

A detailed black and white illustration of ants serves as the background for the book cover. In the foreground, two large ants are shown in profile, facing each other. Their bodies are covered in fine hairs, and their legs are long and segmented. In the background, many smaller ants are scattered across a cracked, rocky surface. The overall style is scientific and detailed.

# THE ANTS OF NEVADA

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Natural History Museum of Los Angeles County



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The fieldwork and writing of this book were done while we were at the Desert Research Institute in Reno. All illustrations not otherwise credited were prepared by J. Wheeler.



## INTRODUCTION

### HISTORY

We have counted 144 records for Nevada ants scattered through the literature beginning with W.M. Wheeler (1903) and ending with G.C. and J. Wheeler (1967). These records were found in 31 papers by 11 authors and refer to 69 species. They are cited under localities for each species.

We have not cited the records (except for new species) published since 1967, because we found none that did not duplicate records based on our collections or those in the Natural History Museum of Los Angeles County (LACM) or the United States National Museum of Natural History.

The first comprehensive review of Nevada ants is that of Allred, Beck, and Jorgensen (1963) for the species of the Nevada Test Site. Their list included 53 species, but we have not cited their records since Cole (1966) eliminated 7 of those species and added 4, making the net total of 50 for the site.

When we moved to Nevada in 1967, 51 species had been reported for the state in the literature. Since that year 27 species have been added in the literature, including 4 new species, 2 of which we collected. Our own collecting, reported in this publication, has added 97 more. Adding 2 additional records from museums, we recognize a total of 177 ant species in Nevada.

Sixteen ant species and one subspecies were first named and described from Nevada. The list follows, together with the name of the author, the citation, and the locality from which the original specimens were described (the "type locality").

*Aphaenogaster megommata* M.R. Smith, 1963:244. One mile north of Camp Foster, Pyramid Lake, Washoe Co.

*Formica nevadensis* W.M. Wheeler, 1904b:373. "Ormsby Co."

*Formica planipilis* Creighton, 1940:9. "Mt. Wheeler (Lehman Cave)," White Pine Co.

*Formica sibylla* W.M. Wheeler, 1913:530. Kings Canyon, Ormsby Co.

*Lasius humilis* W.M. Wheeler, 1917:528. Pyramid Lake, Washoe Co.

*Lasius nevadensis* Cole, 1956b:26. "Kyle Canyon, Charleston Mts., near Las Vegas," Clark Co.

*Leptothorax nevadensis* W.M. Wheeler, 1903:252. Kings Canyon, Ormsby Co.

*Myrmecocystus arenarius* Snelling, 1982:71. Blow Sand Mts., Churchill Co.

*Myrmecocystus pyramicus* M.R. Smith, 1951:91. Five miles west of Mullen Gap, Washoe Co.

*Neivamyrmex nyensis* Watkins, 1977. Five and one half miles south and 3 mi. east of Beatty, Nye Co.

*Pheidole paiute* Gregg, 1958:17. Goldfield, Esmeralda Co.

*Pheidole californica pyramidentis* Emery, 1922. New name for *Ph. c. nevadensis* W.M. Wheeler, 1915:408. Pyramid Lake, Washoe Co.

*Pogonomyrmex colei* Snelling, 1981:99. Boulder City, Clark Co.

*Stenamma smithi* Cole, 1966:7. Nevada Test Site, Nye Co.

*Stenamma wheelerorum* Snelling, 1973:34. T. 17 N., R. 19 E., sec. 19, nr Mt. Rose, 8,800 ft., Washoe Co.

*Veromessor lariversi* M.R. Smith, 1951:94. Five miles west of Mullen Gap, Washoe Co.

*Veromessor smithi* Cole, 1963:678. Nevada Test Site, Mercury, Nye Co.

### MATERIAL STUDIED

We have based our study of the ants of Nevada on about 5,200 records (i.e., samples from colonies) from approximately 1,450 localities. Of these records we have collected 3,736, and R.C. Bechtel, Nevada State Department of Agriculture, has presented us with his own collection of 666 (the Wheeler and Bechtel collections are now deposited in the Natural History Museum of Los Angeles County). The LaRivers collection of ants provided 278 records. We have included 163 records from other collectors. We have added 223 records in the United States National Museum based on ants determined by the late Dr. M.R. Smith and 104 records in the Natural History Museum of Los Angeles County, courtesy of R.R. Snelling. The remainder are records included from the literature only.

