Lasius subumbratus* was under the same rock in two collections, *L. sitiens* in one, and *L. alienus* and *Formica obscuriventris* in one. Six ants in one collection were taken singly in an open area. Eggs were found under one rock in early July, larvae under one in late June, pupae under another in late June, and winged forms under one rock in late July. Eight collections were in aspen: two in association with grass, sagebrush, and snowberry; two maple, oak, and fir; one sagebrush; and one fir. Three collections were in sagebrush: one in association with snowberry and oak, and one with herbs and conifers. One collection was in a grassy meadow with oak and conifers, and one in

ephedra and blackbrush. In 79 recorded Utah habitats it occurred 41 times in montane areas. In 51 elevational records between 3500 and 10,000 ft it was somewhat equally distributed between 4000 and 8000, once over 10,000. Beck et al. (1967:70) found it feeding on dead rodents in seven instances in Utah.

When the protective rock is removed, these ants run rapidly into burrows and to the opposite side of the rock. Larvae that are present may be abandoned with no attempt on the part of the workers to carry them into deeper burrows. Sometimes those on the ground stay and work furiously to move the eggs and pupae into the burrows. Under one rock three *Aphaenogaster subterranea* were present that had antennae and legs missing. These likely were captured by *niger*.

#### *Lasius pallitarsis* (Provancher)

*Fornica pallitarsis* Provancher, 1881, Nat. Canad. 12:355.

*Lasius niger* var. *sitkaensis*: Rees and Grundmann 1940:7; Cole 1942:374.

*Lasius sitkaensis*: Beck et al. 1967:71.

*Leptothorax sitkaensis*: Knowlton 1975:6.

Records (Map 16): **BOX ELDER**: Snowville (C42). **CACHE**: Bear River Range, Blacksmith Fk Cyn, Franklin Basin, Logan, Logan Cyn (KU). **CARBON**: Scofield (BAD). **DAGGETT**: Red Crk (BAD). **DUCHESNE**: Duchesne 3 mi E (WU). **GARFIELD**: Bryce Cyn Nat Park (WU). **KANE**: Kanab (C42). **RICH**: Meadowville (KU). **SALT LAKE**: Big Cottonwood Cyn, Holladay, Mill Crk Cyn (C42), Red Butte Cyn (U), Salt Lake City (C42). **SAN JUAN**: La Sal (RG), Mexican Hat 13 mi S (A). **SANPETE**: Bluebell Flats (KU), Ephraim 8.8 mi E (A), Mt Pleasant (BAD), Orangeville 27.4 mi W (A). **SEVIER**: Fish Lake (BY), Koosharem (BAD). **UINTAH**: Bonanza (KU), Dry Fk rd 22.8 mi N U121 (A), Gusher (C42), Red Cloud Loop rd 9.2 mi W U44 (A). **UTAH**: Aspen Grove (BAD), Santaquin Cyn 3.6 mi up (A). **WASATCH**: Wallsburg (BAD). **WASHINGTON**: Zion Nat Park (C42). **WAYNE**: Pleasant Crk (BAD).

Smith (1979:1437) lists this species from eastern to western United States, including Arizona and Nevada, nesting under stones or logs in forested areas. Gregg (1963:463) lists it from Colorado between 4600 and 12,200 ft under rocks and logs in a variety of habitats, predominantly conifers. Wheeler and Wheeler (1978:393) found it between 6000 and 9700 ft in Nevada, and frequently under rocks, also common in and under wood and in soil in craters in North Dakota (1963). Cole (1942:374) indicates its habitat in Utah as under stones.

There were 124 ants in six collections taken from under rocks. In one case these ants were under the same rock as *Aphaenogaster subterranea*, and once with *L. subumbratus*. In this latter case the tunnels of the two species of *Lasius* were distinctly apart under separate areas of the boulder. Two ants in one collection were taken singly away from the colony. Three collections were in aspen, one in association with conifers. One collection was in ephedra and blackbrush, one herbs, one a grassy meadow, and one firs. In 34 recorded Utah habitats it was taken 19 times in montane forest. In 15 recorded elevations between 4276 and 8750 ft it was taken most frequently under 6000. Beck et al. (1967:71) found it feeding on dead rodents in eight instances in Utah.

#### *Lasius sitiens* Wilson

*L. sitiens* Wilson, 1955, Bull. Mus. Comp. Zool. 113:108.

Records (Map 17): **CACHE**: Logan (KU). **JUAB**: Fish Spngs Ranch (U), Topaz Mt (KU). **UTAH**: Diamond Fk Cyn (KU), Tibble Fk Cyn (A), Wanrhodes Cyn (KU).

Smith (1979:1437) lists this species from the western United States, including Colorado, Arizona, and Nevada, nesting under stones in dry open areas between 7000 and 8000 ft. Cole (1966:20) found its nests under stones in pinyon-juniper in southern Nevada. Thirty ants in one collection were taken from under a rock in an association of oak, maple, aspen, and fir in Utah.

#### *Lasius subumbratus* Viereck

*L. umbratus subumbratus* Viereck, 1903, Trans. Amer. Ent. Soc. 29:73; Rees and Grundmann 1940:7; Cole 1942:375.

*L. subumbratus*: Creighton 1950:424.

Records (Map 16): **DUCHESNE**: Mirror Lake (Wi). **GARFIELD**: Bryce Cyn Nat Park (Wi). **GRAND**: Warner Ranger Sta (Wi). **KANE**: Cedar City 24.3 mi E (A), Long Valley Mts (Wi). **SALT LAKE**: Big Cottonwood Cyn, Brighton (U), Lake Blanche (Wi). **SAN JUAN**: Blanding 16.5 mi N (A), Blue Mts (Wi) (? = Abajo Mts). **SANPETE**: Ephraim 8.8 mi E (A). **SUMMIT**: Kamas 4.6 and 9.2 mi E, Mirror Lake 11.6 mi N (A), Shingle Crk (Wi). **UINTAH**: Red Cloud Loop rd 9.2 mi W U44 (A). **UTAH**: Orem (A), Provo (U), Tibble Fk Lake (A), Timpanogos Pk (Wi). **WASATCH**: Cascade Spngs 3 mi N (A). **WEBER**: Woodruff 29.1 mi W (A).

Smith (1979:1439) lists this species from eastern to western United States, including Arizona and Nevada, nesting under stones or

logs in meadows and forests. It is a social parasite of *L. pallitarsis*. Gregg (1963:477) lists it from Colorado between 5160 and 9224 ft under rocks and logs in a variety of habitats. Cole (1942:375) indicates it as uncommon in Utah, nesting under stones.

There were 294 ants in nine collections taken from under rocks. In two instances ants of *L. niger* were under the same rocks, and once those of *L. pallitarsis* were present. Ten ants in one collection were found under a log, and 20 ants in one collection singly in a garden. Six collections were taken in conifers: two in association with grass, herbs and aspen; two sagebrush and aspen; one a grassy meadow; and one aspen. Two collections were taken in grass; one sagebrush; one sagebrush, snowberry, and oak; and one a garden. In 22 recorded Utah habitats it was taken 19 times in montane forest. Six recorded elevations were between 5000 and 10,050 ft.

#### *Lasius umbratus* (Nylander)

*Formica umbrata* Nylander, 1846. Acta. Soc. Sci. Fenn. 2:1048.

*L. umbratus mixtus* var. *aphidicola*: Rees and Grundmann 1940:7; Cole 1942:375.

*L. umbratus aphidicola*: Ingham 1959:74.

*L. umbratus*: Smith 1979:1439.

Records (Map 16): **BEAVER**: Beaver 5.5 mi E (U). **CACHE**: Logan Cyn (C42). **IRON**: Cedar City 19 mi E (A). **RICH**: Woodruff (U). **SALT LAKE**: Big Cottonwood Cyn (U), Little Willow Crk Cyn (RG). **SAN JUAN**: Kigalia Ranger Sta (Wi). **SANPETE**: Pine Plantation (KU). **SUMMIT**: Henefer (C42). **UINTAH**: Jensen (U). **UTAH**: Jordan Narrows (C42), Santaquin Cyn 7.1 mi up (A). **WASHINGTON**: Kolob (159). **WEBER**: Ogden Cyn (C42).

Smith (1979:1439) lists this species from eastern to western United States, including Utah, Arizona, and Idaho, nesting under stones or logs. It is associated with *L. alienus* and *L. niger*. Gregg (1963:478) lists it from Colorado between 5254 and 9500 ft under rocks predominantly in conifer habitats. Wheeler and Wheeler (1963) found it frequently under rocks and in earthen mounds in North Dakota. Cole (1942:375) indicates its habitat in Utah as under stones. Ingham (1959) found it in logs in oak and aspen in southern Utah.

Forty ants in one collection were found under a log, and 40 in another collection under a rock. Two collections were taken in

aspen: one in association with pine and one in a grassy meadow. In 14 recorded Utah habitats it was taken 10 times in montane forest. Six recorded elevations were between 4494 and 8402 ft.

#### *Lasius vestitus* Wheeler

*L. umbratus vestitus* Wheeler, 1910. Psyche 17:238.

Record: **SAN JUAN**: La Sal Mts (U).

Smith (1979:1440) lists this species from the western United States, including Idaho. Wheeler and Wheeler (1978:393) found it between 7600 and 8100 ft in Nevada.

#### *Leptothorax ambiguus* Emery

*L. curvispinosus ambiguus* Emery, 1895. Zool. Jahrb. Syst. 8:317.

Records: **BOX ELDER**: Locomotive Spngs (KU). **UTAH**: Spanish Fk Cyn (KU).

Smith (1979:1392) lists this species from midwestern United States; no intermountain state is listed. It nests in soil or hollow grass stems in woodlands and grasslands. Its occurrence in Utah is doubtful.

#### *Leptothorax andrei* Emery

*L. andrei* Emery, 1895. Zool. Jahrb. Syst. 8:318.

Record: **TOOELE**: Granite Mt (U).

Smith (1979:1392) lists this species from western United States, including Arizona and Nevada, nesting under stones. Cole (1966:17) found it in southern Nevada in pinyon-juniper, where it probably nests under stones. Allred and Cole (1971:239) found it in juniper in Idaho.

#### *Leptothorax crassipilis* Wheeler

*L. acervorum crassipilis* Wheeler, 1917. Proc. Amer. Acad. Arts. Sci. Boston 52:513.

*L. crassipilis*: Creighton 1950:278; Smith 1979:1396.

Record: **CARBON**: Scofield 4 mi S (A).

Smith (1979:1396) lists this species from western United States, including Utah, Colorado, Arizona, and Wyoming, nesting under rocks and logs. Gregg (1963:402) lists it between 5700 and 9100 ft under rocks and logs in conifers, oak, and manzanita habitats in Colorado. La Rivers (1968:6) lists it from Nevada, where Wheeler and Wheeler (1978:391) found it at 8100 ft. Three ants in one collection in Utah were taken from under an aspen log.

*Leptothorax furunculus* Wheeler

*L. furunculus* Wheeler, 1909. J. New York Ent. Soc. 17:82; Knowlton 1975:5.

Records: **BOX ELDER**: Cedar Crk (City), Curlew Jct, Hansel Mts, Snowville (K75), Wellsville Mts (KU).

Smith (1979:1393) lists this species from Colorado and Wyoming. Gregg (1963:383) lists it from Colorado between 6970 and 7500 ft in pinyon-juniper areas. Knowlton (1975:5) found it associated with sagebrush in northern Utah.

*Leptothorax hirticornis* Emery

*L. hirticornis* Emery, 1895, Zool. Jahrb. Syst. 8:317; Cole 1942:370; Smith 1979:1397.

Record: **SALT LAKE**: locality unknown (C42).

Smith (1979:1397) lists this species from midwest and western United States, including Utah and Colorado, nesting with *Formica obscuripes* in large mounds of detritus in open areas. Gregg (1963:405) lists it between 5354 and 7000 ft in Colorado.

*Leptothorax muscorum* (Nylander)

*Myrmica muscorum* Nylander, 1846, Acta Soc. Sci. Fenn. 2:1054.

*L. acervorum canadensis*: Rees and Grundmann 1940:6; Cole 1942:369; Hayward 1945:120.

*L. acervorum canadensis* var. *yankee*: Rees and Grundmann 1940:6; Cole 1942:369.

*L. canadensis*: Ingham 1959:60.

*L. muscorum*: Beck et al. 1967:71.

Records (Map 17): **BOX ELDER**: Box Elder Cyn (US). **CACHE**: Blacksmith Fk Cyn, W Hodges Cyn (KU), Logan (C42), Logan Cyn Summit, Mendon Cold Spngs (KU), Millville (US), Tony Grove, Wellsville (KU). **GARFIELD**: Osiris (U). **IRON**: Cedar Breaks Nat Mon (I59). **JUAB**: Red Crk Spng (KU). **SALT LAKE**: Big Cottonwood Cyn S Fk (C42), Brighton, Butterfield Cyn (U), Little Cottonwood Cyn (C42). **SANPETE**: Manti (KU). **UINTAH**: Paradise Park (U), Whiterocks Cyn (KU). **UTAH**: American Fk Cyn (U), Aspen Grove (BY), Emerald Lake (BAD).

Smith (1979:1397) lists this species from eastern to western United States, including Arizona, nesting under rocks, logs, or bark of fallen trees in woodlands. Gregg (1963) lists it from Colorado between 5354 and 12,500 ft under rocks and logs in a variety of habitats, predominantly in conifers. La Rivers (1968:6) lists it from Nevada, where Wheeler and Wheeler (1978:391) found it between 6400 and 11,000 ft. Cole (1942:369) indicates its habitat in Utah as under decaying wood and

in standing dead trees. Ingham (1959) found it under logs in fir, spruce, and bristlecone pine in southern Utah.

In 22 recorded Utah habitats it was found 15 times in montane forest. In 16 recorded elevations between 4495 and 10,500 ft it was taken most frequently above 7000. Beck et al. (1967:71) found it feeding on dead rodents in one instance in Utah.

*Leptothorax nevadensis* Wheeler

*L. nevadensis* Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55:224; Rees and Grundmann 1940:6; Cole 1942:370; Knowlton 1970:210, 1975:5.

Records (Map 17): **BEAVER**: Beaver 5.5 mi E (U). **BOX ELDER**: Cedar Crk (City) (K70), Curlew Valley (US), Hansel Mts, Kelton Pass, Snowville (K70). **CACHE**: Blacksmith Fk Cyn (RG), Green Cyn (US). **RICH**: Randolph 8 mi SW (KU). **SANPETE**: Ephraim Cyn (KU).

Creighton (1950) and Smith (1979:1393) list four forms of this species from the western United States, including Nevada, nesting in soil usually under stones. The subspecies that occurs in Utah is likely *rudis* or *nevadensis*. These can be separated by the sculpture on the dorsum of the thorax. On *nevadensis* the thorax is densely and evenly punctate, whereas on *rudis* the punctures are interrupted by prominent rugae on the epinotum and mesonotum. Cole (1966:17) found its nests in southern Nevada in pinyon-juniper and under stones in Utah (1942:370). Wheeler and Wheeler (1978:392) found it between 6100 and 10,000 ft in Nevada. Knowlton (1975:5) found it associated with rabbitbrush and grass in northern Utah. In 10 recorded Utah habitats it was taken four times in montane forest. One recorded elevation is 4544 ft.

*Leptothorax nitens* Emery

*L. nitens* Emery, 1895, Zool. Jahrb. Syst. 8:318; Rees and Grundmann 1940:6; Cole 1942:370; Creighton 1950:265; Grundmann 1958:164; Knowlton 1970:211, 1975:6.

Records (Map 18): **BOX ELDER**: Box Elder Cyn (KU), Cedar Crk (City), Hansel Mts (K75), Kelton, Kelton Pass, Snowville (K70) and 13 mi SW, Wellsville Mts (KU). **CACHE**: Providence Cyn (C42), Spring Hollow (US). **GARFIELD**: Boulder Mt (G58). **GRAND**: Moab 10 mi SE (KU). **MILLARD**: Black Rock (US). **SAN JUAN**: Abajo Mts (G58). **UTAH**: American Fk Cyn (RG).

Smith (1979:1394) lists this species from western United States, including Colorado and Wyoming, nesting under rocks and in duff. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:384) lists it between 6000 and 8000 ft under rocks in conifers, pinon-juniper, and oak habitats in Colorado. La Rivers (1968:6) lists it from Nevada, where Wheeler and Wheeler (1978:392) found it at 6300 and 6400 ft. Cole (1942:370) found it under stones in Utah. Grundmann (1958:164) indicates that it nests under stones in desert conditions and transition zones in shrubs in Utah. Knowlton (1975:6) found it associated with horsebrush in northern Utah. In 15 recorded Utah habitats between 4225 and 7000 ft, it was found 7 times in montane areas.

### *Leptothorax rugatulus* Wheeler

*L. rugatulus brunnescens* Wheeler, 1917, Proc. Amer. Acad. Arts, Sci. 52:510; Creighton 1950:269; Smith 1979:1394.

*L. rugatulus*: Cole 1942:369; Creighton 1950:268; Grundmann 1958:164; Knowlton 1975:6.

Records (Map 18): **BOX ELDER**: Box Elder Cyn (KU), Cedar Hill (K75), Park Valley (City) (C42), Snowville (K75) and 13 mi SW (KU), Wildcat Hills (K75). **CACHE**: Blacksmith Fk Cyn (US), Green Cyn (KU), Hyde Park (US), Logan Cyn (KU), Richmond (US). **MILLARD**: White Valley (C42). **SALT LAKE**: Red Butte Cyn (U). **SAN JUAN**: Mexican Hat (G58). **SANPETE**: Majors Flats (KU). **TOOELE**: Clover, Delle, Fisher Pass (C42). **UINTAH**: Bonanza 3 mi S (KU). **WEBER**: Uintah (US).