### KEYS

Illustrated keys are provided wherever useful. The only labels on these key figures are the couplet numbers illustrated by the figures. Some significant part of a figure may be empha-

sized by an arrow. Unless otherwise specified our keys refer to workers only. In dimorphic or polymorphic species the largest workers are needed for identification. Furthermore, it must be understood that these keys refer only to the species recorded from Nevada or to those whose ranges indicate that they might occur here; the latter are marked with an asterisk.

## PLAN OF SPECIES ACCOUNTS

The heading for each species is its binomen (in italics), i.e., generic name followed by the species name; this is followed by the name of the author of the species (in roman type).

## WORKER

Our first paragraph is a superficial description of workers including only size, color, and sheen. Definitive structural or anatomical characteristics are given in the keys. It is difficult to measure precisely the length of an ant so we give only a rough approximation of size: minute = less than 2 mm long; small = 2–4 mm long; medium-sized = 4–6 mm long; large = 6–8 mm long; very large = 8–14 mm long. In describing color we have used the Munsell soil color charts. In our previous books (Wheeler and Wheeler, 1963, 1973) we have used the Munsell color formulas as well as the names, but no one has evinced an interest in the use of the system; hence we omit the formulas and use only the Munsell color names.

## RANGE

This is the entire known geographic distribution of the species.

## LITERATURE NOTES

For some statements we have cited references; otherwise we regard the information as general knowledge. We have not attempted a complete review.

## NEVADA NOTES

These summarize information about species in Nevada: number of records, number of localities, elevational range, distribution by biomes, nest, and behavior. These notes are based largely on our collections; other collectors have given scant information or none.

Photographs of the nests of some species are reproduced near the Nevada notes sections. Cards in the photographs of ant nests measure 3 × 5 inches (7.6 × 12.7 cm).

## NEVADA LOCALITIES

The first information given is the number of the distribution map for the species in Appendix 2. We have shown with spots all the cited localities. A spot may cover several localities, as its diameter on the map is approximately 10 mi. In the Wassuk Range, for example, in traveling 7 horizontal miles one might ascend from 4,000 to 11,000 ft. It is impossible to show both distance and elevation on the same small map. Therefore, at the end of our treatment of each species we have given the elevation (in feet above sea level) after each locality, provided it was furnished by the collector.

For common and widely distributed species collected at more than 35 localities, we have not listed the localities, but all are indicated on the appropriate maps. Complete locality information for these species is on file at the LACM and will be furnished on request by R.R. Snelling.

The designation of localities where collections were made in Nevada presents problems not encountered in the more thickly settled portions of the country. The easiest way to describe a locality is to give its distance and direction from the nearest town, but towns in Nevada are few and scattered. In some designations we have used the legal description for the locality, but some of the wildest parts of the state have never been surveyed.

We have found the metric system preferable for small measurements, e.g., the length of ants and the size of their mounds. But for horizontal distances of locations and elevations above sea level we use the English system exclusively because the entire United States has been mapped in this manner in contour by the Army Map Service. Equivalent metric maps are not available.

**ABBREVIATIONS AND SYMBOLS.** Co. = County; Hwy. = Highway; Mon. = Monument; Nat. = National; nr = near; Ra. = Range; Rd. = Road; Sta. = Station. Compass directions are represented by the symbols N, E, S, and W and various combinations thereof. They are understood to be followed by the word “of,” e.g., “5 mi. WSW Reno” would be read aloud as “five miles west-southwest of Reno.” For those not familiar with the legal description of land we recommend some American treatise on surveying or our 1963 book (pp. 76–77). As an example of such a designation we cite the locality in the Sheep Range in Clark County. The complete designation would be: section 7, Township 17 South, Range 61 East. This would be ordinarily abbreviated sec. 7, T. 17 S., R. 61 E. All ranges in Nevada are east, but townships may be north or south. [The dividing line between T-N and T-S is the Mt. Diablo Base Line at approximately 37°52' north latitude.] **CAUTION:** The use of “range” in legal descriptions has no relation whatsoever to mountain ranges nor to the distribution of a species. To save space we have dispensed with all unnecessary punctuation and abbreviations: 7-17S-61. If we did not know the section, it would be: -17S-61.

**REFERENCES.** For anyone who wishes to make a detailed study of Nevada localities the following publications by the Nevada Department of Transportation, Carson City 89712, are indispensable: “Directory of Geographic Names in Nevada” and “Nevada Map Atlas.” The following topographic maps of the United States Geological Survey (1:250,000 series) are very useful: Caliente, Death Valley, Elko, Ely, Goldfield, Kingman, Las Vegas, Lovelock, Lund, McDermitt, Mariposa, Millett, Reno, Tonopah, Vya, Walker Lake, Wells, and Winnemucca.