Creighton (1950) and Smith (1979:1394) list two races of this species from the western United States, including Utah and Colorado, where it nests under rocks or wood. The Utah race is likely the subspecies *brunnescens*, which may be separated from *rugatulus* by the thoracic rugae that are well developed on *rugatulus*, but feeble, often replaced by punctures, on *brunnescens*. Hunt and Snelling (1975:23) list it from Arizona. Gregg (1963:387) lists it from Colorado between 5354 and 8700 ft under rocks and logs in a variety of habitats, predominantly conifers. La Rivers (1968:6) lists it from Nevada, where Wheeler and Wheeler (1978:392) found it between 6000 and 10,000 ft. They found it under rocks and other objects in North Dakota (1963). Cole (1942:369) indicates that it nests under stones in Utah. In Utah it occurs in the transition zone (Grundmann 1958:164). Knowlton (1975:6) found it

associated with sagebrush and snowberry in northern Utah. In 20 recorded Utah localities it occurred 6 times in montane areas between elevations of 4270 and 6300 ft, mostly at lower elevations.

### *Leptothorax silvestrii* (Santschi)

*Tetramorium silvestrii* Santschi, 1909, Soc. Ent. Ital., Bol. 41:6.

Record: **BOX ELDER**: Cedar Hill (KU).

Smith (1979:1395) lists this species from southern Arizona nesting in oak above 3500 ft. Its occurrence in Utah is questionable.

### *Leptothorax tricarinatus* Emery

*L. tricarinatus* Emery, 1895, Arb. Zool. Jahrb. System 8:318; Knowlton 1970:211, 1975:6.

*L. tricarinatus tricarinatus*: Smith 1952:100; Smith 1979:1395.

*L. tricarinatus neomexicanus*: Smith 1952:101; Grundmann 1958:164; Ingham 1959:60; Smith 1979:1395.

Records (Map 18): **BOX ELDER**: Kelton (K70). **DUCHESNE**: Avintaquin Cmpgnd (A). **JUAB**: Mt Nebo (US), Nephi 20 mi SW (Sm52). **MILLARD**: White Valley (Sm52). **SANPETE**: Orangeville 19.5 mi W (A). **SUMMIT**: Mirror Lake 17.3 mi N (A). **UINTAH**: Red Cloud Loop rd 19 mi W U44 (A). **WASATCH**: Daniels Pass (US). **WASHINGTON**: Kolob (I59).

Creighton (1950) and Smith (1979:1395) list two races of this species from western United States, including Utah, Colorado, Arizona, and Wyoming, nesting in soil and under rocks in open grassy areas. Both races are known for Utah. The subspecies *neomexicanus* may be separated from *tricarinatus* by the length of the epinotal spines, which are longer on *neomexicanus*, and by the opaque thorax of *neomexicanus* versus the shining surface of *tricarinatus*. Gregg (1963) lists it between 4600 and 7800 ft under rocks in a variety of habitats, predominantly grass areas in Colorado. Grundmann (1958:164) lists it as a plateau form between 6000 and 8000 ft in Utah. Ingham (1959) found it in clumps of dry grass associated with sagebrush, oak, and a variety of herbs in southern Utah.

There were 120 ants in three collections taken from under rocks, and 50 in one collection under a log. Immatures were found under one rock in early July. Two collections were taken in aspen: one in association with fir and one with sagebrush and conifers. One



collection was taken in grass and one in pine. It was found in 7 montane areas in 10 localities where the habitat was recorded, at elevations from 4225 to 8000 ft.

### *Liometopum occidentale* Wheeler

*L. apiculatum luctuosum* Wheeler, 1905, Bull. Amer. Mus. Nat. Hist. 21:325; Rees and Grundmann 1940:6; Cole 1942:371.

*L. occidentale luctuosum*: Creighton 1950:339; Grundmann 1958:165; Ingham 1959:60.

*L. tricarinatus*: Knowlton 1970:211, 1975:6.

*L. luctuosum*: Allred and Cole 1979:99.

Records (Map 18): **CARBON**: Wellington 10 mi NE (A). **DUCHESNE**: Duchesne 9 mi W (WU), Myton (RG). **EMERY**: Greenriver, Gunnison Butte (RG). **GRAND**: Dewey (U), Moab (RG). **KANE**: Glen Cyn City (AC), Kanab 12.5 mi N (A), Mt Carmel Jet, Zion Nat Park (159). **PIUTE**: Marysvale 4.1 mi S (A). **SAN JUAN**: Blanding (C58), Hatch Wash nr La Sal (RG), Monticello 17 mi E (U). **WASHINGTON**: Rockville, Zion Nat Park (159). **WAYNE**: Capitol Reef Nat Park (U).

Creighton (1950) and Smith (1979:1417) indicate two forms of this western United States species, including Colorado, Arizona, and Wyoming. The Utah specimens probably belong to the subspecies *luctuosum* rather than *occidentale*. Gregg (1963:443) lists this species between 4800 and 7550 ft under rocks and logs in conifers and pinyon-juniper in Colorado. Wheeler and Wheeler (1978:392) found it between 5200 and 8100 ft in Nevada. Cole (1966:18) found a nest in southern Nevada in detritus at the base of a juniper; it also nests under stones in Utah, for the most part at elevations above 4000 ft (1942:371). Grundmann (1958:165) indicates this as a mountain species that nests between 4000 and 7000 ft in Utah. Ingham (1959) found it in southern Utah under rocks and bark of living trees in a variety of habitats. Allred and Cole (1979:99) found it in sagebrush-grass and juniper-pinyon associations in southern Utah.

Sixty ants in two collections were taken from small crater mounds, 29 in one collection from under a rock, and 25 in one collection from duff under a pinyon tree. Three collections were taken in sagebrush, one in association with juniper and pinyon. None of 18 recorded Utah localities were in montane areas. In 15 recorded elevations between 3250 and 7300 ft nine are between 4000 and 6000.

### *Manica hunteri* (Wheeler)

*Myrmica hunteri* Wheeler, 1914, Psyche 21:119.

*Manica hunteri*: Wheeler and Wheeler 1970:135; Smith 1979:1352.

Record: **CACHE**: Benson (W70).

Smith (1979:1352) lists this species from the western United States, including Utah, Nevada, Idaho, and Wyoming, nesting in open areas of coniferous forests. Wheeler and Wheeler (1970) state that its habitat is under stones in craters in coniferous forest, specifically lodgepole pine, although craters are rare. They found it between 2200 and 9600 ft in Nevada (1978:391).

### *Manica mutica* (Emery)

*Myrmica mutica* Emery, 1895, Zool. Jahrb. Syst. 8:311; Rees and Grundmann 1940:5; Cole 1942:368.

*Manica mutica*: Ingham 1959:38; Wheeler and Wheeler 1970:159; Knowlton 1970:211, 1975:6.

Records (Map 19): **BOX ELDER**: Blue Crk (City) (C42), Cedar Hill (K70), Corinne (C42), Kelton, Penrose 7 mi W (KU), Tremonton (C42). **CACHE**: Benson (W70), Hyrum (C42), Lewiston (US). **DAVIS**: NE Antelope Island (W70), Layton (W70), Woods Cross (RG). **GARFIELD**: Osiris, Panguitch (W70). **IRON**: Cedar Breaks Nat Mon (W70), Cedar City (RAU), Coal Crk Cyn (159). **JUAB**: Lexington (US). **KANE**: Long Valley (W70). **MILLARD**: Delta (BY), Fillmore (US). **PIUTE**: Junction (W70). **SALT LAKE**: Big Cottonwood Cyn (U), Great Salt Lake S end, Midvale, Murray (W70), Salt Lake City (RG). **SANPETE**: Chester, Fayette (C42). **TOOELE**: Iosepa, Lake Point, Tooele (C42). **UTAH**: Aspen Grove (BY), Lehi (W70), Provo (U), Salem, Springville (C42), Thistle 14.6 mi E (A), E Utah Lake (BY). **WEBER**: Ogden, Plain City (C42).

Smith (1979:1352) lists this species from midwest and western United States, including Colorado, nesting in a wide variety of habitats, where it is associated with *Formicoxenus chamberlini*. Gregg (1963:316) lists it from Colorado between 4500 and 8600 ft under rocks and wood in conifers, pinyon-juniper, cottonwood-willow, grass, sagebrush, and greasewood habitats. La Rivers (1968:2) lists it from Nevada. Wheeler and Wheeler (1970) list it from Colorado, Arizona, Nevada, Idaho, Wyoming, and Utah, where it often nests in small craterlike mounds in a variety of habitats including coniferous forest, pinyon-juniper, and grasslands between 1100 and 8600 ft. They found it frequently in soil craters in North Dakota (1963). Cole (1942:368) indicates that in Utah it nests under stones and in ditch banks, sometimes constructing small craters. Ingham (1959, 1963)

found it under rocks in juniper and alkali flats in southern Utah.

Twenty ants in one collection in Utah were taken from under a rock in an association of grass, clover, Russian thistle, and sagebrush. In 41 recorded habitats it was taken only six times in montane areas. In 35 recorded elevations between 4225 and 10,399 ft it was taken most frequently under 5000, once over 8000.

### *Monomorium minimum* (Buckley)

*Myrmica minima* Buckley, 1867, Proc. Ent. Soc. Phila. 6:338.

*Monomorium minimum*: Rees and Grundmann 1940:3; Cole 1942:361; Grundmann 1958:163; Ingham 1959:57; Beck et al. 1967:71; Knowlton 1975:6; Allred and Cole 1979:98.

Records (Map 19): **BEAVER**: Beaver 5.5 mi E (U). **BOX ELDER**: Hansel Mts (K75), Locomotive Spngs (KU). **CACHE**: Ant Valley, Green Cyn, Leeds Cyn (KU). **EMERY**: Huntington (BAD). **GARFIELD**: Boulder (U). **GRAND**: Moab 15 mi S (KU). **IRON**: Highway US91 (I59). **JUAB**: Callao (BAD). **KANE**: Glen Cyn City (AC), W Glen Cyn Res (G58), Grosvenor Arch (US), Kanab (G58) and 20 mi N (C42), Long Valley Jct 2 mi W, Mt Carmel Jct (I59). **MILLARD**: Swasey Spngs (RG). **MORGAN**: Morgan (KU). **SALT LAKE**: Big Cottonwood Cyn (U), Little Willow Cyn (C42), Rose Cyn (U), Salt Lake City (RG). **SAN JUAN**: Blanding (RG), Mexican Hat (G58). **SANPETE**: Manti (KU). **SEVIER**: Sevier (KU). **SUMMIT**: Echo (BAD). **TOOELE**: Clover, Fisher Pass, Little Valley Ranger Sta, Orrs Ranch (C42). **UTAH**: American Fk (RG), Aspen Grove (BY), Diamond Fk Cyn, Spanish Fk Cyn (KU). **WASATCH**: Provo River N Fk (U). **WASHINGTON**: Highway 18 (I59), Pinto 3 mi S (US) and 3 mi N (KU), Zion Nat Park (I59). **WEBER**: Hooper (C42).

Smith (1979:1382) lists this species from Canada to Florida and western United States, including Colorado, with nests in exposed soil, under objects, or in rotting wood. Hunt and Snelling (1975:21) list it from Arizona. Gregg (1963:368) lists it between 3500 and 8500 ft under rocks predominantly in pinyon-juniper areas in Colorado. Cole (1966:16) found it in southern Nevada under stones in blackbrush and other desert shrub types, rarely in pinyon-juniper. He states that in Utah it nests under stones, in crater mounds, under bark, or in logs (1942:361). Allred and Cole (1979:98, 1971:239) found it in southern Utah and Idaho in a variety of desert shrub types. Wheeler and Wheeler (1963) found it commonly in soil craters in North Dakota. Grundmann (1958:163) found it abundant in transition zones and canyon sides under

stones in Utah. Ingham (1959, 1963) found it under stones or in small crater mounds in open areas associated with sagebrush, juniper, thistlepoppy, galletagrass, little rabbitbrush, winterfat, and greasewood in southern Utah. Knowlton (1975:6) found it associated with rabbitbrush in northern Utah.

In 43 recorded Utah habitats only 10 were in montane areas. Twenty-seven elevational records between 3250 and 8000 ft show it most common (24 times) between 4000 and 7000. Beck et al. (1967:71) found it feeding on dead rodents in three instances in Utah.

### *Myrmecocystus flaviceps* Wheeler

*M. yuma* var. *flaviceps* Wheeler, 1912, Psyche 19:174.

*M. flaviceps*: Snelling 1976:85; Smith 1979:1446.

Records (Map 19): **JUAB**: Callao 5 mi E (U). **MILLARD**: Black Rock (US) and 5 to 8 mi N, Deseret 30 to 32 mi S (S76). **WASHINGTON**: Harrisburg (S76), Zion Nat Park (WU).

Smith (1979:1446) lists this species from western United States, including Utah, Arizona, and Nevada. Snelling (1976:85) indicates that its nests are craterlike in juniper, sagebrush, saltbush-greasewood, creosote bush, creosote bush-bur sage, and palo verde-cactus.

### *Myrmecocystus hammettensis* Cole

*M. hammettensis* Cole, 1938, Amer. Midl. Natl. 19:678.

Record: **BOX ELDER**: Park Valley (City) 31 mi SW (KU).

Smith (1979:1446) lists this species from western United States, including Nevada and Idaho. Snelling (1976:102) indicates its habitat as saltbush-greasewood and sagebrush-grass in craterlike nests.

### *Myrmecocystus kennedyi* Cole

*M. melliger semirufus* var. *kennedyi* Cole, 1936, Ent. News 47:119.

*M. melliger semirufus*: Cole 1942:386.

*M. kennedyi*: Creighton 1950:449; Grundmann 1958:167; Snelling 1976:65; Smith 1979:1446.

Records: **BOX ELDER**: Lucin (C42). **GRAND**: Moab (C42). **JUAB**: Silver City (US). **WASHINGTON**: St George 5 mi S (S76).

Smith (1979:1446) lists this species from western United States, including Utah, Arizona, Nevada, and Idaho. Snelling (1976:66) lists its habitats as sagebrush, creosote bush-bur sage, and palo verde-cactus, where nests

occur as craters in bare areas away from vegetation. Cole (1942:386) indicates its habitat as craterlike nests in open areas in Utah. None of four recorded Utah habitats were in montane areas. Four recorded elevations were between 4000 and 6100 ft.

*Myrmecocystus mendax* Wheeler

*M. melliger mendax* Wheeler, 1908, Bull. Amer. Mus. Nat. Hist. 24:351; Rees and Grundmann 1940:11; Cole 1942:385.

*M. melliger*: Allred and Cole 1979:98.

Records: **CACHE**: Wellsville (RG). **EMERY**: Green-river (US). **KANE**: Glen Cyn City (AC). **MILLARD**: Swasey Spngs (C42). **SAN JUAN**: Dead Horse Pt State Park (US).

Smith (1979:1447) lists this species from western United States, including Colorado, Arizona, and Nevada. Gregg (1963:645) lists it between 3600 and 6600 ft under rocks and in crater nests in pinyon-juniper and grass habitats in Colorado. Snelling (1976:40) indicates its habitats as pinyon-oak, mesquite-acacia, pinyon-juniper, oak-juniper, and shrubs between 3600 and 6600 ft. Cole (1942:386) indicates that in Utah its nests are in unprotected soil of open areas. Allred and Cole (1979:98) found it in a variety of desert shrub types in southern Utah with no apparent plant preference. None of the recorded habitats in Utah were from montane areas, and four recorded elevations were between 3250 and 6000 ft.

*Myrmecocystus mexicanus* Waesmael

*M. mexicanus* Wesmael, 1838, Bull. Acad. Sci. Belg. 5:770; Garrett 1910:342; Snelling 1976:122; Allred and Cole 1979:98; Smith 1979:1447.

*M. mexicanus hortideorum*: Rees and Grundmann 1940:11; Cole 1942:386; Creighton 1950:446; Grundmann 1958:166; Ingham 1959:75; Beck et al. 1967:71.

Records (Map 20): **EMERY**: Green River, Gunnison Butte (RG). **GARFIELD**: Boulder, Henry Mts (S76), Shootering Cyn (US). **GRAND**: Arches Nat Park (S76), Moab (G58), Thompson (C42). **IRON**: Shirts Cyn (RAU). **KANE**: Glen Cyn City (AC). **MILLARD**: Black Rock (US) and 5 mi N (KU), Deseret 32 mi S (S76). **SALT LAKE**: Garfield (S76). **SAN JUAN**: Aztec Cyn (U), Blanding (G58), Bluff (RG), Four Corners, Mexican Water, Montezuma Crk, Red Mesa (BAD). **WASHINGTON**: Hurricane 3 mi SW (159), Pine Valley (City) (BAD), Santa Clara (US), St George (BY).

Smith (1979:1447) lists this as a western species of United States, including Utah, Colorado, Arizona, and Nevada. Gregg

(1963:648) lists it between 4500 and 6800 ft in large craters predominantly in pinyon-juniper and sagebrush habitats in Colorado. In southern Nevada Cole (1966) found it abundantly in hopsage-matrimony vine, Russian thistle, blackbrush, and pinyon-juniper habitats. It was scarce in creosote bush areas. Nests in Utah are craterlike, generally on hills and ridges with sparse cover (Cole 1942:386). Grundmann (1958:166) indicates it as a desert species in Utah that occasionally may be found chewing on the ears of mice caught in traps. Ingham (1959, 1963) found it in southern Utah in a variety of shrub types, and Allred and Cole (1979:98, 1971:239) found it in southern Utah and Idaho in a variety of desert shrub types. Snelling (1976:124) indicates that its nests are craterlike.

In 31 recorded Utah habitats it was never found in a montane area. In 18 elevational records it was about equally distributed between 2625 and 6675 ft, slightly more common above 4000. Beck et al. (1967:71) found it feeding on dead rodents in 13 instances in Utah.

*Myrmecocystus mimicus* Wheeler

*M. melliger mimicus* Wheeler, 1908, Amer. Mus. Nat. Hist., Bull. 24:353.

*M. mimicus*: Ingham 1959:76; Allred and Cole 1979:99.

Records: **CACHE**: Green Cyn (KU). **WASHINGTON**: Grafton, Harrisburg Jet 2 mi W, Harrisburg Jet toward Hurricane (159).