**PROBLEM LOCALITIES.** 1. Little Valley—This frequently mentioned locality needs special treatment since there are three different valleys in Washoe County with this name. Our records always refer to T. 16 N., R. 19 E., sec. 5, 8, 17, 18, 19, 20, in the Carson Range about 20 mi. south of Reno.

2. Mummy Mountain—This mountain will not be named

on some maps. It is in the Spring Mountains in Clark County, 4 mi. NE Charleston Peak, and is in T. 19 S., R. 56 E., sec. 12 and 13.

3. Murry Summit—It is in White Pine County and is spelled correctly; it is *not* Murray, as one would expect.

4. Ormsby County—This county no longer exists as a political entity. In 1969 it was merged with Carson City and became incorporated as Carson City. Nevertheless, we find it necessary and convenient to retain the name Ormsby County for historical reasons: many older records cite Ormsby County and for some that is the only locality. Also we have retained it in the list of records and on the maps to avoid the confusion that would result if a city were equated with the 16 other Nevada counties.

### THE BIOMES OF NEVADA

This section is a basis for the study of the ecology of the ants of Nevada and has been compiled from: Billings, 1954; Cronquist et al., 1972; Jaeger, 1957; Munz and Keck, 1965; Munz, 1968; Odum, 1971; Shelford, 1963.

Any large terrestrial area may be divided on the basis of easily recognizable plant communities into biomes. A biome is named from the life form of the climax vegetation (grassland, desert, deciduous forest, etc.). The climax is that community of plants which is self-perpetuating and in equilibrium with the environment (Odum, 1971:264). A biome also has its characteristic fauna which for many kinds of animals is largely determined by the plants. For ant species characteristic of each biome see the section on Bionomics. Odum recognized 10 biomes for North America, but only four are found in Nevada: Alpine, Coniferous Forest, Pinyon-Juniper, and Desert (see Fig. 1).

The climax vegetation which identifies a biome is called the *climatic* climax. This differentiates it from the small areas of subclimaxes which exist within the biome and which may never reach climatic climax for various local causes, e.g., physiographic climaxes (illustrated by the differences between the adjacent north-facing and south-facing slopes) and edaphic climaxes, which are determined by the soil.

### THE ALPINE BIOME

The most northern biome is the circumpolar Tundra. Tundra-like areas also occur on high mountains in the Temperate Zone where they are called Alpine Tundra or Alpine Meadow biomes; we use the term Alpine. In Nevada such areas are small and scattered above the tree line on the summits of a few of the higher mountain ranges above 10,000 ft., such as Deep Creek, East Humboldt, Grant, Ruby, Schell Creek, Snake, Spring, Toiyabe, Toiyabe, Wassuk, and White ranges (see Fig. 2).

The vegetation of the Alpine Biome consists typically of low perennial grasses, sedges, and forbs. There is greater variation in the floristic composition of this biome, from one range to another, than in any other biome. Endemism is conspicuous: many species have evolved in place and have not migrated from boreal regions. For example, the Nevada primrose (*Primula nevadensis*) is an endemic that occurs only

on high limestone ridges in the southern Snake and Grant ranges.

We suspect that the bristlecone pine (*Pinus longaeva*) and limber pine (*P. flexilis*) forests (especially the older ones) should be regarded as ecotone between the Alpine and the Coniferous Forest biomes because they are so open. This zone is best developed between 9,500 ft. and timberline (about 10,500 ft.). The trees are 30–50 ft. (9–15 m) tall at the lower limit, to krumholtz at timberline (see Fig. 3).

### THE CONIFEROUS FOREST BIOME

The Coniferous Forest Biome (see Fig. 4) comprises the broad transcontinental belt of coniferous forest extending across Canada and Alaska with southward extensions in the mountains of the eastern and western United States. In Nevada “the mountain ranges receive more precipitation than the lowlands, resulting in the development of forests and rich meadows and in the production of streams and lakes. The storms tend to precipitate increasing amounts of moisture with increase in altitude. The gradient in annual precipitation can be as great as from four inches on the valley bottom to 30 inches on or near the mountain top just a few miles away. This precipitation gradient is reflected in the density of vegetation. Also there is a gradient between the warm valley temperature and the cold alpine or subalpine temperature. Together these climatic differences, along with the edaphic and topographic features, influence the composition of species, and relatively distinct altitudinal zones can be recognized” (Cronquist et al., 1972:131).