Smith (1979:1447) lists this species from midwest to western United States, including Arizona. Cole (1966:22) found it commonly in creosote bush habitats in southern Nevada, as well as some other desert shrub types. The nests are holes in the ground or in craters in open areas. Ingham (1959, 1963) found it in southern Utah in craters in bur sage, rabbitbrush, cholla, creosote bush, mesquite, sagebrush, Joshua trees, sand sage, four-wing saltbush, and shadscale. Allred and Cole (1979:99) found it in juniper-ephedra-grass, ephedra-grass, and blackbrush associations in southern Utah. Snelling (1976:58) lists pinyon-juniper, oak-juniper, sagebrush, saltbush-greasewood, creosote bush-bur sage, and grassland at habitats below 4000 ft. Nests are craterlike, frequently concealed by a grass clump. Only one of four recorded Utah habitats was in a montane area. Five recorded

elevations were between 2700 and 5000 ft. Snelling (pers. comm.) believes that these Utah records are misidentifications.

### *Myrmecocystus navajo* Wheeler

*M. mexicanus navajo* Wheeler, 1908, Bull. Amer. Mus. Nat. Hist. 24:360; Cole 1942:386.

*M. navajo*: Grundmann 1958:167; Snelling 1976:126; Smith 1979:1447.

Records: **BEAVER**: Milford 26.7 mi W (A). **JUAB**: Trout Crk (City) 9 mi E (S76). **MILLARD**: Delta 60 mi W (S76), White Valley (C42). **SAN JUAN**: Bluff (G58).

Smith (1979:1447) indicates this as a western United States species, including Utah, Colorado, Arizona, and Nevada. Gregg (1963:651) lists it between 4100 and 4400 ft in craters in grass habitats in Colorado. Cole (1942:386) indicates that in Utah the nests are inconspicuous in open areas. Grundmann (1958:167) states that in Utah it inhabits obscure ground burrows, with the sand spread out in the form of a disc. Snelling (1976:128) indicates that nests are in the center of a flat disc or may be craterlike in saltbush-greasewood. Fifty ants in one collection were taken from a crater mound in shadscale in Utah.

### *Myrmecocystus pyramicus* Smith

*M. pyramicus* Smith, 1951, Great Basin Nat. 11:91; Beck et al. 1967:71.

Record: **SAN JUAN**: Mexican Water (BAD).

Smith (1979:1447) lists this species from western United States, including Nevada and Idaho. Snelling (1976:135) indicates its habitats as sagebrush and saltbush-greasewood, with craterlike nests between 2350 and 6700 ft. Beck et al. (1967:71) found it feeding on dead rodents in two instances in Utah.

### *Myrmecocystus romainei* Cole

*M. melliger semirufus* var. *romainei* Cole, 1936, Ent. News 47:120.

*M. romainei*: Snelling 1976:81; Smith 1979:1447.

Records (Map 20): **BOX ELDER**: Park Valley (KU). **EMERY**: Greenriver (S76). **GARFIELD**: Dixie State Park (S76). **IRON**: Beryl (S76). **KANE**: Glen Cyn City (AC). **MILLARD**: Delta, Lynndyl (S76). **SAN JUAN**: Bluff (S76). **UINTAH**: Dinosaur Nat Mon, Jensen (S76). **WASHINGTON**: Enterprise, Leeds (S76).

Smith (1979:1447) lists this species from midwest to western United States, including Utah, Colorado, Arizona, and Nevada. Snelling (1976:81) designates its habitats as grass,

pinyon-juniper, and creosote bush-tarbrush in irregular crater nests. None of 12 recorded Utah habitats were in montane areas. In 11 recorded elevations between 2750 and 5600 ft, 9 were above 4000.

### *Myrmecocystus semirufus* Emery

*M. melliger* var. *semirufus* Emery, 1893, Zool. Jahrb. Syst. 7:667.

*M. semirufus*: Grundmann 1958:167; Gregg 1963:653.

Records: **BOX ELDER**: Park Valley (City) 31 mi SW (KU). **DUCHESNE**: Dinosaur Nat Mon (Gr63).

Smith (1979:1448) lists this species as extreme western United States, but does not list an intermountain state. Snelling (pers. comm.) believes these Utah records to be misidentifications of *M. kennedyi*, *M. mendax*, or *M. romainei*. Gregg (1963:653) lists *semirufus* from Colorado between 4800 and 5000 ft under rocks and in crater nests in pinyon-juniper and cottonwood-willow habitats, and gives a record for Utah. La Rivers (1968:9) lists it from Nevada. Grundmann (1958:167) states that in Utah it lives in ground burrows surrounded by a sand crater. Snelling (1976:49) indicates its habitats as oakwoods, pinyon-juniper, sagebrush, creosote bush-bur sage, and creosote bush, with craterlike nests at elevations between 4000 and 5000 ft.

### *Myrmecocystus testaceus* Emery

*M. melliger* var. *testaceus* Emery, 1893, Zool. Jahrb. Syst. 7:667.

*M. testaceus*: Beck et al. 1967:71; Snelling 1976:138; Smith 1979:1448.

*M. mojave*: Beck et al. 1967:71.

Records: **BEAVER**: Minersville (BAD). **BOX ELDER**: Lucin (BAD). **CARBON**: Price (BAD). **EMERY**: San Rafael River (BAD). **JUAB**: Callao (BAD). **KANE**: Adairville (BAD). **MILLARD**: Swasey Spngs (S76). **SAN JUAN**: Four Corners, Mexican Water, Montezuma Crk, Red Mesa (BAD). **UINTAH**: Duchesne 3 mi E (S76). **WASHINGTON**: Pine Valley (City) (BAD). **WAYNE**: Pleasant Crk (BAD).

Smith (1979:1448) lists this species from western United States, including Utah, Nevada, and Idaho. Snelling (1976:139) indicates its habitats as sagebrush, pinyon-juniper, and chaparral between 1400 and 6900 ft in craterlike mounds. Four known specific habitats in Utah were in desert areas under 6000 ft.

*Myrmica americana* Weber

*M. sabuleti americana* Weber, Lloydia 2:144; Rees and Grundmann 1940:5; Cole 1942:368.

*M. americana*: Creighton 1950:94; Grundmann 1958:162; Ingham 1959:36; Knowlton 1975:6; Smith 1979:1348.

Records (Map 20): **BOX ELDER**: Cedar Hill (US), Hansel Mts, Kelton Pass (K75), Wildcat Hills (US). **CACHE**: Logan Cyn Summit (KU). **GARFIELD**: Bryce Cyn Nat Park (C42). **KANE**: Long Valley Jct 2 mi W (159). **RICH**: Randolph 2.3 mi N, Sage Crk Jct 5.1 mi W (A). **SALT LAKE**: Big Cottonwood Cyn, Butterfield Cyn (U). **SAN JUAN**: Abajo Mts (G58). **SANPETE**: Orangeville 19.5 mi W (A). **SUMMIT**: Kamas 21 and 26.4 mi E, Wyoming brdr on U150 (A). **UINTAH**: Bonanza 25 mi S (A).

Smith (1979:1348) designates this as a common grassland species more common east of the Rocky Mountains and rare in the west, but known from Utah, Colorado, and Arizona. Gregg (1963:310) lists it between 3500 and 7500 ft under rocks and wood in conifers, pinyon-juniper, oak, mahogany, and grassy areas in Colorado. La Rivers (1968:2) lists it from Nevada. Wheeler and Wheeler (1978:389) found it at elevations as high as 10,400 ft in Nevada, and commonly under rocks in North Dakota (1963). Cole (1942:368) indicates that in Utah it nests under stones. Grundmann (1958:162) designates it as a mountain form from oak-juniper to aspen-fir, nesting under stones in Utah. Ingham (1959) found it under stones in southern Utah. Knowlton (1975:6) found it associated with rabbitbrush in northern Utah.

Fifty-five ants in three collections in Utah were taken from under rocks, one under the same rock with *Lasius crypticus*. One collection was in conifers, one grass, and one juniper and pinyon. In 17 localities 9 were in canyon-montane forest habitats. Five recorded elevations were between 6500 and 7977 ft.

*Myrmica brevispinosa* Wheeler

*M. rubra brevinodis* var. *brevispinosa* Wheeler, 1907, Bull. Wis. Nat. Hist. Soc. 5:74.

*M. brevinodis discontinua*: Beck et al. 1967:71.

Records (Map 20): **CARBON**: Price (U), Scofield (BAD). **EMERY**: Carter Crk nr Green River (U). **RICH**: Laketown (BAD), Woodruff 13.8 and 18.4 mi W (A). **SAN JUAN**: Abajo Mts (U). **TOOELE**: Blue Lakes (30 mi S Wendover), Gold Hill (U). **UINTAH**: Ashley Crk nr Vernal, Paradise Park 11 mi S (U). **WASHINGTON**: Pine Valley (BAD).

Creighton (1950) and Smith (1979:1348) list two races of this species from midwest to western United States, including Colorado, Idaho, and Wyoming, nesting near streams or permanent bodies of water. The Utah race is likely *discontinua*, which may be distinguished by its dark brown color in contrast to the orange yellow color of *brevispinosa*. Gregg (1963:299) lists this species between 4600 and 10,850 ft under rocks and wood in conifers, pinyon-juniper, and cottonwood-willow habitats in Colorado. Wheeler and Wheeler (1963) found it under rocks in North Dakota.

Eighty ants in one collection were taken from under a rock, and one ant from under a log where *Formica gnava* was present. Two collections were in aspen, one in association with grass, sagebrush, and conifers. In 12 recorded Utah habitats 4 were in montane forest. Nine recorded elevations were between 5566 and 8000 ft. Beck et al. (1967:71) found it feeding on dead rodents in three instances in Utah.

*Myrmica emeryana* Wheeler

*M. scabrinodis schenki* var. *emeryana* Wheeler, 1917, Proc. Amer. Acad. Sci. Arts 52:504.

*M. scabrinodis sulcinodoides*: Rees and Grundmann 1940:5.

*M. scabrinodis brevinodis*: Rees and Grundmann 1940:5.

*M. schenecki emeryana*: Cole 1942:368.

*M. scabrinodis mexicana*: Cole 1942:368.

*M. emeryana tahoensis*: Creighton 1950:99; Smith 1979:1349.

*M. emeryana emeryana*: Grundmann 1958:161.

*M. emeryana*: Ingham 1959:36.

Records (Map 21): **BEAVER**: Beaver 5.5 mi E (U). **CACHE**: Franklin Basin, Leeds Cyn, Logan Cyn, Tony Grove Cyn (KU). **GARFIELD**: Aquarius Plateau (G58), Boulder (U), Bryce Cyn Nat Park (RC), Escalante 20 mi E (U). **KANE**: Long Valley Jct 11 mi W (159). **SALT LAKE**: Big Cottonwood Cyn, Butterfield Cyn (U). **SAN JUAN**: Abajo Mts (U). **SUMMIT**: Soapstone Ranger Sta (U). **UINTAH**: Ashley Crk nr Vernal (U). **UTAH**: Aspen Grove (BY), Halls Fk rd 5.2 mi N Hobbie Crk rd (A), Leki (? = Lehi) (C42), Mt Timpanogos (BY).

Creighton (1950) and Smith (1979) designate two races of this species occurring at high elevations in the mountains of western United States, including Utah, Arizona, Nevada, and Wyoming. The subspecies *tahoensis* may be separated from *emeryana* by the lamina of the antennal scape, which is small and diagonally transverse on *emeryana*,

but is a prominent median flange on *ta-hoensis*. Gregg (1963:312) lists this species from Colorado between 5800 and 9713 ft under rocks in conifers, oak, manzanita, and pinyon-juniper areas. Cole (1966:3) states that in southern Nevada it is found under stones in pinyon-juniper. Wheeler and Wheeler (1978:389) found it at 9000 and 10,400 ft in Nevada and commonly in wood and under rocks in North Dakota (1963). Grundmann (1958:161) states that it is a mountain form in Utah, generally associated with aspen-fir above 5000 ft, and making nests under stones. Ingham (1959) found it under stones in grass in southern Utah.

One ant was collected under a rock in a meadow of grass, sedges, and herbs. Other ants under the same rock were *Formica fusca*, *F. gnava*, and *Myrmica monticola*. In 18 of 19 collections in Utah it was taken in canyon-montane forest. The 12 recorded elevations varied between 4562 and 8000 ft, 9 above 7000.

### *Myrmica hamulata* Weber

*M. sabuleti hamulata* Weber, 1939, Lloydia 2:146.

*M. hamulata*: Creighton 1950:99.

*M. hamulata hamulata*: Smith 1979:1349.

Record: GARFIELD: Rubys Inn (US).

Creighton (1950) and Smith (1979:1349) list two forms of this species from midwest and western United States, including Utah, Colorado, and Arizona, nesting in upland plateaus between 7000 and 8000 ft. The Utah form is likely *hamulata*. Gregg (1963:300) lists this species between 8000 and 8700 ft in conifers, oak, and manzanita in Colorado.

### *Myrmica incompleta* Provancher

*M. incompleta* Provancher, 1881, Nat. Canad. 12:359; Smith 1979:1349.

*M. rubra brevinodis* var. *sulcinodoides*: Rees and Grundmann 1940:5.

*M. rubra brevinodis*: Rees and Grundmann 1940:5.

*M. brevinodis sulcinodoides*: Cole 1942:368.

*M. brevinodis*: Cole 1942:368; Creighton 1950:95; Ingham 1959:36; Knowlton 1970:211, 1975:6.

*M. incompleta incompleta*: Smith 1979:1349.

Records (Map 21): BOX ELDER: Kelton (K75) and 6 mi N (K70), Tremonton (KU). CACHE: Blacksmith Fk Cyn, Elk Valley, W Hodges Cyn (KU), Logan (C42), Logan Cyn (KU), Riverheights (RG), Tony Grove Cyn (KU). CARBON: Scofield (BAD). RICH: Garden City (KU), Laketown (BAD), Pickleville (KU). SALT LAKE: Big

Cottonwood Cyn, Salt Lake City (RG). SUMMIT: Woodland (C42). UINTAH: Ashley Crk nr Vernal (U). UTAH: Provo (BY). WASATCH: Deer Crk Res, Heber (U). WASHINGTON: Pine Valley (City) (BAD). WAYNE: Bicknell (U). WEBER: Beaver Crk head of, Monte Cristo 8 mi S, Roy 2 mi S (KU). COUNTY UNKNOWN: Beaver Head (KU).

Creighton (1950, as *M. brevinodis*) and Smith (1979:1349) list two races of this species, only one occurring in eastern to western United States, including Utah and Colorado, nesting under various objects through a wide elevational range. The Utah subspecies is likely *sulcinodoides*. Hunt and Snelling (1975:21) list this species from Arizona. Gregg (1963) lists it between 4600 and 10,500 ft under logs and rocks in juniper, mahogany, coniferous forest, grass, and other areas in Colorado. La Rivers (1968:2) lists it from Nevada, where Wheeler and Wheeler (1978:389) found it between 6400 and 9700 ft. Cole (1942:368) indicates its habitat in Utah as under stones, and Ingham (1959) found it under stones in southern Utah.

In 27 recorded Utah localities it was found 11 times in montane areas. In 19 recorded elevations it was about equally distributed between 4225 and 7675 ft.

### *Myrmica lobicornis* Emery

*M. rubra scabrinodis* var. *fracticornis* Emery, 1895, Zool. Jahrb. Syst. 8:313.

*M. scabrinodis lobicornis* var. *fracticornis*: Rees and Grundmann 1940:5.

*M. lobicornis fracticornis*: Cole 1942:368; Beck et al. 1967:71; Smith 1979:1349.

*M. lobicornis lobifrons*: Creighton 1950:100; Ingham 1959:37; Knowlton 1975:6; Smith 1979:1350.

*M. lobifrons*: Knowlton 1970:211.

Records (Map 21): BOX ELDER: Snowville (K70). CACHE: Franklin Basin, Logan Cyn summit, Tony Grove Cyn (KU). DAGGETT: Radosovich Ranch (BAD). DUCHESNE: Fruitland (U), Neola (C42). GARFIELD: Boulder Mt (U). IRON: Cedar Breaks Nat Mon (159). KANE: Adairville (BAD), Long Valley Jct 11 mi W (159). RICH: Laketown (BAD). SALT LAKE: Alta, Big Cottonwood Cyn S fk (C42), Brighton, Butterfield Cyn, Red Butte Cyn (U). SANPETE: Bluebell Flats, Ephraim Cyn (KU), Wales (RG). SUMMIT: Camas (? = Kamas) (C42) and 21 mi E (A), Henrys Fk Basin (RG), Soapstone Cyn (RG). TOOELE: S Willow Cyn (U). UINTAH: Whiterocks Cyn (KU). UTAH: American Fk Cyn (U), Colton (BAD). WASATCH: Currant Crk (BAD), Deer Crk Res. (U). WASHINGTON: Pine Valley (City) (BAD).

Creighton (1950) and Smith (1979) list two subspecies from eastern to western United States, including Utah, Colorado, and Arizona, nesting under stones or wood near

streams, where they are associated with *Lep-tothorax provancheri*. Records of both are reported from Utah. They may be separated by the antennal lamina, which encircles the bend of the scape in the form of a saucerlike flange on *lobifrons* but forms an angular toothlike projection on the inner side of the bend on *fracticornis*. Gregg (1963:303) lists this species between 6240 and 12,500 ft under rocks and logs in conifers, oak, manzanita, birch, pinyon-juniper, sagebrush, and mahogany habitats in Colorado. La Rivers (1968:2) lists it from Nevada, where Wheeler and Wheeler (1978:389) found it between 6400 and 10,800 ft. They found it frequently in wood, and also commonly under rocks in North Dakota (1963). Allred and Cole (1971:239) found it in Idaho in association with a variety of shrub types. Cole (1942:368) indicates that it nests under stones and in logs in Utah. Ingham (1959) found it under stones or wood in coniferous forests in southern Utah. Knowlton (1975:6) found it associated with rabbitbrush in northern Utah.

Twenty ants in one collection were taken from under a rock in conifers. In 31 reported Utah habitats it was taken 21 times from montane areas. In 19 recorded elevations between 4544 and 10,500 ft it was about equally distributed, taken once under 5000 and three times over 9000. Beck et al. (1967:71) found it feeding on dead rodents in six instances in Utah.

### *Myrmica monticola* Wheeler

*M. scabrinodis schenki* var. *monticola* Wheeler, 1917, Proc. Amer. Acad. Arts Sci. Boston 52:505.

*M. scabrinodis*: Hayward 1945:120.

*M. monticola*: Knowlton 1970:211, 1975:7.

Records (Map 21): **BOX ELDER**: Cedar Crk (City) (K70), Cedar Hill (K75), Curlew Valley (KU), Hardup (K75), Kelton, Kelton Pass, Snowville (K70), Wildcat Hills (K75). **GRAND**: Moab 10 mi SE (KU). **SAN JUAN**: Pack Crk (US). **SANPETE**: Majors Flat (KU). **UTAH**: Halls Fk rd 5.2 mi N Hobbler Crk rd (A). **COUNTY UNKNOWN**: locality given as "Mt Timpanogos or Uinta Mts" (H).

Smith (1979:1350) lists this species from eastern to western United States, including Colorado, nesting under objects in woodlands. Gregg (1963:309) lists it between 6000 and 8600 ft under rocks and logs in conifers, oak, pinyon-juniper, birch, and grass habitats in Colorado. Wheeler and Wheeler (1963)

found it frequently in and under wood in North Dakota. Knowlton (1975:7) found it associated with sagebrush, grass, and junipers in northern Utah.

One ant was collected from under a rock in a meadow association of grass, herbs, and sagebrush. Other ants under the same rock were *M. emeryana*, *Formica fusca*, and *F. gnava*. In 13 recorded Utah habitats it was taken only twice in montane forest. Two recorded elevations were 4225 and 4544 ft.

### *Neivamyrmex californicus* (Mayr)

*Eciton californicum*: Mayr, 1870, Verh. Zool.-Bot. Ges. 20:969.

*Eciton* sp.: Cole 1942:360; Ingham 1963:40.

*N. californicus*: Smith 1979:1330.

Records: "MILFORD CO" (C42) (? = Milford in Beaver Co). **IRON**: Modena (I63).

Smith (1979:1330) lists this species from western United States, including Utah and Nevada. Ingham (1963) found it in sagebrush in southern Utah. One recorded elevation in Utah was 5468 ft.

### *Paratrechina parvula* (Mayr)

*Prenolepis parvula* Mayr, 1870, Zool.-Bot. Ges. Wien, Verh. 20:947.

*Paratrechina* sp.: Beck et al. 1967:72.

*Paratrechina parvula*: Smith 1979:1444.

Records: **DUCHESNE**: Tabiona 11.6 mi E (A). **SAN JUAN**: Four Corners, Mexican Water (BAD).

This is tentatively listed as *parvula*. Smith (1979:1444) lists it from eastern to western United States, including Utah and Arizona, nesting under stones and logs or in small craters in open grassy areas.

Sixteen ants in one collection in Utah were taken from under a rock in sagebrush. Beck et al. (1967:72) found it feeding on dead rodents in two instances in Utah.

### *Pheidole bicarinata* Forel

*P. bicarinata* race *vinelandica* Forel, 1886, Ann. Soc. Ent. Belg. 30:45; Ingham 1963:78.

*P. bicarinata buccalis*: Creighton 1950:171; Grundmann 1958:163.

*P. bicarinata*: Ingham 1959:50; Beck et al. 1967:72.

*P. longula*: Ingham 1963:77.

*P. bicarinata paiute*: Allred and Cole 1979:98.

*P. bicarinata vinelandica*: Smith 1979:1367.

Records (Map 22): **BEAVER**: Frisco (BAD). **BOX ELDER**: Lucin (BAD). **CARBON**: Wellington 10 mi NE (A). **DUCHESNE**: Roosevelt (BAD). **GRAND**: Dewey

Bridge, Moab (G58). **KANE:** Adairville, Cottonwood Crk (BAD), Glen Cyn City (AC), Navajo Wells (BAD). **MILLARD:** Desert Range Exp Sta (BAD). **SAN JUAN:** Abajo Mts (U), Four Corners (BAD), La Sal Jct 1.6 and 23.1 mi S (A), Montezuma Crk (BAD). **UINTAH:** Jensen (BAD). **WASHINGTON:** Diamond Valley, Grafton (BAD), Pintura (I59), Rockville, nr Short Crk (Arizona) (BAD), Snow Cyn (I63), Springdale (I59), Timpoweap Cyn (I63), Toquerville (BAD), Zion Nat Park (I59).

Creighton (1950) and Smith (1979) list four races of this species primarily as eastern and central United States, occurring in Colorado, Utah, Arizona, Nevada, and Wyoming, nesting in logs, exposed soil, or under objects in grassy areas. The subspecies may be separated by the following key.

- 1. Basal face of epinotum in the major largely covered with transverse striae ..... *bicarinata*
- Basal face of epinotum in the major largely punctate ..... 2
- 2(1). Epinotum of minor with angular teeth, broad at the base and not resembling spines ..... *longula*
- Epinotum with thick, short spines ..... 3
- 3(2). Color of major reddish to blackish brown, minor dull yellow to blackish brown ..... *pauite*
- Color of major clear yellow to yellowish brown, minor clear yellow ..... *vinelandica*

Gregg (1963:408) lists it in Colorado between 3500 and 6970 ft under rocks and logs in a variety of habitats. Cole (1966:15) found it in southern Nevada under stones in various types of desert brush. Wheeler and Wheeler (1963) found it about equally under rocks and wood in North Dakota. Ingham (1959, 1963) found it in southern Utah under stones or in roots of oak and rabbitbrush, or in craterlike mounds in open areas in a variety of vegetative types. Allred and Cole (1979:99) found it in southern Utah in a wide variety of desert shrub types, abundantly in sagebrush.

Twenty ants in one collection were taken from a small mound, 50 in one collection from under a rock, and one singly in an open area. Three collections were taken in sagebrush: one in association with grass, one pinyon, and one juniper and pinyon. Only one of 27 localities in Utah was in a montane forest. Of 23 recorded elevations between 2500 and 7500 ft, 20 were between 3000 and 6000. Beck et al. (1967:72) found it feeding on dead rodents in 19 instances in Utah.

*Pheidole californica* Mayr

*P. californica* Mayr, 1870, Verh. Zool. Bot. Ges. Wien 20:987; Rees and Grundmann 1940:4; Cole 1942:362; Grundmann 1958:163.

*P. californica oregonica*: Cole 1942:362; Ingham 1959:52.

Records (Map 22): **GRAND:** Moab (C42). **KANE:** Kanab (C42). **SALT LAKE:** Big Cottonwood Cyn (U), Ft Douglas (C42), Mt Olympus (U), Salt Lake City (RG). **SAN JUAN:** Abajo Mts (G58), La Sal (C42). **TOOELE:** Clover, Fisher Pass (C42). **UTAH:** Ironton (C42).

Creighton (1950) lists five and Smith (1979:1368) three races of this species from western United States, including Idaho, Arizona, and Nevada. The two races recorded for Utah may be separated by the occipital rugae of the major, which are coarse and wavy on *californica* and fine and essentially straight on *oregonica*. Cole (1942:362) indicates the habitat of this species in Utah as under stones in dry grassy areas. Grundmann (1958:163) indicates that in Utah it nests under stones or in soil around roots, generally in grass habitats. Ingham (1959, 1963: found it in dry sandy soil in sagebrush in southern Utah. Only 3 of 11 localities in Utah were in montane forest. Twelve recorded elevations ranged from 4042 to 7125 ft, 11 under 6000.

*Pheidole ceres* Wheeler

*P. ceres* Wheeler, 1904, Bull. Amer. Mus. Nat. Hist. 20:10; Grundmann 1958:163; Beck et al. 1967:72.

Records: **KANE:** Kanab (G58). **SUMMIT:** Echo (BAD).

Smith (1979:1368) lists this species as southwestern United States, including Colorado and Arizona, nesting under stones in dry, sunny localities between 5000 and 9000 ft. Gregg (1963:413) lists it from Colorado between 5947 and 8500 ft under rocks in a variety of habitats, predominantly pinyon-juniper. In Utah it prefers plateaus between 5000 and 8000 ft and nests under stones in desert conditions (Grundmann 1958:163). Two recorded collections in Utah were at



4973 and 5467 ft. Beck et al. (1967:72) found it feeding on dead rodents in one instance in Utah.

### *Pheidole dentata* Mayr

*P. morrissi* var. *dentata* Mayr, 1886, Verh. Zool.-Bot. Ges. Wien 36:457.

*P. dentata*: Beck et al. 1967:72.

Records: **GRAND**: Dewey (U). **WASHINGTON**: Toquerville (BAD).

Smith (1979:1369) lists this species from eastern to midwestern United States (no intermountain state is listed), where it nests in soil mounds or under various objects. Beck et al. (1967:72) found it feeding on dead rodents in one instance in Utah.

### *Pheidole desertorum* Wheeler

*P. desertorum* Wheeler, 1906, Bull. Amer. Mus. Nat. Hist. 22:337; Cole 1942:362; Grundmann 1958:163; Ingham 1959:52; Smith 1979:1369.

Records (Map 22): **GRAND**: Moab (U). **UINTAH**: Red Cloud Loop rd 9.2 mi W U44 (A). **WASATCH**: Hanna 4.4 mi W (A). **WASHINGTON**: Castle Cliff (C42), Virgin City (159).

Smith (1979:1369) lists this as a western species, including Utah, Arizona, and Nevada, nesting under stones and in small crater mounds. Cole (1966:15) found it in southern Nevada under large stones in various habitats of desert shrubs. Grundmann (1958:163) indicates that in Utah it lives under stones in desert habitats under 4500 ft. Ingham (1959, 1963) found it under rocks in blackbrush, yucca, mesquite, and four-wing saltbush in southern Utah.

Seventy-three ants in two collections were found under rocks, once under the same rock with *Fornica argentea* and *F. pallidefulva*. One collection was taken in a grassy meadow. In five recorded Utah localities two were in canyon-montane forest. Recorded elevations range between 2500 and 4000 ft.

### *Pheidole grundmanni* M.R. Smith

*P. grundmanni* Smith, 1953, J. New York Ent. Soc. 61:144; Smith 1979:1370.

Record: **UINTAH**: Merkeley Park on Ashlet Crk (Sm53) (? = Ashley Crk).

Smith (1979:1370) lists this species only from Utah. It was taken from under a stone in cottonwoods at 6000 ft (Smith 1953:144).

### *Pheidole hyatti* Emery

*P. hyatti* Emery, 1895, Zool. Jahrb. Syst. 8:289; Ingham 1959:53; Beck et al. 1967:72.

Records: **IRON**: New Harmony (159). **KANE**: Adairville (BAD). **WASHINGTON**: Grafton, Rockville (BAD).

Creighton (1950) and Smith (1979:1370) list two forms of this species from midwest to western United States, including Colorado and Nevada. The Utah form is likely *hyatti*. Hunt and Snelling (1975:21) list it from Arizona. Gregg (1963:419) lists it between 5500 and 5900 ft under rocks in grassy habitats in Colorado. Ingham (1959) found it under rocks in oak, pinyon-juniper, rabbitbrush, and sagebrush in southern Utah.

None of four recorded Utah habitats were in montane areas. Four recorded elevations were between 3660 and 6000 ft. Beck et al. (1967:72) found it feeding on dead rodents in three instances in Utah.

### *Pheidole pilifera* Cole

*P. pilifera artemisia* Cole, 1933, Ann. Ent. Soc. Amer. 26:616; Rees and Grundmann 1940:4; Cole 1942:362; Creighton 1950:187; Ingham 1959:53; Smith 1979:1372.

Records (Map 22): **EMERY**: Hideout Cyn nr Green River (U). **GARFIELD**: Boulder (U). **SALT LAKE**: Big Cottonwood Cyn (U). **SEVIER**: Salina Cyn nr Fremont Jet (U). **UINTAH**: Gusher (C42). **UTAH**: Payson (C42), Provo (RG), Provo Cyn (U), Wanrhodes Cyn (KU). **WASHINGTON**: Springdale (C42).

Creighton (1950) and Smith (1979:1372) list four races of this species from eastern to western United States, including Utah, Colorado, Arizona, and Nevada, nesting under stones or in craterlike excavations in open areas where they are associated with *P. inquilina*. The two subspecies that likely occur in Utah may be separated by the surface of the occiput of the major, which has prominent rugae on *artemisia*, whereas on *coloradensis* the surface is finely and contiguously punctate. Gregg (1963:422) lists this species from Colorado between 5100 and 8500 ft under rocks in a variety of habitats, predominantly in pinyon-juniper. Cole (1966:15) found it in southern Nevada under large stones in pinyon-juniper. He indicates its habitat in Utah as sagebrush (1942:362). Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota. Ingham (1959) found it under rocks in sagebrush in southern Utah. In 10 recorded Utah habitats it was taken 3

times in montane forest. In 11 recorded elevations it was about equally distributed between 3900 and 7000 ft, twice over 7000.

### *Pheidole sitarches* Wheeler

*P. soritis* Wheeler, 1908, Bull. Amer. Mus. Nat. Hist. 24:439.

*P. sitarches soritis*: Creighton 1950:190; Cole 1956:116; Ingham 1959:53; Allred and Cole 1979:99; Smith 1979:1373.

Records (Map 23): **KANE**: Glen Cyn City (AC). **UTAH**: Dry Fk rd 13.4 mi N U121 (A). **UTAH**: Provo (C56). **WASATCH**: Hanna 9.2 mi W (A). **WASHINGTON**: nr Short Crk (Arizona) (I59). **COUNTY UNKNOWN**: Skull Valley (? probably Tooele Co) (C56).

Creighton (1950) lists three and Smith (1979:1373) four races of this species from eastern to western United States, including Utah, Colorado, and Arizona. The Utah subspecies is likely *soritis*, which may be separated from the close Colorado form by the head of the minor, which is striate posteriorly on *soritis* but punctate on *campestris*. Gregg (1963:424) lists this species between 3500 and 4400 ft under rocks in cottonwood-willow and grassy habitats in Colorado. Ingham (1959, 1963) found it in low mounds in bur sage, little rabbitbrush, junipers, and sagebrush in southern Utah. Allred and Cole (1979:99) found it in southern Utah in a variety of desert shrub types, most frequently in ephedra-grass.

Sixty ants in two collections were found under rocks. One was in sagebrush and one was in sagebrush in association with snowberry. In six recorded Utah habitats it was taken twice from montane forest. Three recorded elevations were between 3250 and 5000 ft.

### *Pheidole virago* Wheeler

*P. virago* Wheeler, 1915, Amer. Mus. Nat. Hist., Bull. 34:401; Ingham 1959:54.

Record: **WASHINGTON**: between Hurricane and Harrisburg Jet (I59).

Smith (1979:1374) lists this species from Texas and Arizona. Ingham (1959, 1963) found it in southern Utah in small crater mounds in creosote bush, bur sage, little rabbitbrush, cholla, marigold, and Russian thistle. In two recorded Utah collections it was taken at 2900 and 3000 ft.

### *Pogonomyrmex barbatus* (M.R. Smith)

*Myrmica barbata* Smith, 1858, Cat. Hym. Brit. Mus. 6:130.

*P. barbatus molefaciens*: Olsen 1934:501; Rees and Grundmann 1940:4; Cole 1942:367.

*P. barbatus marfensis*: Rees and Grundmann 1940:4; Cole 1942:367.

*P. barbatus fuscatus*: Rees and Grundmann 1940:4; Cole 1942:367.

Records: **EMERY**: Goblin Valley 10 mi E (KU). **WASHINGTON**: St George (O). **WAYNE**: Fruita 5 mi SE (U).

Smith (1979:1353) lists the distribution of this species as eastern United States westward to include Colorado, Arizona, and Nevada, nesting in low to high craterlike mounds. Grundmann (1958:162) designated it as a southern Utah and northern Arizona desert form, nesting in low craterlike mounds in sandy soil. Cole (1968:56) believes that the St. George (Washington County) record for Utah listed by Olsen (1934) may represent a sparse population of short duration. Cole's distribution map (p. 57) shows it considerably east and south of Utah.

### *Pogonomyrmex brevispinosus* Cole

*P. brevispinosus* Cole, 1968, Univ. Tenn. Press, p. 89.

Record: **KANE**: Wahweap (KU).

Smith (1979:1354) lists this species from western United States, including Nevada, nesting in low crater mounds. Its occurrence in Utah is questionable.

### *Pogonomyrmex californicus* (Buckley)

*Myrmica californica* Buckley, 1867, Proc. Ent. Soc. Phila. 6:336.

*P. californicus*: Olsen 1934:502; Rees and Grundmann 1940:5; Cole 1942:367, 1968:120; Creighton 1950:123; Grundmann 1958:162; Ingham 1959:41; Smith 1979:1356.

Records (Map 23): **KANE**: Glen Cyn Res, Kanab (G58). **SAN JUAN**: Hole-in-the-Rock Cyn (U). **WASHINGTON**: Beaver Dam Wash (I59), Hurricane (RG), between Hurricane and Harrisburg Jet (I59), Leeds, Leeds Cyn (KU), Santa Clara (US), Santa Clara Crk (KU), Shivwits Indian Res (I59), Snow Cyn (KU), St George (O), Veyo (I59), Virgin, Washington (KU).

Smith (1979:1356) indicates the range of this species as primarily southwestern United States, including Arizona and Nevada, in circular or semicircular craters of loose sand. Cole (1966:4) states that in southern Nevada its nests are craterlike, occurring principally in hopsage-matrimony vine and Russian

thistle habitats. He (1968:121) shows it in extreme southern parts of Utah essentially west of the Colorado River and in much of Arizona and Nevada. Grundmann (1958:162) designates its distribution in Utah as below 4000 ft, basically a Lower Sonoran form. Ingham (1959) indicates its habitat in southern Utah as conical mounds in creosote bush, sagebrush, and juniper. None of its Utah collections were in canyon-montane areas. In 16 recorded elevations it was between 2500 and 4973 ft, 9 under 3000.