The following list of the principal trees will suffice to characterize the Coniferous Forest Biome: white fir (*Abies concolor*), alpine fir (*A. lasiocarpa*), red fir (*A. magnifica*), incense cedar (*Calocedrus decurrens*), Engelmann spruce (*Picea engelmannii*), whitebark pine (*Pinus albicaulis*), limber pine (*P. flexilis*), Jeffrey pine (*P. jeffreyi*), bristlecone pine (*P. longaeva*), western white pine (*P. monticola*), lodgepole pine (*P. murrayana*), ponderosa pine (*P. ponderosa*), Douglas fir (*Pseudotsuga menziesii*), and mountain hemlock (*Tsuga mertensiana*).

### THE PINYON-JUNIPER BIOME

This biome (see Figs. 5, 6) is larger in area in Nevada than the Coniferous Forest Biome. It is usually restricted to the lower slopes of mountain ranges, but there are many basins in eastern Nevada whose floors are high enough for these woodlands to form a continuous expanse from range to range. It usually occurs between 5,000 and 8,000 ft., with the lower limit determined by the annual precipitation which must average at least 12 inches (30.5 cm) (Cronquist et al., 1972:127).

The pinyon-juniper woodland consists of evergreen conifers which rarely exceed 18 ft. (6 m) in height. The woodland is usually open, the trees being far enough apart for their branches not to touch. At high elevations, however, the branches may come in contact. The understory may comprise a variety of plants (including sagebrush); often, however, the ground is nearly bare. Incorporated within the pinyon-juniper



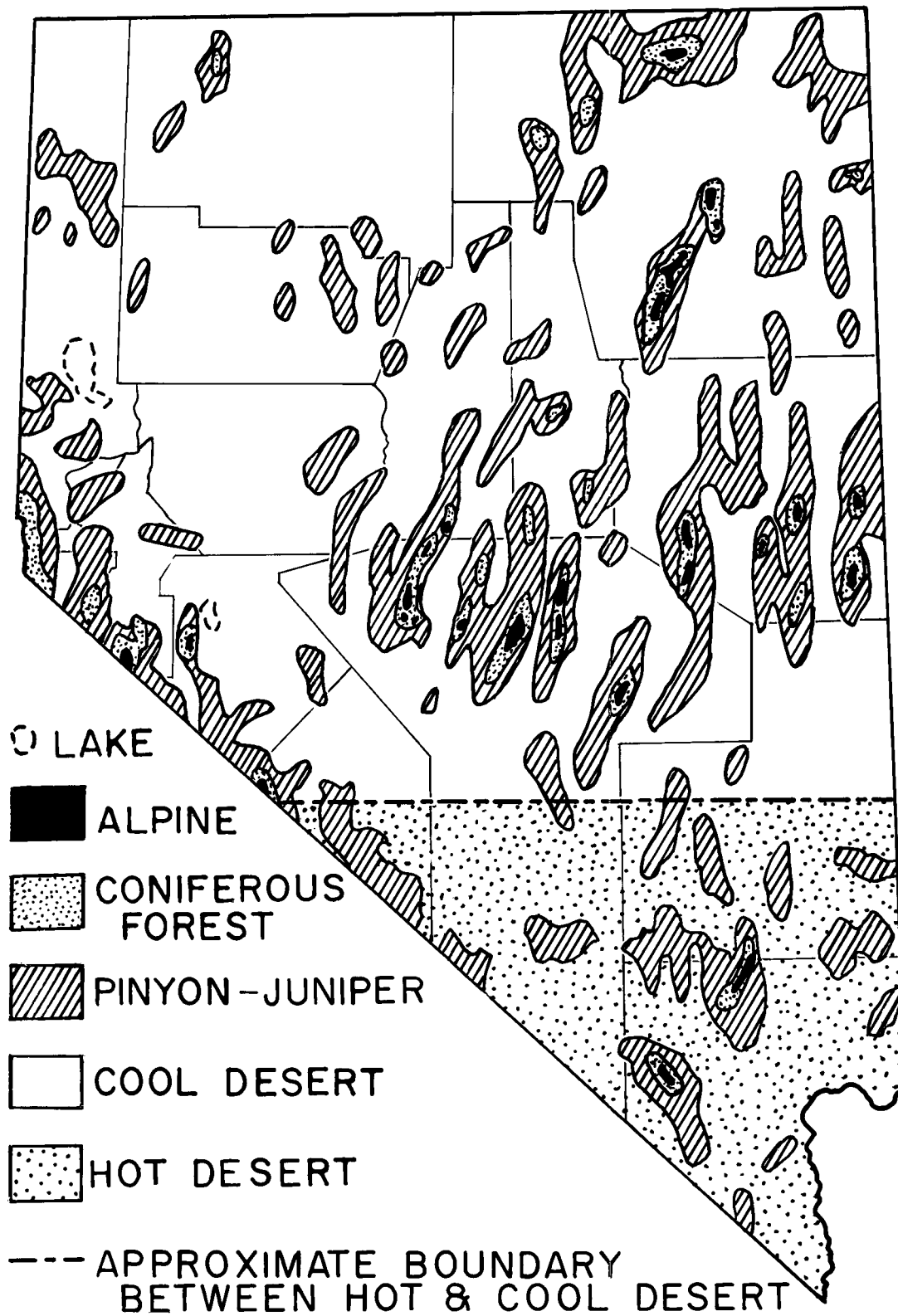


Figure 1. Biomes in Nevada. (Adapted from Houghton, Sakamoto, and Gifford, 1975.)