### *Pogonomymex imberbiculus* Wheeler

*P. imberbiculus* Wheeler, 1902, Amer. Nat. 36:87; Ingham 1959:46; Allred and Cole 1979:99.

Records: KANE: Glen Cyn City (AC). WASHINGTON: Hurricane (I59).

Smith (1979:1357) lists this species from midwest to western United States, including Colorado, Arizona, and Nevada, nesting under stones or in small craters in open areas. Gregg (1963:336) lists it at 4800 ft in saltbush habitats in Colorado. Cole (1968:168) shows it in isolated collections in southeastern Nevada and Arizona only in the extreme southeastern corner. He states that in southern Nevada it nests under stones in hopsage and matrimony vine (1966:6). Ingham (1959, 1963) designates its habitat in southern Utah as soil without mounds in creosote bush, blackbrush, yucca, cholla cactus, and bur sage. Allred and Cole (1979:99) found it in a saltbush-sagebrush association in southern Utah. Three Utah collections were between 3250 and 3500 ft.

### *Pogonomymex maricopa* Wheeler

*P. californicus maricopa* Wheeler, 1914, Psyche 21:155.

*P. maricopa*: Ingham 1963:47; Cole 1968:138; Smith 1979:1356.

Records (Map 23): JUAB: Chicken Crk Res (KU). MILLARD: Sutherland (US). WASHINGTON: Hurricane (BY), Leeds, Leeds Cyn (US), Santa Clara (KU), St George (BY), Washington (KU).

Smith (1979:1356) lists this species from western United States, including Utah, Colorado, Arizona, and Nevada, nesting in crater-like mounds. Gregg (1963:327) lists it at 4600 ft in weedy areas in Colorado. Cole (1968:139) shows it across extreme southern Utah extending northward along the Colorado River drainage and southward into

much of Arizona, as well as southwestern Nevada. Ingham (1959, 1963) found it in sand sagebrush and little rabbitbrush in southern Utah.

Eight recorded Utah habitats were in desert areas between 2500 and 5000 ft, mostly at lower elevations. Its occurrence in Juab and Millard counties is questionable; such records likely are *occidentalis*.

### *Pogonomymex occidentalis* (Cresson)

*Myrmica occidentalis* Cresson, 1865, Proc. Ent. Soc. Phila. 4:426.

*P. occidentalis*: Olsen 1934:507, 509; Rees and Grundmann 1940:5; Cole 1942:365; 1968:94; Beck et al. 1967:72; Knowlton 1970:211, 1975:7; Allred and Cole 1979:99; Smith 1979:1355.

*P. occidentalis utahensis*: Olsen 1934:509; Cole 1942:365.

*P. occidentalis comanche*: Creighton 1950:128; Grundmann 1958:162; Ingham 1959:44.

*P. occidentalis occidentalis*: Grundmann 1958:162.

Records (Map 24): BEAVER: Beaver (RC), Lund 35 and 49 mi N, Milford 1.3 mi N, and 11.5 and 26.7 mi W (A), Wildcat Cyn (C42). BOX ELDER: Blue Crk (City), Bovine (C42), Brigham (O) and 0.9 mi E (A), Collinston (C42), Corinne (US) and 6.1 and 16.1 mi W, Deweyville 0.3 mi N (A), Garland, Hansel (US), Hansel Mts (K70), Hardup, Howell (C42), Kelton 17.2 and 28.5 mi SW (A), Lampo (US), Locomotive Spngs, Lucin (C42), Promontory 1.3 and 10.3 mi W (A), Promontory Pt (C42), Snowville (O) and 7.7, 19.1 and 30.7 mi S (A), Thicket (KU), Wendover 28 mi N (A), Willard (C42) and 1.5 mi S (A). CACHE: Blacksmith Fk Cyn (KU), Cache Jet (C42), Cornish (KU), Cove (C42), Leeds Cyn (KU), Logan (C42), Logan Cyn (KU), Mendon, Providence (C42), Smithfield 0.5 mi N (A), Mt Sterling (C42). CARBON: Argyle Cyn, Kenilworth (U), Myton rd 5 and 22.7 mi E US6, Price 2.2 mi S (A) and 20 mi S (WU), Wellington 5 mi S, and 5 and 10 mi NE (A). DAGGETT: Radosovich Ranch (BAD). DAVIS: Farmington (C42), Kaysville (O), Layton 1.5 mi S (A). DUCHESNE: Blue Bench, Currant Crk (C42), Duchesne 5.3 mi E, 2 mi N (A) and 11 mi W (WU), Hanna 1.5 mi W, Myton rd 33.5 mi E US6, Neola 6.2 mi S, Tabiona 11.6 mi E, Wellington rd 7.2, 17.3 and 27.4 mi S US40 (A). EMERY: Buckhorn Res (BY), Emery 4.5 mi N and 4.9 mi S, Ferron 1.4 mi N (A), Goblin Valley and 10 mi E (KU), Green River (C42), Hanksville 16 mi N (KU), Hideout Cyn nr Green River (U), Huntington (US) and 1.7 mi S, Orangeville 3 mi W, Wellington 15, 26, 36 and 46 mi S (A). GARFIELD: Antimony 5.8 and 27.6 mi S (A), Boulder Mts, Carcass Crk (on Boulder Mt) (U), Bryce Cyn Nat Park (US), Escalante 20 mi S and 20 mi E (U), Henry Mts (G58), Hanksville 26.6 mi S (A), Osiris (U), Rubys Inn (US), Tropic 3.3 mi E, Jet U12 and U63 0.5 mi E (A). GRAND: Arches Nat Park, Cisco (BY) and 1.5 mi E, Crescent Jet 5 and 18.8 mi S, and 6, 37 and 47 mi E (A), Dewey (U), Green River 5 and 16 mi E (A), Moab (G58) and 1.5 mi S (A), Thompson (C42). IRON: Beryl 1 mi NE (A), Cedar City (RAU), 3.7 mi E, and 6.3, 16.8 and 27 mi W (A), Columbia Iron Mine 7 mi W (I59), Enoch (RAU), Iron Mt (US), Little Pinto

(KU) and 3 mi NE (US), Lund 8.6 and 19 mi N, Modena 5.3 and 8.7 mi W, and 10.4 and 25 mi NE, Newcastle 7.2 and 17.2 mi W (A). **JUAB:** Callao 7.8 mi E, Eureka 0.5 mi E and 3.7 mi S (A), Fish Spngs (BY), 0.8 mi N, and 1, 10.6, 20.8 and 30.8 mi E, Gandy 10.1 mi N (A), Indian Farm Cyn (in Deep Crk Mts) (U), Jericho (BY), Levan 6.9 mi N and 10 mi S, Lynndyl 11.5 and 21.5 mi N, Nephi 3 mi N, and 5.5, 12.1 and 23 mi W (A), Pony Express Sta (US), Tintic (C42), Topaz Mt and 5 mi NW (US), Trout Crk (City) 2.8 mi N (A). **KANE:** Adairville (BAD), Cannonville 8.7, 31.3 and 41 mi S (A), Escalante River (BY), Glen Cyn City (AC), Johnson Cyn (BY), Kanab (O), 4-7 mi N (159), 4 mi E (KU), and 5, 20.4, 31 and 41 mi E (A), Long Valley Jet 2 mi W (159) and 0.5 mi S, Mt Carmel Jct, Orderville 2 mi N (A), Paria (BY), Wahweep Cmpgnd (US). **MILLARD:** Black Rock (KU), Delta (BY) and 0.5 mi W (A), Deseret (US), 3 mi S (KU) and 30 mi S (US), Fillmore (C42), Hinckley 4.8, 14.7, 24.9, 35, 45, 58.1 and 69.6 mi W (A), Holden, Kanosh (US), Lynndyl 2 mi S (A), Meadow (C42), Milford 16.3, 31.5, 46.3 and 61.3 mi N (A). **PIUTE:** Antimony 4.8 mi N (A), Grass Valley (KU), Kingston (A), Marysvale (BY) and 4.1 mi S (A). **RICH:** Garden City 1.6 mi N, Randolph 2.3 and 5.3 mi N, Woodruff and 4 mi W (A). **SALT LAKE:** Big Cottonwood Cyn, Ft Douglas, Granite, Point-of-Mt (C42), Riverton 2.6 mi S (A), Salt Lake City (C42), Sandy (O). **SAN JUAN:** Abajo Mts (G58), Blanding 6.7 mi N (A) and 8 mi N (U), Blue Crk, Bluff (C42) and 0.6 and 11.6 mi S (A), Jct Colorado and San Juan rivers (U), La Sal, La Sal Jct (RG) and 1.6, 11.7 and 23.1 mi S, Mexican Hat 8.2 mi S, Moab 12 mi S, Monticello 0.5 mi N, Jet U95 and U261 7.7 mi W, Jct U261 and US163 9.4, 19.6 and 29.9 mi N (A), Squaw Flat Cmpgnd (in Canyonlands Nat Park) (WU). **SANPETE:** Ephraim and 3 mi N (A), Ephraim Cyn (U), Fairview (BY) and 16.5 mi N, Freedom 0.5 mi N, Gunnison (A), Indianola (BY), Levan 20 mi S (A), Majors Flats (KU), Mt Pleasant (C42) and 0.5 mi N, Nebo Loop rd 6.3 mi E Jct U11 (A), Wales (RG). **SEVIER:** Axtel 4 mi S, Big Rock Candy Mt (A), Elsinore (C42), Fremont 18.9 and 28.6 mi N, Richfield 2.3 and 7.5 mi S (A). **SUMMIT:** Coalville (U), Francis 1 mi E, Wyoming brdr 1.5 and 10.4 mi W on I80 (A). **TOOELE:** Clover 1 mi W (A), Delle (O) and 2, 12 and 22 mi W (A), Dugway (BY) and 5 and 10 mi E, Faust 1.5 mi W and 3.6 mi E (A), Grantsville (O) and 2 and 12.1 mi W (A), Iosepa (C42), Johnson Pass (US), Little Valley (C42), Lookout Pass (BY), Low, Orrs Ranch (C42), Rowley Jct 0.5, 10.8, 21 and 31 mi S, Simpson Spngs 4 and 14 mi E (A), Stansbury Island (C42), Tooele (O), 1 mi S and 3.3 mi W, Jct U36 and U73, Vernon, Wendover 10.3, 13.3, 14.5 and 23.1 mi N (A), S Willow Cyn (U). **UINTAH:** Bonanza 3 mi S (KU), 8 and 21 mi S, and 5 and 15 mi N, Dry Fk rd 9.4 mi N U121 (A), Ft Duchesne (C42), Gusher 4 mi E (KU), Jensen 5.5 mi W and 7.5 mi E, Lapoint 1 and 10.7 mi E (A), Ouray (C42), Split Mt, Vernal (BY), 6 mi E (KU) and 5 and 10 mi N (A). **UTAH:** Cedar Fort (U) and 1.9 mi N (A), Elberta (C42) and 1 mi W, Fairfield 3.3 mi W (A), Lehi (O) and 4.4 mi W (A), Orem, Provo, Provo Cyn (BY), Santaquin (C42), 1.5 mi N, 1.5 mi W and 0.5 mi S, Springville 2 mi S, Thistle 2.7, 3.6, 7.7, 9 and 14.6 mi E (A), W Utah Lake (BY). **WASATCH:** Francis 5.4 mi W, Hanna 4.4 mi W (A), Heber (U) and 2.3 mi W (A), Soapstone Cyn (U). **WASHINGTON:** Grafton (159), Hurricane (RAU), Leeds (RG),

Mt Meadow, New Harmony (BY), Pine Valley (City) (159), Pinto, 3 mi S (US) and 5 mi S (KU), Rockville, Santa Clara (159), Springdale (C42), St George (RG), Virgin, Zion Nat Park (O). **WAYNE:** Capitol Reef Nat Park, Fruita 5 mi SE (U), Hanksville 3, 17.4 and 27.2 mi W, and 7 and 16.7 mi S, Torrey 3.7 mi E and 5.3 mi W (A). **WEBER:** Little Mt (C42), Ogden (O), Ogden Cyn (BY), Riverdale (C42), Jct U39 and U166 3.3 mi E, Woodruff 34.8 mi W (A). **COUNTY UNKNOWN:** Brush Crk (RG) (prob Uintah Co), Westville (C42) (prob Wellsville in Cache Co).

Smith (1979:1355) indicates this species as a western one, including Utah, Colorado, Arizona, Nevada, Idaho, and Wyoming. Gregg (1963:331) lists it from Colorado between 3500 and 9000 ft in a variety of habitats, predominantly in pinyon-juniper, sagebrush, and grass. Ingham (1959, 1963) indicates its habitat in southern Utah as a variety of shrub types. Allred and Cole (1979:99) found it in southern Utah in a wide variety of desert shrub types, most frequently in grass-hopsage and ephedra-grass-blackbrush-hopsage associations. Rees and Grundmann (1940:5), Cole (1942:365), and Grundmann (1958:162) list it from a variety of situations in Utah.

Thirty-two hundred ants in 211 collections were taken from 87 different plant types or associations. Eighty-one collections were taken in sagebrush or sage associations. Fifty-two collections were in grass or grass associations other than with sagebrush. Twelve collections were from pure stands of greasewood, and 10 collections from greasewood with other plants except sagebrush or grass. Seventeen collections were from halogeton associated with other plants except sagebrush or grass. Thirteen collections were from shadscale in association with other plants except sagebrush or grass. Only 8 collections were taken from rabbitbrush associations other than with sagebrush or grass, and only 5 collections from blackbrush. Only 2 collections were taken in juniper and/or pinyon where other plants were not present, but 19 collections where sagebrush was associated.

This species commonly inhabits the shoulders and barrow pits along roads. Whenever sedges, meadow grass, or salt grass were present alongside the roads, I never found colonies of this species. Apparently it does not like the saline environment in this type of situation. Colonies were seldom found in heavy clay soils, but occasionally in lighter clays.

Unstable sandy soil does not support this species, apparently because of the shifting potential of the sand from frequent winds. From just west of Hinckley in Millard County for a distance of about 14 miles westward, the soil is alkaline clay with greasewood, saltbush, and shadscale. In this area harvester mounds were found only along the shoulder of the highway where a gravel substrate was present. None were found on the alkaline flats until the greasewood and saltbush were replaced by shadscale and desert pavement. Between Sagecreek Junction and Laketown in Rich County, a distance of 10 miles where the soil is a reddish clay loam, not a single harvester mound was seen. Typical mounds were not seen between Blanding and Bluff in San Juan County, where the elevation dropped from 6100 to 4300 ft in 70 miles, and only those of *P. rugosus* were present. South of Bluff past Mexican Hat both mound forms and species were present, but *occidentalis* was not as common as in other areas. About 11 miles north of Mexican Hat following highway U261, Cedar Mesa lies at 6500 ft. Mounds of *rugosus* were found up to its base but were replaced on top by *occidentalis*. Ants of *rugosus* occur infrequently further westward along U95, where the elevation drops back to under 4600 ft.

In the 375 localities listed, only 31 were in montane forest. The 119 recorded elevations varied from 2750 to 9000 ft, 86 of them between 4000 and 6000. Only 21 were over 6000 ft, 2 over 8000.

There were 213 typical mounds observed. In 5 cases two main mounds were joined and apparently inhabited by the same colony. In only one instance did I find a colony occupying three joined mounds. In a greasewood habitat 17.2 mi southwest of Kelton in Box Elder County a colony was found with three joined, small linear mounds that had a total of nine entrances. A typical mound in an alkali-greasewood flat 7.8 mi east of Callao in Juab County was covered with black chips of desert pavement. In an area 4.9 mi south of Emery along U10 at 6000 ft in Emery County in greasewood, grass, and Russian thistle several mounds were completely covered with a layer of black gravel, which undoubtedly was carried from the shoulder of

the road where it had been used for surfacing. Some such mounds were as far as 60 ft from the road. Four mounds on an east-facing slope at the north edge of Woodruff at 6400 ft in Rich County in sagebrush were covered with large gravel, the particles much larger than seen on other harvester mounds elsewhere in the state. These also were elongate and ridged, not the symmetrical cones like the typical harvester mounds. A low mound was found two feet from the asphalt 14.7 miles west of Hinckley in Millard County, with the opening at the base on the northeast side. The area around the entrance was coated with a hardened amber material resembling baltic amber or shellac. Apparently this was deposited from the feet of the workers over a long period of time, perhaps picked up as a distillate from the hot surface of the adjacent asphalt. No other situation of this type was observed with any other mound over the state. A mound in another area had two rodent burrows in it, with a gopher snake curled in one of them.

Food storage of seeds was frequently found in the upper part of the mounds, usually within a few inches of the top.

In northwestern Utah around Kelton in Box Elder County, where the range of three species of harvesters overlaps, *occidentalis* are much larger than most *salinus*, but about the same size as *owyheei*.

To see the angled basal tooth on the mandible, one sometimes must study a series for best observation of open mandibles. On some specimens all teeth of both mandibles are well developed and the basal tooth on both sides is well developed and distinctly angled. On other specimens the basal tooth on one side may be vestigial, in which case the other teeth on the same mandible may be much reduced, almost lacking in some cases, or moderately well developed in others. The basal tooth on the other mandible, however, is well developed and distinctly angled. Frequently the angle is not distinct as such, but the basal tooth forms a gentle curve instead. In series 388, taken 3.3 miles west of Tooele alongside highway U112 in Tooele County, one ant has eight teeth on the right mandible and seven on the left. The basal tooth is offset on both mandibles. In series 122, taken 37 miles east of Crescent Junction alongside highway 170

in Grand County, most specimens have a basal tooth that is only slightly angled with the posterior border of the mandible, forming almost an equal curvature. In series 305, taken five miles south of Crescent Junction alongside highway US163 in Grand County, most specimens have a basal tooth that is not as offset as most other typical *occidentalis* scattered throughout Utah. On some of these specimens one side of the mandible is almost straight, whereas on the other, or on both sides on some specimens, the basal tooth forms a slight gentle curve. Other characters, such as the rugae and puncta on the head and the shape of the base of the antenna, are typical characters. In series 113, taken 26 miles south of Wellington alongside highway US6 in Emery County, the basal tooth on both mandibles is well developed but the posterior margin of the mandible is almost straight without an angle. A colony (series 115), taken 46 miles south of Wellington in Emery County in halogeton in mid-July, consisted of many workers with a few immatures but no winged forms. In a series of 30 workers examined, the basal tooth on many is almost in a straight line with the basal margin of the mandible, and on a few it is in straight alignment. Other characteristics are typical of *occidentalis*. In series 199, taken one mile east of Francis in Summit County the basal tooth is often reduced on one mandible. On some specimens where it is reduced, the border of the reduced tooth is not at a distinct angle, but almost straight. In series 354, taken 17.4 miles west of Hanksville on highway U24 in Wayne County, many workers have essentially a straight mandibular border; others have an angled basal tooth at least on one side, but not as drastically as typical *occidentalis* of other areas of Utah.

On some workers all of the teeth on both mandibles except the two basal ones are worn off so that the inside edge of the mandible is essentially straight except for the two basal teeth, which are typically offset. In series 356, taken 3.7 miles east of Torrey in Wayne County, one worker has both mandibles with no evidence of any teeth. The edge is heavily chitinized, but it appears that all the teeth have been worn off smooth so that the normal toothed edge is perfectly straight, with no indentation showing where

teeth should be, even to the offset basal tooth, which is also missing on both sides.

Some intergradation of mandibles occurs in northwestern Utah, mainly between *salinus* and *owyheei*. Most *occidentalis* in that area are typical, but some have atypical mandibles close to *salinus* and *owyheei*. In series 549, taken 17.2 miles southwest of Kelton in Box Elder County, some ants have typical *occidentalis* mandibles, antennae, and petiole pattern; some have mandibles and antennae of *occidentalis*, with a petiole pattern of *salinus*; some have mandibles of *salinus* or *owyheei* and antennae of *occidentalis*, but with a petiole typical of *salinus*.

In 111 mounds where other than workers were found, immatures but no winged forms were found in 20 (18 percent), winged forms only in 47 (42 percent), and both immatures and winged in 44 (40 percent). Immatures and winged forms were found in mounds above normal ground level only between 28 June and 3 August. When immatures were found in the summer they were between two to four inches below the outer surface of the mound in different parts of the mound as oriented to the direction of the sun. This may be optimum for brooding temperatures of the immatures, and they likely are moved periodically by workers as the outside temperature and rays of the sun change.

On 31 July in sagebrush one mile east of Brigham in Box Elder County at 0650, a mound was observed that was still in shade. No ants were outside the mound, but many winged forms were congregated just inside the entrance, probably preparatory for the nuptial flight. Almost as many winged ants as workers were found inside the mound. On the same day in a grass and sunflower habitat 6.1 miles west of Corinne in Box Elder County at 0740, a small mound was observed that was still in shadow. Many winged forms were assembled just inside the entrance, but no ants were outside. The same situation was seen in two other adjacent mounds. In a mound located three miles west of Orangeville at 6000 ft in Emery County in rabbitbrush, greasewood, and herbs near an irrigated farm, winged forms were much more numerous than workers on 31 July and were found near the opening to the nest, whereas the fewer workers were deeper in the mound.

Apparently the winged forms were nearing their swarming time.

Winged forms vary in depth in the mound, but frequently can be seen "peeking" from the openings. Callow (newly emerged) workers frequently were found mixed with the winged forms and were the principal workers to rescue immature stages when the nest was disturbed. Winged females are much more active in trying to hide or escape when disturbed than are winged males. The winged females frequently aid the callow workers in rescuing the immature forms, but I never once saw a winged male performing that task.

One colony taken 41 miles east of Kanab in Kane County was in a low mound in rabbitbrush, matchbrush, and saltbush. Moderate numbers of workers were present, but no immature or winged forms. These ants behaved differently than typical *occidentalis*—they were not aggressive and did not swarm toward the intruder when disturbed, but simply scurried around almost at random. Their abdomens were darker (almost blackish) than the amber unicolor of typical *occidentalis*. Forty-five miles west of Hinckley, alongside highway US6-50 in Millard County, a colony was found in a typical *occidentalis* mound with the opening at the base on the southeast side. These ants behaved similarly to *salinus*. They were not aggressive but tried to hide when disturbed. A mound covered with thick detritus and occupied by *occidentalis* was found 7.7 miles west of junction U261 on U95 in San Juan County in sagebrush, pinyon, and juniper. Ants of *Conomyrma insana* were abundant on the mound, crawling on and between the sticks. No nest openings of these small ants could be seen, nor were any of their nests found in the vicinity. No interaction between the two species was observed as they intermingled on the mound. A large, flattened mound was found in rabbitbrush, sagebrush, and juniper 19 miles north of Lund on the road to Pine Valley in Iron County in late July at 6700 ft. Workers were transporting sand particles from its opening. Many workers, immature, and winged forms were found in the mound. Nine small mounds occupied by *Conomyrma insana* were on the harvester mound. No apparent competition

or interaction was seen between the two species as they intermingled in their scurryings.

Beck et al. (1967:72) found *occidentalis* feeding on dead rodents in only two instances in Utah.

### *Pogonomyrma owyhee* Cole

*P. occidentalis owyhee* Cole, 1938, Amer. Midl. Nat. 19:240.

*P. owyhee*: Cole 1968:102; Knowlton 1970:211, 1975:7; Smith 1979:1355.

Records (Map 24): **BOX ELDER**: Cedar Crk (City) (K75), Cedar Hill (US), Curlew Valley (K70), Hansel Mts, Hardup, Kelton (K75), 6 mi N (US), 8.3 mi E, 70.4 mi SW (A), and 12 mi NW (KU), Kelton Pass (K75), Kelton rd 5 mi E U30 (A), Locomotive Spngs (K75), Park Valley (City) 10 mi E (KU), Snowville (K75) and 1 mi W, Jet U30 and U42 and 3.8, 5.8, 6.1 and 6.7 mi N (A), Wildcat Hills (K75). **EMERY**: Goblin Valley, Hanksville 16 mi N (KU). **GRAND**: Moab, Thompson (KU). **JUAB**: Fish Spngs (KU). **MILLARD**: Black Rock (KU). **WASHINGTON**: Rockville, Santa Clara Crk, St George, Virgin, Zion Nat Park (KU).

Smith (1979:1355) lists this species as western United States, including Utah, Nevada, Idaho, and Wyoming, nesting in earthen mounds. Allred and Cole (1971:239) found it in Idaho abundantly in associations of rabbitbrush-sagebrush-grass, less commonly in other shrub associations. Knowlton (1975:7) found it associated with sagebrush and rabbitbrush in northern Utah.

There were 260 ants taken from typical conical mounds in nine collections. Immatures and winged forms were found in four mounds in late July. In two of the mounds only female alates were found. Seven collections were taken in sagebrush: two in association with grass and one with grass and rabbitbrush. Two collections were taken in greasewood. In a greasewood area alongside an old railroad bed 8.3 miles east of Kelton in Box Elder County, a colony was adjacent to several colonies of *salinus*. Elevations of *owyhee* in Utah are between 4310 and 5600 feet in desert habitats.

On 31 July in Box Elder County two mounds were seen wherein many winged forms were concentrated just inside the entrance. At one mound several winged females came out of the entrance but quickly reentered when I approached. In series 558, taken 5.8 miles north of highway U30 along U42 in Box Elder County, the ants were not as aggressive as *occidentalis* nor as prone to

hide as *salinus*, but their behavior was closer to that of *salinus*. Fewer could be enticed to come out of the entrance than is the case with *occidentalis* when air is blown into the entrance. Workers of *occidentalis* literally swarm out in such a reaction.

In series 560, taken 6.7 miles north of the junction of highways U30 and U42 alongside U42 in Box Elder County, many specimens have a broadly rounded thorax, not flattened. The superior lobe of the scape base is somewhat variable. On several specimens on one side the lobe has a collar that is extended superiorly, but with no up-curvature as on typical *occidentalis*. On the other side of the same specimens the lobe is similar to *salinus*, angular and rounded, without the collar extension. Both segments of the petiole lack the typical *salinus* transverse striae, although faint subparallel striae are on the posterior half of the petiole, whereas the postpetiole lacks such striae on a few specimens. Most specimens in other series have the superior lobe of both antennae with an extension of the collar. In series 559, taken 0.6 mile southeast of series 560 above, at least one specimen has a superior lobe of the scape base that is almost typically *salinus*—rounded without the collar extension. On the other antenna the superior lobe is angled and rounded without the collar extension. In series 557, which was taken six miles southeast of the above collections, one specimen has typical *owyheeii* antennae and mandibles with an atypical *salinus* petiole.

The records of this species from Juab, Milard, Emery, Grand, and Washington counties most likely are errors of identification of aberrant specimens of *occidentalis*, wherein the offset basal tooth of the mandible is not typical. Such variations were discussed under *occidentalis* previously.

### *Pogonomymex rugosus* Emery

*P. barbatus rugosus* Emery, 1895, Zool. Jahrb. Syst. 8:309; Rees and Grundmann 1940:5; Cole 1942:366; Creighton 1950:120; Grundmann 1958:162; Ingham 1959:39.

*P. rugosus*: Cole 1968:70; Allred and Cole 1979:99; Smith 1979:1354.

Records (Map 23): **EMERY**: Green River (RG). **GRAND**: Arches Nat Park (BY), Dewey (U), Green River S of (KU), Moab (U), Thompson (C42). **KANE**: Glen

Cyn City (AC), Kanab (G58) and 4 and 40 mi E, Wahweap (KU). **SAN JUAN**: Abajo Mts (U), Blanding 6.4 and 12.2 mi S (A), Bluff (KU) and 0.6 and 11.6 mi S (A), Four Corners (US), Goulding Mt (RG), Mexican Hat (U), Monument Valley (KU), Navajo Bridge (on Highway 89) (G58), Jct U95 and U261 35 and 40.4 mi W, Jct U261 and US163 3.7 mi N (A). **UTAH**: Silver Lake Flat (A). **WASHINGTON**: Hurricane (RG), Harrisburg Jct 2 mi W (I59), Leeds Cyn, Rockville, Santa Clara, Snow Cyn (KU), Springdale (WU), St George (O), Virgin City, Zion Nat Park (I59).

Smith (1979:1354) lists this species from midwest to western United States, including Utah, Colorado, Arizona, and Nevada, nesting in the soil in a flattened gravel disc. Gregg (1963:323, 327) lists it between 3600 and 8500 ft in sagebrush, saltbush, conifers, juniper, oak, manzanita, grass, and greasewood areas in Colorado. Cole (1968:71) shows it across all of extreme southern Utah, arching northward near the borders as it extends into central and southeastern Nevada and central western Colorado. He states that in southern Nevada its nests consist of low gravel mounds or discs, commonly found in hopsage-matrimony vine, shadscale, blackbrush, creosote bush, Russian thistle, and other mixed shrubs (1966:5). Ingham (1959, 1963) indicates its habitat in southern Utah as flattened pebble mounds in creosote bush, sagebrush, pinyon-juniper, blackbrush, joshua trees, bur sage, little rabbitbrush, four-wing saltbush, and shadscale. Allred and Cole (1979:99) found it in southern Utah in several desert shrub types, most commonly in grass communities.

There were 160 ants in seven collections taken from low crater mounds not over four inches high and 18 inches to two feet in diameter. Eleven ants in one collection were taken from under a log. No typical cleared area occurs around these mounds. Two collections were taken in blackbrush, one in association with grass and Russian thistle. Two collections were in greasewood: one in association with Russian thistle and one with grass, herbs, and sagebrush. One collection was taken in herbs, one saltbush, one grass and matchbrush, and one grass near aspen. In 36 recorded Utah habitats two were in montane areas. In 27 recorded elevations between 2500 and 7500 ft, 21 were between 3000 and 5000, two over 7000. These ants are not as aggressive as *occidentalis*, and some attempt to hide when disturbed. Ants of one colony



found in a habitat of blackbrush, Russian thistle, and grass 35 miles west of U261 along U95 in San Juan County were harvesting grass seeds on 30 July and carrying them into their nest.

The record in northern Utah County collected by me is valid. I revisited the exact site a year later, but no ants were present. In the initial collection only 11 ants could be found, and they were at 7450 ft under a small aspen limb on an open west-facing, grassy slope below an aspen grove.

### *Pogonomyrmex salinus* Olsen

*P. salinus* Olsen, 1934, Bull. Mus. Comp. Zool. 77:498; Knowlton 1970:211, 1975:7.

Records (Map 24): **BEAVER:** Desert Range Exp Sta (BY). **BOX ELDER:** Cedar Crk (City) (KU), Cedar Hill (K75), Curlew Jct, Curlew Valley, Hardup (KU), Kelton (K70), 5 mi SE (KU), 8.3 mi E, 3.3 and 12 mi W, and 39.8, 50.9 and 60.1 mi SW (A), Kelton Pass (K70), Kosmo (K75), Locomotive Spngs (K70), Penrose 7 mi NW, Park Valley (City) 10 mi E (KU), Promontory 20.3 mi W (A), Snowville (K75), Wildcat Hills (US). **IRON:** Cedar City (RAU). **JUAB:** Callao 5 and 10 mi E (A), Fish Spngs (KU), Gandy 10.1 mi N (A), Topaz Mt (KU), Trout Crk (City) 12.3 mi N (A). **MILLARD:** Gandy 1.7 mi N, and 3.2, 3.5, 8.5, 13.6, 17.2 and 20.1 mi S, Gandy rd 0.5 mi N US6-50, Hinckley 14.7 mi W (A). **TOOELE:** Knolls 3, 3.5, 13, 16.8 and 22.8 mi W, Wendover 5.5 mi E (A).

Smith (1979:1355) lists this species from western United States, including Nevada, nesting in a low craterlike mound in pinyon-juniper areas. Cole (1968:107) shows it along the eastern border of Nevada in the northern half of that state but not next to Utah in the southern third of Nevada. He indicates that in southern Nevada it is one of the dominant ants of the pinyon-juniper, replacing *occidentalis* at higher elevations, contacting but not overlapping the range of the latter. The nests are saucerlike depressions in cleared areas (1966:6). Knowlton (1975:7) found it associated with sagebrush in northern Utah.

There were 510 ants in 20 collections taken from low crater mounds. Sixty-five ants in 4 collections were taken from low, flat mounds, and 40 ants in 2 collections were taken from ground burrows without mounds. Eighty ants in 3 collections were taken from mounds that were larger than the others and typically shaped like those of *occidentalis*; however, all had openings at the top, only one with a crater. Immatures were found in 5

nests and winged forms in 10. Both immatures and males were found together in 4 nests. Fourteen collections were taken in greasewood: 5 in association with halogeton, 2 shadscale, and one halogeton and shadscale. Five collections were in shadscale, 5 shadscale and halogeton, one halogeton, one halogeton and saltbush, and one pickleweed. Two collections were taken on the shoulder of a road where no vegetation was present. All 44 recorded Utah habitats were in desert areas between elevations of 4222 and 5834 ft.

These ants are not aggressive and attempt to hide when disturbed, exhibiting little attempt to rescue exposed immature forms. In only two colonies was there indication of aggression. In two colonies alongside a paved highway, kernels of wheat were found.

This species apparently extends alongside highway US6-50 70 miles eastward from the Nevada border to within about 14 miles of Hinckley in Millard County. At intervals westward from Hinckley the soil is an alkaline clay with greasewood, shadscale, and saltbush. No harvester mounds, even of *occidentalis*, were seen in these areas except along the shoulder of the road where a gravel substrate was present. When the greasewood, saltbush, and alkaline-clay are replaced by desert pavement and shadscale, harvester mounds are present. For 8 miles north of US6-50 alongside the Nevada border toward Gandy, only two mounds were seen in the alkali-clay greasewood habitat up to the shadscale of the bajada. In the valley east of Kelton in Box Elder County in northwestern Utah, where the soil is not as alkaline or clay, harvester mounds are common in greasewood alongside the highway. However, the mounds there are small and frequently covered with greasewood detritus. For many miles south-west of Kelton in the greasewood-shadscale-halogeton habitat, no mounds of *salinus* were seen except those occasionally in the middle of the hardpacked dirt road.

This species with its typical low crater mounds extends along US80 from about 1.5 miles east of Knolls in Tooele County westward to Wendover. Typical *occidentalis* with its higher pyramid mounds extends eastward along I80 from about 3 miles west of Knolls. In this overlap area of about 4.5 miles are some mounds that are intermediate between

the two species types—higher pyramid mounds with top craters. In the area east of the typical crater mounds for a distance of about 1.5 miles, no typical crater mounds were seen but frequent intermediate types were present. The intermediate types were not seen eastward from about 3 miles east of Knolls.

Between 40 and 60 miles southwest of Kelton in Box Elder County the only mounds found were in the middle of the hard-packed dirt road. Between about 25 and 70 miles west of Hinckley in Millard County along US6-50, wherever mounds of *occidentalis* were abundant no colonies of *salinus* were found. In a halogeton-shadscale area 12.3 miles north of Trout Creek City in Juab County, colonies of *occidentalis* were abundant in the same area as *salinus*.

In an alkali-greasewood area five miles east of Callao in Juab County a completely flat mound was covered with a dense concentration of black chips of desert pavement. In the same habitat five miles farther east a typical mound was covered with black chips of desert pavement, including the inside of the crater.