niper woodland one often encounters dense stands of mountain mahogany (*Cercocarpus ledifolius*).

The most widespread pine is single-leaf pinyon (*Pinus monophylla*), although the common pinyon (*P. edulis*) occurs in the eastern part of the state. The most common juniper is the Utah juniper (*Juniperus osteosperma*). In the extreme northwestern part of the state it is replaced by the western juniper (*J. occidentalis*).

## THE DESERT BIOME

A desert is a region characterized by high summer daytime temperatures, strong winds, and scant rainfall with usually less than 10 inches (25 cm) a year, which is irregularly distributed. The vegetation is sparse, widely spaced, and usually shrubby.

In North America the Desert Biome extends across the western United States and adjacent Mexico. Odum (1971) divided this biome into the Cool Desert and the Hot Desert. The Cool Desert comprises the Great Basin and the Painted Desert where winters are cold: sagebrush (*Artemisia tridentata*) is the index species. The remainder of the North American Desert Biome is called Hot Desert. Here the rainfall ranges from 3 to 12 inches (7.6–30 cm) and the temperature is generally warm throughout the year; the index species is larrea (*Larrea tridentata*) (also called creosote bush). Jaeger (1957) divided the Hot Desert into three parts: the Mojave, the Sonoran, and the Chihuahuan deserts. Of these, only the Mojave Desert occurs in Nevada, extending from the southern tip of the state up to the 37th Parallel. Its index species is the Joshua tree (*Yucca brevifolia*), which occurs only at elevations above 3,500 ft.

**THE COOL DESERT.** "The Great Basin is the bleakest of the American deserts; the landscape is monotonous and almost completely devoid of trees, except along the occasional watercourses where willows and cottonwoods manage to grow" (Farb, 1963:238).

The vegetation of the Cool Desert is largely shrubby. The shrubs grow slowly and tend to uniformity in shape and size, ranging from 2 to 7 ft. (60–130 cm) in height. Usually they are not close enough together for their branches to touch and less than half the area is shaded by their crowns (10% in shadscale but up to 85% in sagebrush). The ground between is usually bare, but may support a few clumps of grasses; after a wet spring the soil may be covered with small annuals.

The most common shrubs are sagebrush (*Artemisia tridentata*) (see Figs. 7, 8, 9) and shadscale or saltbush (*Atriplex confertifolia*). Other common shrubs are saltbush (*Atriplex* spp.), sagebrush (*Artemisia spinescens*), Mormon tea (*Ephedra nevadensis*), winterfat (*Ceratoides lanata*), boxthorn (*Lycium cooperi*), *Tetradymia* spp., and hop-sage (*Grayia spinosa*). The principal herbs are ricegrass (*Oryzopsis hymenoides*), galleta (*Hilaria jamesi*), speargrass or needlegrass (*Stipa speciosa*), and globemallow (*Sphaeralcea* spp.). Cacti are uncommon.

Most Cool Desert plants are perennials. This makes possible a moderately large plant after only small increments of annual growth. Annuals must reproduce very early in the

spring when sufficient moisture is available to complete their life cycle.

Sagebrush is dominant on alluvial fans and other places where the soil is porous and well drained, so that most of the salt has leached out. Shadscale, or saltbush, thrives on fine sand and clay containing some salt. Shadscale occupies habitats too warm and/or dry for sagebrush.

Sagebrush is the common undercover shrub in the Pinyon-Juniper Biome, so that it is often difficult to determine whether one is in ecotone or biome. Sagebrush may extend to elevations as high as 10,000 ft.

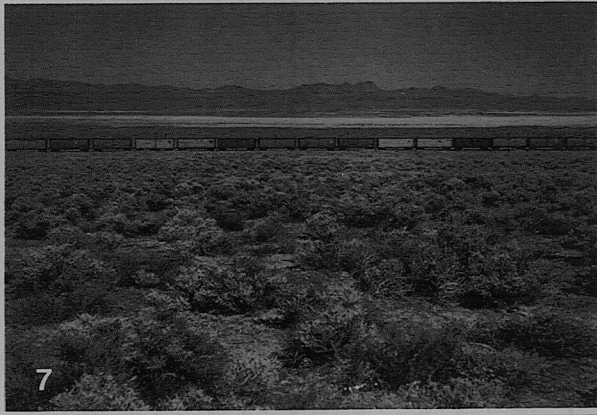
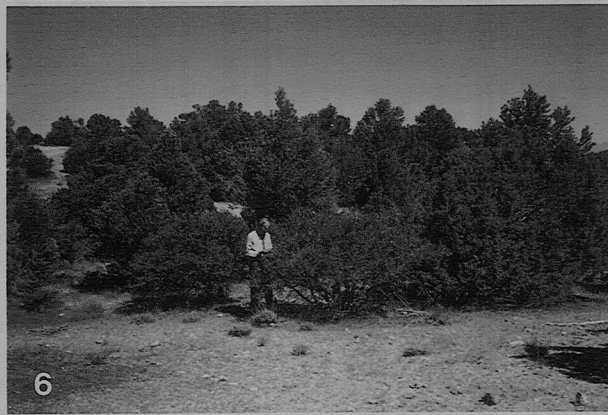
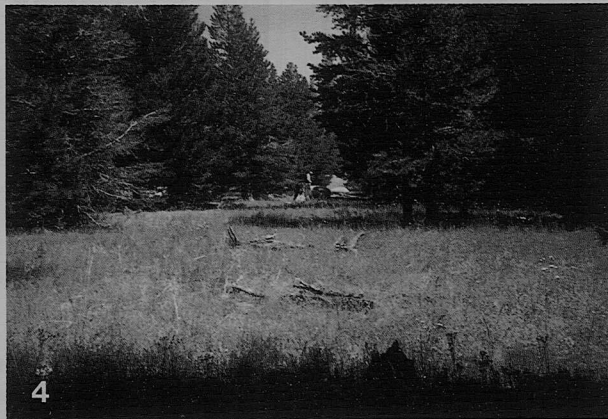
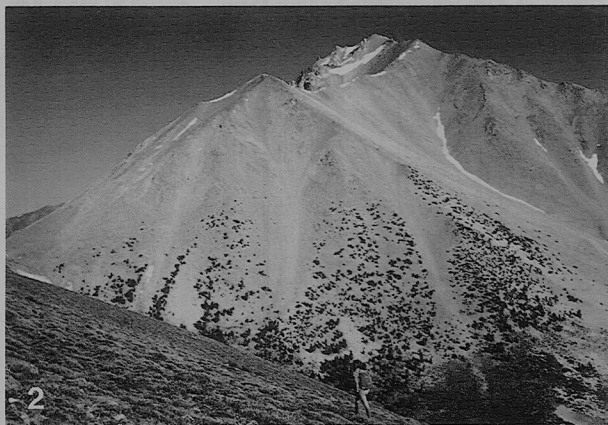
Several other edaphic subclimaxes occur in the Cool Desert. Greasewood (*Sarcobatus vermiculatus*) (see Fig. 10) is the principal phreatophyte in saline soils and is often found in pure stands, but strangely it is the least tolerant of saline water. "In this association the plants are usually evenly spaced, 4 to 7 feet (1.2 to 2.1 meters) apart, and range from 2 to 5 feet (0.6–1.5 meters) in height. They are green during the growth period, and when in full leaf or fruit present a luxuriant appearance, contrasting sharply with the gray of shadscale or the silvery gray of sagebrush. Land of this type contains harmful amounts of salt, and usually has a high water table during at least a part of the year" (Schantz, 1925:20).

Sand dunes are numerous. A few are active and very large. Most are partly stabilized. If the sand is less than 10 ft. deep, the community is dominated by indigo bush (*Dalea polyadenia*) and Indian ricegrass (*Oryzopsis hymenoides*).