In a shadscale area 14.7 miles west of Hinckley in Millard County a mound was typical *occidentalis* in shape except that the opening was at the top. However, the mound lacked the crater typical of *salinus*. These ants demonstrated typical *salinus* behavior of nonaggressiveness and attempts to hide when disturbed. The mound was conspicuously covered with black chips of gravel that were common in the vicinity as desert pavement. However, the closest source of these to the mound was about 50 ft away. Another mound in the same area was of the same shape but possessed a small crater on the top. This mound was covered by light-colored gravel, probably brought from excavating within the mound. These ants behaved as typical *salinus*. A mound that was an intermediate type—relatively high pyramid with top crater—was found 3.5 miles west of Knolls alongside US80 in Tooele County. The ants behaved as intermediates between *salinus* and *occidentalis*—some tried to escape and hide, whereas others crawled around in a manner typical of *occidentalis*.

In series 395, taken 13 miles west of Knolls along US80 in Tooele County, all of the spec-

imens examined have typical *salinus* straight-margin mandibles, but some have the basal part of the scape more typical of *occidentalis*. Others in the same series have the typical *salinus* scape. In series 397, taken 22.8 miles west of Knolls alongside US80, in Tooele County, two ants have all the teeth rounded and not heavily sclerotized. The distal three teeth are fused together. The basal tooth is not offset and is in straight alignment with the mandibular margin. Two others have the teeth rounded, with the two distal ones fused, but the basal tooth is in straight alignment with the margin of the mandible. In series 405, taken 3.5 miles west of Knolls, the ants have characters typical of both *salinus* and *occidentalis*. The basal tooth is consistently in line with the others, not offset. The superior lobe of the scape in many is more rounded (almost like typical *salinus*) than in *occidentalis*, but many specimens have a superior lobe that is more angled, similar to that of *occidentalis*. In series 510, taken 17.2 miles south of Gandy in Millard County, the ants are typical *salinus* except that, although some have the superior lobe of the scape rounded as is typical of *salinus*, others have a lobe that is more angular like *occidentalis*.

In series 548 there are intergrades between *salinus* and *owyheei*. One specimen has a *salinus* antenna on one side and an *owyheei* antenna on the other, with a typical *salinus* petiole. Another has *salinus* antennae and an *owyheei* petiole; one has *owyheei* antennae and *salinus* petiole. Most others of the series are typical *salinus*. In series 551, taken 39.8 miles southwest of Kelton, two specimens have *owyheei* antennae but *salinus* petioles. In series 546, taken 8.3 miles east of Kelton, some of the ants are typical *salinus* with reference to the superior lobe of the base of the scape, transverse rugae on the petiole, and the postpetiole. A few specimens have the superior lobe of the base of the scape similar to that of *owyheei*, and on these the transverse rugae on the petiole and postpetiole are not as distinct as on typical *salinus*, especially on the anterior half of the postpetiole.

*Pogonomyrmex subnitidus* Emery

*P. occidentalis* var. *subnitidus* Emery, 1895, Zool. Jahrb. Syst. 8:310.

*P. subnitidus*: Allred and Cole 1979:99.

Records: **KANE**: Glen Cyn City (AC). **SAN JUAN**: Mexican Hat 3.2 mi S (A).

Smith (1979:1355) lists this species only from Nevada nesting in craterlike mounds, and Cole (1968:114) lists it from western Nevada. Allred and Cole (1979:99) found it in southern Utah in ephedra-grass associations.

Thirty ants in one collection were taken from a typical *occidentalis*-type mound in an association of matchbrush and Russian thistle. I was stung on the arm by one of the workers, and the reaction was equal to if not more severe than that to *occidentalis*.

Ants of this species are significantly larger than those of *occidentalis*. The head is much darker than *occidentalis*, almost black, and the rugae are much closer together, with a little-beaded appearance. The basal tooth on the mandible is almost curved toward the other teeth, and the inner margin of the mandible is generally straight except that a small hump exists. In series 335, taken 11.6 miles south of Bluff in San Juan County, 24 of the 25 specimens collected have the mandibular teeth worn down, some to the point where no vestiges of teeth are visible. One such specimen has the tips of both mandibles broken off.

### *Polyergus breviceps* Emery

*P. rufescens breviceps* Emery, 1893, Zool. Jahrb. Syst. 7:666; Rees and Grundmann 1940:10; Cole 1942:385; Creighton 1950:558.

*P. rufescens umbratus*: Creighton 1950:560; Grundmann 1958:167; Ingham 1959.

Records (Map 25): **CACHE**: Green Cyn, Logan, Logan Cyn (C42), Providence (KU). **GARFIELD**: Boulder Mt nr Boulder (G58). **IRON**: Cedar City (I59). **KANE**: Cedar City 24.3 mi E (A). **SALT LAKE**: Big Cottonwood Cyn (U). **SANPETE**: Chester (RG), Majors Flats (KU). **SEVIER**: Richfield (RG). **UINTAH**: Bonanza (KU).

Smith (1979:1466) lists this species as mid-western to western United States, including Arizona, where it associates with a variety of species of *Formica*. Gregg (1963:638) lists it from Colorado between 5080 and 8900 ft under rocks, logs, and in domes in a variety of habitats. La Rivers (1968:11) lists it from Nevada, where Wheeler and Wheeler (1978:396) found it between 6400 and 10,500 ft. Cole (1942:385) indicates its habitat in Utah as under stones, associated with a variety of species of *Formica*. Grundmann

(1958:167) designates it in Utah as typically a mountain form in dry and rocky situations where sagebrush is present. Ingham (1959) found it in southern Utah in pinyon-juniper and sagebrush in association with *Conomyrma insana*.

Ten ants in one collection were taken from a burrow under a log in an association of grass, herbs, aspen, and pine. Ants of *Formica fusca* were in the same burrow. In 12 recorded Utah habitats it occurred six times in montane areas. In 8 elevation records between 4535 and 8000 ft it was most abundant under 6000, taken only twice above 6000.

### *Ponera pennsylvanica* Buckley

*P. pennsylvanica* Buckley, 1866, Proc. Ent. Soc. Phila. 6:171; Smith 1979:1342.

Record: **COUNTY UNKNOWN**: locality unknown (Sm79).

Smith (1979:1342) lists this species from eastern to western United States, including Utah and Colorado, nesting under logs, stones, and other objects. Hunt and Snelling (1975:20) list it from Arizona. Gregg (1963:282) lists it between 3600 and 6970 ft under rocks in pinyon-juniper and cottonwood-willow habitats in Colorado.

### *Solenopsis aurea* Wheeler

*S. geminata* var. *aurea* Wheeler, 1906, Amer. Mus. Nat. Hist., Bull. 22:336.

*S. aurea*: Ingham 1963:86.

Record: **WASHINGTON**: St George (I59).

Smith (1979:1385) lists this species from southwestern United States, including Arizona, in moundless nests in fully exposed situations. Cole (1966:17) found its nests in southern Nevada in open areas in blackbrush and hopsage-matrimony vine habitats. Ingham (1963) found it in Joshua trees and four-wing saltbush in southern Utah. Records for Utah range from 2500 to 3000 ft.

### *Solenopsis molesta* (Say)

*Myrmica molesta* Say, 1836, Bost. J. Nat. Hist. 1:293.

*S. molesta*: Rees and Grundmann 1940:4; Cole 1942:361; Knowlton 1970:211, 1975:8.

*S. molesta validiuscula*: Cole 1942:361; Grundmann 1958:163; Ingham 1959:58; Beck et al. 1967:72; Knowlton 1970:211, 1975:8.

Records (Map 25): **BOX ELDER**: Cedar Crk (City), Kelton Pass, Snowville (K70), Wildcat Hills (US).

**CACHE:** Benson (C42), Cornish, Green Cyn (KU), Logan Cyn (C42), Millville, Paradise (KU). **CARBON:** Myton rd 15 and 22.7 mi E US6 (A). **DAVIS:** Kaysville (C42). **DUCHESNE:** Currant Crk (C42). **EMERY:** Greenriver (C42). **GARFIELD:** Carcass Crk (on Boulder Mt), Boulder (U). **GRAND:** Dewey (U), Moab (C42). **IRON:** Cedar City 7 mi E (I59). **JUAB:** Topaz Mt (KU). **KANE:** Kanab (C42), Long Valley (KU), Long Valley Jet 2 mi W (I59), Navajo Wells (BAD). **MILLARD:** White Valley (C42), Kanosh (US). **PIUTE:** Fish Lake Jet I mi S (U). **SALT LAKE:** Big Cottonwood Cyn (U), Emigration Cyn, Ft Douglas, Lake Blanche Trail, Little Willow Cyn, Parleys Cyn (C42), Salt Lake City (RG). **SAN JUAN:** Blanding, Bluff (G58), La Sal Crk (in La Sal Mts) (RG), Mexican Hat (G58). **SANPETE:** Ephraim Cyn (U). **TOOELE:** Irapah (U), Iosepa, Orrs Ranch, Vernon Crk (C42), Rush Valley (BAD). **UINTAH:** Dry Fk rd 15 mi N U121 (A), Jensen (BAD), Paradise Park 11 mi S (U). **UTAH:** Diamond Fk Cyn (KU), Provo (C42), Spanish Fk Cyn, Wanrhodes Cyn (KU). **WASATCH:** Deer Crk Res, Midway (U), Soldier Summit (BAD) and 7.9 mi N (A). **WASHINGTON:** Beaver Dam Wash, Diamond Valley (BAD), Grafton (I59), Leeds (RG) and 5 mi N, New Harmony, Zion Nat Park (I59). **WAYNE:** Fruita 5 mi SE (U). **WEBER:** Ogden (C42).

Creighton (1950) lists two races of this species; the Utah one is likely *validiuscula*. Smith (1979:1387) lists this species distribution from Canada to eastern and western United States, but does not list an intermountain one. He indicates that it frequently nests in or near nests of other ants, from which it robs food and brood. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:373, 375) lists it from Colorado between 3500 and 8378 ft under rocks in a variety of habitats. Cole (1966:17) found its nests in southern Nevada in pinyon-juniper and desert shrub habitats, frequently associated with *Pheidole pilifera*. He indicates that it nests under stones and logs or under bark, occasionally occupying the nests of other species in Utah (1942:361). In North Dakota Wheeler and Wheeler (1963) found it frequently under rocks. In Utah it is found under stones in brushy habitats and transition zones, common in desert conditions (Grundmann 1958:163). Ingham (1959, 1963) found it in southern Utah under stones, logs, and bark in pinyon-juniper, oak, sagebrush, rabbitbrush, squawbush, willow, tamarix, poplar, shadscale, and greasewood. Knowlton (1975:8) found it under stones in grass in northern Utah.

There were 247 ants in four collections taken from under rocks. Eggs were found under one rock and immature stages under

another, both in early July. Ants of *Formica haemorrhoidalis* were found under the same rock in one instance, and *F. fusca* and *F. podzolica* in another. In both cases the colonies were separate. Three collections were in sagebrush: one in association with juniper; one grass, legumes, sagebrush, other shrubs, juniper, and pinyon; and one grass, aspen, and pine. One collection was in aspen and fir. In 65 recorded Utah habitats 16 were in montane forest. Of 42 recorded elevations between 2500 and 9000 ft the greatest number, 19, were between 4000 and 5000. Beck et al. (1967:72) found it feeding on dead rodents in seven instances in Utah.

#### *Solenopsis salina* Wheeler

*S. salina* Wheeler, 1908, Amer. Mus. Nat. Hist., Bull. 24:427; Ingham 1959:59.

Records: **WASHINGTON:** Kolob, Pine Valley (City) (I59).

Smith (1979:1388) lists this species from western United States, including Colorado, nesting under stones and wood. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:378) lists it between 3500 and 7704 ft under rocks and wood in a variety of habitats in Colorado. Cole (1966:17) found it in southern Nevada under stones in pinyon-juniper. Ingham (1959) found it in southern Utah under stones in oak where it was associated with *Formica fusca*. Three Utah collections were taken between 6000 and 8000 ft.

#### *Solenopsis xyloni* McCook

*S. xyloni* McCook, 1879, (In) Comstock, Rpt. Cooton Ins., p. 188; Ingham 1959:58.

Records: **WASHINGTON:** Santa Clara (US), Shivwits Indian Res (I59), St George (US).

Smith (1979:1389) lists this species from eastern to western United States including Colorado, nesting in earthen mounds or under stones and other objects. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:373) lists it at 4400 ft under rocks in cottonwood-willow and grassy habitats in Colorado. Cole (1966:17) found its nests in southern Nevada at the base of shrubs in creosote bush habitats. Ingham (1959) found it under rocks in creosote bush, poplar, willow, datura, and rabbitbrush in southern Utah. Known habitats in Utah are in desert areas.

*Stenamma brevicorne* (Mayr)

*Aphaenogaster brevicornis* Mayr, 1886, Verh. Zool.-Bot. Ges. Wien 36:443.

*S. brevicorne*: Cole 1942:363; Knowlton 1975:8.

Record: **BOX ELDER**: Snowville 17 mi SW (KU). **CACHE**: Logan (C42).

Smith (1979:1358) lists this species from eastern to western United States, including Colorado, nesting under stones or wood in wooded areas. Gregg (1963:348) lists it at 3800 ft in deciduous areas in Colorado. Knowlton (1975:8) found it associated with sagebrush and shadscale in northern Utah.

*Stenamma chiricahua* Snelling

*S. chiricahua* Snelling, 1973, Los Angeles Co. Mus., Contr. Sci. 245:7.

Record: **MORGAN**: Morgan (KU).

Smith (1979:1358) lists this species from mountains in southern Arizona. Its occurrence in Utah is questionable.

*Stenamma diecki* Emery

*S. westwoodi diecki* Emery, 1895, Zool. Jahrb. Syst. 8:300.

*S. diecki*: Cole 1942:363; Smith 1957:140; Snelling 1973:18; Knowlton 1975:8.

Records (Map 25): **BOX ELDER**: Cedar Hill, Wildcat Hills (K75). **CACHE**: Blacksmith Fk Cyn, Green Cyn (KU), Logan (C42), Logan Cyn, Trenton (KU). **UTAH**: American Fk Cyn (U).

Smith (1979:1358) lists this species from eastern to western United States, but does not indicate an intermountain state. It nests under wood or other objects in wooded areas. Wheeler and Wheeler (1978:391) found it at 6400 ft in Nevada, and frequently under and in wood in North Dakota (1963). Gregg (1963:350) lists it from Colorado between 6050 and 7350 ft under rocks in conifers. In eight recorded Utah habitats it was taken four times in montane forest. Three recorded elevations were between 4460 and 7000 ft.

*Stenamma huachucanum* M.R. Smith

*S. huachucanum* Smith, 1957, Amer. Midl. Nat. 57:153; Knowlton 1975:8.

Records: **BOX ELDER**: Hansel Mts, Hardup, Kelton Pass, Snowville (K75).

Smith (1979:1359) lists this species only from Arizona nesting under rocks. Gregg (1963:350) lists it from Colorado at 8300 ft under rocks in mixed forest. Knowlton

(1975:8) found it associated with sagebrush, rabbitbrush, and junipers in northern Utah.

*Stenamma impar* Forel

*S. brevicorne impar* Forel, 1901, Soc. Ent. de Belg., Ann. 45:347.

Record: **UTAH**: Spanish Fk Cyn (KU).

Smith (1979:1359) lists this species as eastern to midwestern United States, and does not indicate an intermountain state. It nests in soil or rotten wood.

*Stenamma occidentale* M.R. Smith

*S. occidentale* Smith, 1957, Amer. Midl. Nat. 57:146; Snelling 1973:25; Smith 1979:1359.

Records (Map 25): **CACHE**: Blacksmith Fk Cyn, Green Cyn, Leeds Cyn, Paradise (KU). **UINTAH**: Bonanza (KU). **UTAH**: Diamond Fk Cyn (KU).

Smith (1979:1359) lists this species from midwest and western United States, including Utah, Colorado, Arizona, and Idaho, nesting under rocks. Gregg (1963:353) lists it from Colorado between 5900 and 8500 ft under rocks in conifers, birch, and oak habitats.

*Stenamma smithi* Cole

*S. smithi* Cole, 1966, Brigham Young U. Sci. Bull. 7(3):7; Knowlton 1975:9; Smith 1979:1359.

*S. knowltoni*: Gregg 1972:35; Knowlton 1975:8.

Records (Map 26): **BOX ELDER**: Cedar Crk Jet (Gr), Cedar Hill (US), Curlew Valley Jet, Hansel Mts, Hardup, Kelton Pass, Snowville (K75). **CACHE**: Newton (KU).

Smith (1979:1359) lists this species from Utah, Nevada, and Idaho, nesting in sagebrush and juniper duff. Cole (1966:8) found the type series in mixed brush in Nevada. Gregg (1972:38) lists its Colorado habitats as duff of sagebrush, juniper, and greasewood, and in grass. Wheeler and Wheeler (1978:391) found it at 7000 ft in Nevada. Knowlton (1975:8, 9) found it associated with sagebrush, grass, greasewood, and rabbitbrush in northern Utah.

*Tapinoma sessile* (Say)

*Formica sessile* Say, 1836, Bost. J. Nat. Hist. 1:287.

*T. sessile*: Rees and Crundmann 1940:6; Cole 1942:372; Hayward 1945:120; Grundmann 1958:165; Ingham 1959:68; Beck et al. 1967:73; Knowlton 1970:212, 1975:9.