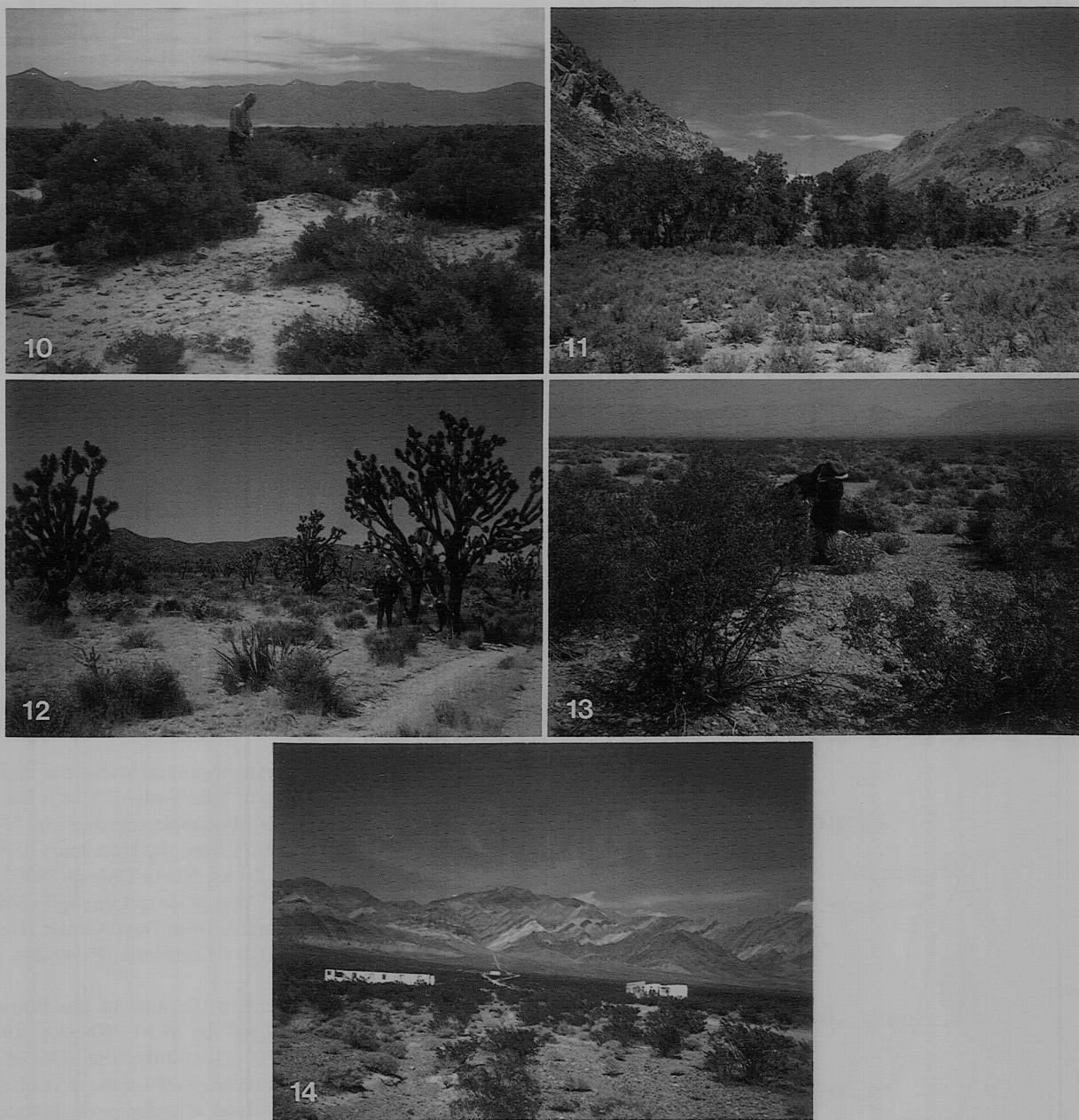
**THE HOT DESERT.** "When the traveler approaching the southwestern borders of the Great Basin Desert encounters his first Joshua tree, he can be sure as though there had been a boundary marker that he has reached the Mohave. . . . John C. Frémont, in 1844, . . . labelled it 'the most repulsive tree in the vegetable kingdom.' . . . To the Mormon colony of California, setting out across the Mohave to join the main group in Utah, these branches appeared to be arms urging them across the searing desert to a promised land; to their eyes the tufts of shaggy leaves somewhat resembled the beard of an Old Testament patriarch. So they named this strange, gesticulating plant Joshua, after the leader of the children of Israel into the land of Canaan" (Farb, 1963:241).

We have a better suggestion for the traveler: drive southward on U.S. Highway 95; about 7 mi. south of Tonopah the first Joshua tree is found, though it may not be recognized as such: it looks more like a short, stout post. Twenty-three miles south of Goldfield the first larrea is seen, assuring the traveller that he has reached the Hot Desert. We regard the previous 30 mi. as ecotone between the Cool and Hot deserts. Joshua tree is considered to be the index species of the Mojave Desert (see Fig. 12).