Records (Map 26): **BOX ELDER**: Bear River City (US), Brigham 0.9 mi E (A), Cedar Crk (City) (K70), Cedar Hill (K75), Hansel Mts, Kelton Pass (K70), Locomotive Spngs (BAD), Mantua (KU), Raft River S Fk (RG),

Snowville (K75), Taylor Farms (K70), Wildcat Hills (K75). **CACHE:** Ant Valley, Blacksmith Fk Cyn (KU), Cowley Cyn (C42), Green Cyn, Leeds Cyn (KU), Logan, Logan Cyn (C42), Mendon Cold Spng, Providence, Tony Grove (KU). **CARBON:** Jct Soldier Summit rd and U33 1.7 mi W (A). **DAGGETT:** Radosovich Ranch (BAD). **DAVIS:** Antelope Island (US), Farmington (C42). **DUCHESNE:** Fruitland 5 mi E (US), Johnny Star Flat (BAD), Tabiona 11.6 mi E (A). **EMERY:** Greenriver (US). **GARFIELD:** Boulder Mt, Henry Mts (C58). **IRON:** Enoch (BAD), Modena 10.4 mi NE (A), Newcastle 1 mi E (159). **JUAB:** Nephi (US). **KANE:** Kanab (C42), Long Valley Jct (159). **MILLARD:** White Valley (C42). **MORGAN:** Morgan (KU). **SALT LAKE:** Arthur (US), Big Cottonwood Cyn, Draper (C42). **SAN JUAN:** Abajo Mts, Blanding, Bluff (C58), Hole-in-the-Rock Cyn (U), Kigalia Ranger Sta (BAD), Monticello 7.6 mi W (A). **SEVIER:** Monroe (US). **SUMMIT:** Echo (BAD), Kamas 14.7 mi E, Mirror Lake 17.3 mi N (A). **UINTAH:** Bonanza (KU), Dry Fk rd 13.4 mi N U121, Red Cloud Loop rd 4.2 mi W U44 (A). **UTAH:** Payson Cyn 12.3 mi up (A), Provo (BAD), Thistle 7.7 mi E (A). **WASATCH:** Hanna 9.2 mi W, Soldier Summit 3.3 and 10.1 mi N (A), Strawberry Valley (US), Strawberry Res 4 mi S (A). **WASHINGTON:** Leeds (RG), Pine Valley (City), Santa Clara (159), Toquerville (BAD), Zion Nat Park (159). **WAYNE:** Hanksville (BAD).

Smith (1979:1421) lists this as primarily an eastern species (no intermountain state is listed) that nests mostly under objects in a variety of habitats. Hunt and Snelling (1975:22) list it from Arizona. Gregg (1963:446) lists it from Colorado between 3500 and 10,505 ft under rocks and wood in a variety of habitats, predominantly in conifers. La Rivers (1968:7) lists it from Nevada, where Wheeler and Wheeler (1978:392) found it between 6100 and 10,500 ft. They found it frequently under rocks, also common in wood in North Dakota (1963). Allred and Cole (1971:239) found it in Idaho in associations of wild rye-grass and rabbitbrush-sagebrush-grass-winterfat. Cole (1942:372) indicates that in Utah it nests under stones, logs, and bark. Grundmann (1958:165) indicates that it is common in Utah in mountain brush in large nests usually under stones in shady areas between 4000 and 8000 ft. Ingham (1959, 1963) found it in southern Utah under rocks, logs, and in grass clumps in a variety of vegetative types. Knowlton (1975:9) found it associated with sagebrush, shadscale, greasewood, snowberry, and rabbitbrush in northern Utah.

There were 556 ants in 13 collections taken from under rocks. In one instance *Lasius alienus* was under the same rock. Eighty ants in 3 collections were taken from

under logs. Thirty ants in one collection were taken from a small mound, and 20 in one collection singly in an open area. Immatures were found under two rocks in mid-July and under a log in late June. Fourteen collections were taken in sagebrush: 3 in association with grass, 2 snowberry, 2 matchbrush, one grass and herbs, one legumes, and one aspen and conifers. One collection was in a herb meadow with aspen; one grass, herbs, shrubs, and aspen; one herbs, sedges, and conifers; and one grass, herbs, aspen, and conifers. In 70 recorded Utah localities 26 were in montane areas. At 31 recorded elevations between 2500 and 8402 ft, 22 were between 4000 and 6000. Beck et al. (1967:73) found it feeding on dead rodents in 12 instances in Utah.

#### *Tetramorium caespitum* (Linnaeus)

*Formica caespitum* Linnaeus, 1758, 10th ed. Syst. Nat. 1:581.

Record: **SALT LAKE:** Salt Lake City (KU).

Smith (1979:1400) lists this species from eastern to western United States, including Nevada, nesting in a variety of situations.

#### *Veromessor lobognathus* (Andrews)

*Messor lobognathus* Andrews, 1916, Psyche 23(3):82.

*V. lobognathus:* Wheeler and Wheeler 1967:240; Allred and Cole 1979:99.

Records: **DUCHESNE:** Duchesne 11 mi W (W67). **KANE:** Glen Cyn City (AC).

Smith (1979:1364) lists this species from midwest to western United States, including Colorado and Nevada, nesting under stones. Gregg (1963:354) lists it between 5747 and 6500 ft under rocks in pinyon-juniper and sagebrush areas. Cole (1966:12) found it a common species in pinyon-juniper in southern Nevada, nesting under large rocks. Allred and Cole (1979:99, 1971:239) found it in southern Utah and Idaho in various associations of desert shrubs. It was most abundant in rabbitbrush-sagebrush. Wheeler and Wheeler (1963) found it frequently under rocks in North Dakota, and indicate that it is rarely taken, occurs between 7000 ft in the southern part of its range to 2500 ft at the northern part, and is an inhabitant of pinyon-juniper, where it nests under stones (1965:60). They found a nest in Utah under a mound of

earth at the base of a clump of grass in an association of sagebrush, saltbush, and grass (1967:240).

SYNONYMIES AND CORRECTIONS  
OF UTAH RECORDS

Names on the left are as written in published literature or on labels on specimens in collections I examined (many representing heretofore unpublished data), and for purposes of this paper are considered to be errors in identification unless other authors have treated them as junior synonyms to the names on the right.

Acanthomyops

- claviger = *A. interjectus*  
coloradensis = *A. interjectus*

Aphaenogaster

- subterranea valida = *A. occidentalis*

Brachymyrmex

- depilis flavescens = *B. depilis*

Camponotus

- caryae decipiens = *C. nearcticus*  
herculeanus ligniperda noveboracensis = *C. novaeboracensis*  
herculeanus pennsylvanicus = *C. herculeanus*  
herculeanus whymperi = *C. herculeanus*  
ligniperda noveboracensis = *C. novaeboracensis*  
maccooki = *C. semitestaceus*  
maculatus sansabeanus = *C. sansabeanus*  
maculatus sansabeanus torrefactus = *C. sansabeanus*  
maculatus vicinus = *C. vicinus*  
marginatus nearcticus = *C. nearcticus*  
nearcticus decipiens = *C. nearcticus*  
pennsylvanicus = *C. modoc*  
pennsylvanicus modoc = *C. modoc*  
sansabeanus sansabeanus = *C. sansabeanus*  
sansabeanus torrefactus = *C. sansabeanus*  
sansabeanus vicinus = *C. vicinus*  
sansabeanus vicinus luteangulus = *C. vicinus*  
sansabeanus vicinus nitidiventris = *C. vicinus*  
sylvaticus maccooki = *C. semitestaceus*

Crematogaster

- coarctata mormonum = *C. mormonum*  
lineolata = *C. emeryana*  
lineolata cerasi = *C. emeryana*  
lineolata coarctata = *C. mormonum*  
lineolata coarctata mormonum = *C. mormonum*  
lineolata emeryana = *C. emeryana*  
lineolata opaca depilis = *C. depilis*  
punctulata = *C. emeryana*  
vermiculata = *C. coarctata*

Dorymyrmex = *Conomyrma*

- bicolor = *C. bicolor*  
pyramicus = *C. insana*  
pyramicus bicolor = *C. bicolor*  
pyramicus flavus = *C. insana*  
pyramicus pyramicus = *C. insana*

Eciton = *Neivamyrmex*

- sp. = probably *N. californicus*

Formica

- aliena = *Lasius alienus*  
cinerea = *F. canadensis*  
cinerea altipetens = *F. altipetens*  
cinerea canadensis = *F. canadensis*  
cinerea cinerea altipetens = *F. altipetens*  
cinerea lepida = *F. canadensis*  
cinerea neocinerea = *F. canadensis*  
claviger = *Acanthomyops claviger*  
crinata = *F. criniventris*  
crinoventris = *F. criniventris*  
flava = *Lasius nearcticus*  
foreliana = *F. gnava*  
fusca argentata = *F. argentea*  
fusca argentea = *F. argentea*  
fusca cinerea = *F. altipetens*  
fusca densiventris = *F. densiventris*  
fusca gelida = *F. neurufibarbis*  
fusca neoclara = *F. neoclara*  
fusca neurufibarbis = *F. neurufibarbis*  
fusca pruinosa = *F. neoclara*  
fusca subaenescens = *F. fusca*  
fusca subpolita = *F. subpolita*  
fusca subpolita neogagates = *F. neogagates*  
fusca subpolita perpilosa = *F. perpilosa*  
fusca subsericea = *F. fusca*  
herculeana = *Camponotus herculeanus*  
insana = *Conomyrma insana*  
integra = *F. haemorrhoidalis*  
integra haemorrhoidalis = *F. haemorrhoidalis*  
integroides coloradensis = *F. integroides*  
integroides propinqua = *F. integroides*  
integroides planipilis = *F. integroides*  
laevigatus = *Camponotus laevigatus*  
latipes = *Acanthomyops latipes*  
marcida = *F. fusca*  
microgyna = *F. rasilis*  
microgyna rasilis = *F. rasilis*  
moki = *F. xerophila*  
moki grundmanni = *F. xerophila*  
moki xerophila = *F. xerophila*  
montana = *F. canadensis*  
neogagates lasioides vetula = *F. lasioides*  
neurufibarbis gelida = *F. neurufibarbis*  
niger = *Lasius niger*  
novoboracensis = *Camponotus novaeboracensis*  
obscuriventris clivia = *F. obscuriventris*  
oreas comptula = *F. oreas*  
oreas oreas = *F. oreas*  
pallidefulva nitidiventris = *F. pallidefulva*  
pallidefulva nitiventris = *F. pallidefulva*  
pennsylvanica = *Camponotus modoc*  
planipilis = *F. integroides*  
propinqua = *F. integroides*  
pruinosa = *F. neoclara*  
rasilis spicata = *F. densiventris*  
rufa aggerans = *F. obscuripes*  
rufa clivia = *F. obscuriventris*  
rufa coloradensis = *F. integroides*  
rufa haemorrhoidalis = *F. haemorrhoidalis*  
rufa laeviceps = *F. laeviceps*  
rufa melanotica = *F. obscuripes*  
rufa muscescens = *F. muscescens*  
rufa obscuripes = *F. obscuripes*  
rufa obscuriventris integroides = *F. integroides*

- rufibarbis gnava* = *F. gnava*  
*rufibarbis occidua* = *F. occidua*  
*sanguinea* = *F. subnuda*  
*sanguinea obtusopilosa* = *F. obtusopilosa*  
*sanguinea puberula* = *F. puberula*  
*sanguinea rubicunda subnuda* = *F. subnuda*  
*sanguinea subnuda* = *F. subnuda*  
*sansabeanus* = *Camponotus sansabeanus*  
*sessilis* = *Tapinoma sessile*  
*subaenescens* = *F. subnitens*  
*subpolita camponoticeps* = *F. subpolita*  
*subpolita ficticia* = *F. subpolita*  
*subsericea* = *F. fusca*  
*truncicola integroides* = *F. integroides*  
*truncicola integroides coloradensis* = *F. integroides*  
*truncicola integroides haemorrhoidalis*  
     = *F. haemorrhoidalis*  
*truncicola mucescens* = *F. mucescens*  
*truncicola obscuriventris* = *F. obscuriventris*  
*truncicola obscuriventris aggerans*  
     = *F. obscuriventris*  
*umbrata* = *Lasius umbratus*  
*vinculans* = *F. neogagates*  
*whymeri alpina* = *F. whymeri*
- Iridomyrmex**
- analis* = *I. pruinosus*  
 *pruinosus analis* = *I. pruinosus*  
 *pruinosus pruinosus* = *I. pruinosus*  
 *pruinosus testaceus* = *I. pruinosus*
- Lasius**
- alienus americanus* = *L. alienus*  
 *americanus* = *L. niger*  
 *americanus sitkaensis* = *L. pallitarsus*  
 *claviger* = *Acanthomyops coloradensis*  
 *flavus* = *L. nearcticus*  
 *flavus claripennis* = *L. nearcticus*  
 *flavus microps* = *L. nearcticus*  
 *flavus nearcticus* = *L. nearcticus*  
 *interjectus* = *Acanthomyops interjectus*  
 *latipes* = *Acanthomyops latipes*  
 *murphyi* = *Acanthomyops murphyi*  
 *neoniger* = *L. niger*  
 *niger alienus americanus* = *L. alienus*  
 *niger americanus* = *L. alienus*  
 *niger neoniger* = *L. niger*  
 *niger sitkaensis* = *L. pallitarsus*  
 *pilosus* = *L. vestitus*  
 *sitkaensis* = *L. pallitarsus*  
 *umbratus aphidicola* = *L. umbratus*  
 *umbratus mixtus aphidicola* = *L. umbratus*  
 *umbratus subumbratus* = *L. subumbratus*
- Leptothorax**
- acervorum canadensis* = *L. muscorum*  
 *acervorum canadensis yankee* = *L. muscorum*  
 *acervorum crassipilis* = *L. crassipilis*  
 *canadensis* = *L. muscorum*  
 *canadensis yankee* = *L. muscorum*  
 *nevadensis nevadensis* = *L. nevadensis*  
 *pilifera* = *Pheidole pilifera*  
 *rugatulus brunnescens* = *L. rugatulus*  
 *rugatulus rugatulus* = *L. rugatulus*  
 *sitkaensis* = *Lasius pallitarsus*  
 *tricarinatus tricarinatus* = *L. tricarinatus*  
 *tricarinatus neomexicanus* = *L. tricarinatus*
- Liometopum**
- apiculatum luctuosum* = *L. occidentale*  
 *luctuosum* = *L. occidentale*  
 *microcephalum occidentale* = *L. occidentale*  
 *occidentale luctuosum* = *L. occidentale*  
 *tricarinatus* = *L. occidentale*
- Myrmecocystus**
- melliger* = *M. mendax*  
 *melliger mendax* = *M. mendax*  
 *melliger orbiceps* = *M. mendax*  
 *melliger semirufus* = *M. kennedyi*  
 *mexicanus hortideorum* = *M. mexicanus*  
 *mexicanus mojave* = *M. testaceus*  
 *mexicanus navajo* = *M. navajo*  
 *mojave* = *M. testaceus*
- Myrmica**
- brevinodis* = *M. incompleta*  
 *brevinodes brevispinosa* = *M. brevispinosa*  
 *brevinodes discontinua* = *M. brevispinosa*  
 *brevinodis sulcinodoides* = *M. incompleta*  
 *californica* = *Pogonomyrmex californicus*  
 *emeryana emeryana* = *M. emeryana*  
 *emeryana tahoensis* = *M. emeryana*  
 *fracticornis* = *M. lobicornis*  
 *hamulata hamulata* = *M. hamulata*  
 *hunteri* = *Manica hunteri*  
 *incompleta incompleta* = *M. incompleta*  
 *lineolata* = *Crematogaster emeryana*  
 *lobicornis fracticornis* = *M. lobicornis*  
 *lobicornis lobifrons* = *M. lobicornis*  
 *lobifrons* = *M. lobicornis*  
 *mojave* = *M. testaceus*  
 *molesta* = *Solenopsis molesta*  
 *mutica* = *Manica mutica*  
 *occidentalis* = *Pogonomyrmex occidentalis*  
 *rubra brevinodis* = *M. incompleta*  
 *rubra brevinodis brevispinosa* = *M. brevispinosa*  
 *rubra brevinodis sulcinodoides* = *M. incompleta*  
 *rubra scabrinodis fracticornis* = *M. lobicornis*  
 *sabuleti americana* = *M. americana*  
 *sabuleti hamulata* = *M. hamulata*  
 *scabrinodis* = *M. monticola*  
 *scabrinodis brevinodis* = *M. emeryana*  
 *scabrinodis lobocornis fracticornis* = *M. lobicornis*  
 *scabrinodis mexicana* = *M. emeryana*  
 *scabrinodis schenki emeryana* = *M. emeryana*  
 *scabrinodis schenki monticola* = *M. monticola*  
 *scabrinodis sulcinodoides* = *M. emeryana*  
 *schenecki emeryana* = *M. emeryana*
- Novomessor**
- albisetosus* = *Aphaenogaster uinta*
- Pheidole**
- bicarinata buccalis* = *P. bicarinata*  
 *bicarinata longula* = *P. bicarinata*  
 *bicarinata vinelandica* = *P. bicarinata*  
 *bicarinata paiute* = *P. bicarinata*  
 *californica oregonica* = *P. californica*  
 *longula* = *P. bicarinata*  
 *morrisoni dentata* = *P. dentata*  
 *pilifera artemisia* = *P. pilifera*  
 *pilifera coloradensis* = *P. pilifera*  
 *pilifera pilifera* = *P. pilifera*  
 *sitarches sitarches* = *P. sitarches*  
 *sitarches soritis* = *P. sitarches*  
 *soritis* = *P. sitarches*



*Pogonomyrmex*  
*barbatus fuscatus* = *P. barbatus*  
*barbatus marfensis* = *P. barbatus*  
*barbatus molefaciens* = *P. barbatus*  
*barbatus rugosus* = *P. rugosus*  
*californicus maricopa* = *P. maricopa*  
*occidentalis comanche* = *P. occidentalis*  
*occidentalis occidentalis* = *P. occidentalis*  
*occidentalis owyheeii* = *P. owyheeii*  
*occidentalis subnitidus* = *P. subnitidus*  
*occidentalis utahensis* = *P. occidentalis*

*Polygerus*  
*rufescens* = *P. breviceps*  
*rufescens breviceps* = *P. breviceps*  
*rufescens fusca subumbratus* = *P. breviceps*  
*rufescens umbratus* = *P. breviceps*

*Ponera*  
*coarctata pennsylvanica* = *P. pennsylvanica*  
*opaciceps* = *Hypoponera opaciceps*  
*trigona* = *P. pennsylvanica*  
*trigona opacior* = *Hypoponera opacior*

*Solenopsis*  
*molesta validiuscula* = *S. molesta*

*Stenamamma*  
*knowltoni* = *S. smithi*

*Symmyrmica*  
*chamberlini* = *Formicoxenus chamberlini*

*Tapinoma*  
*pruinsum* = *Iridomyrmex pruinosus*

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