The most characteristic shrub of the Mojave Desert is larrea, the index species for the entire Hot Desert (see Figs. 13, 14). It is a bronze-green shrub with small evergreen leaves; it stands 0.5–1.5 m high and is widely spaced. The low gray bur-sage (*Ambrosia dumosa*) is the common understory shrub. The Mojave also differs from the Cool Desert in the greater abundance of yucca and cacti in both species and individuals. It also lacks the saguaro (*Carnegiea gigantea*) and the palo verde (*Cercidium floridum*, *C. microphyllum*) of the Sonoran





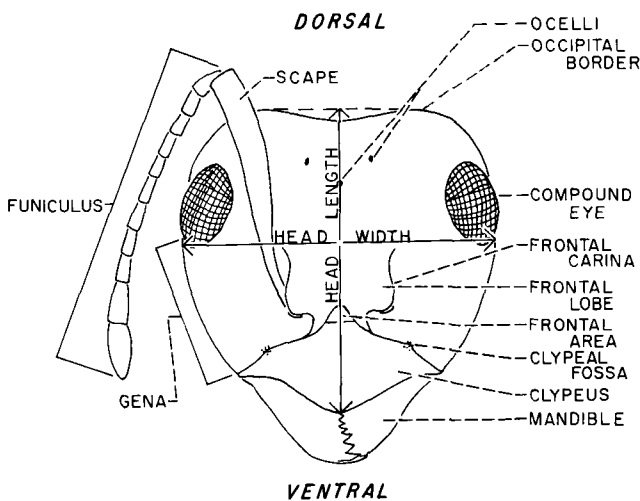
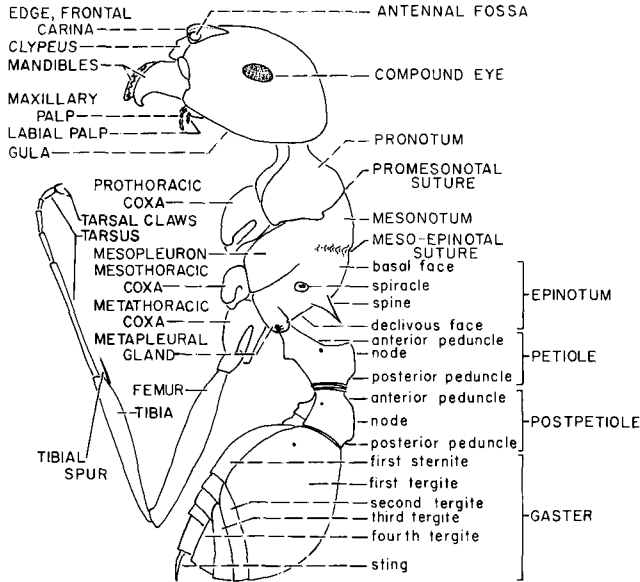


**Figures 10-14.** 10, Cool Desert, *Sarcobatus* Subclimax. The shrubs are greasewood (*Sarcobatus vermiculatus*). Humboldt County, Black Rock Desert; 11, Cool Desert, cottonwood subclimax. A cottonwood (*Populus fremontii*) grove. Nye County, Toiyabe Range, Peavine Creek Canyon; 12, Hot Desert. The trees are Joshua trees (*Yucca brevifolia*). Clark County, west of Searchlight; 13, Hot Desert. The shrubs are larrea (*Larrea tridentata*). Note the wide spacing. Nye County, 7 mi. south of Beatty; 14, Hot Desert. The shrubs are larrea (*Larrea tridentata*). The ruins are an unnamed ghost town about 7 mi. south-southeast of Beatty. In the background is Bare Mountain.

←

**Figures 2-9.** 2, Alpine Biome on Boundary Peak. Photograph by Al McLane; 3, Ecotone below the Alpine Biome. The trees are bristlecone pines (*Pinus longaeva*). Wheeler Peak in White Pine County; 4, Coniferous Forest Biome. Little Valley in Washoe County; 5, Pinyon-Juniper Biome on hillside in background. Note the wide spacing of the trees. In the foreground is a luxuriant stand of sagebrush. Douglas County, 13 mi. southeast of Minden; 6, Pinyon-Juniper Biome. In Storey County, 3 mi. north of Virginia City; 7, Cool Desert. The shrubs are sagebrush (*Artemisia tridentata*). Note the wide spacing. Beyond the freight train is a playa and there are mountains in the background; 8, Cool Desert. An unusually luxuriant growth of sagebrush (*Artemisia tridentata*). Some of the plants attained the height of about 6 ft. (2 m). Elko County, 8 mi. northwest of Jarbidge; 9, Cool Desert. Stunted sagebrush (*Artemisia tridentata*). The plants with white flowers are bitterroot (*Lewisia*). Humboldt County, 34 mi. northeast of Vya.

## GLOSSARY



Desert, but the ocotillo (*Fouquieria splendens*) gets into the extreme southern tip of Nevada. The Mojave soils are light (often pinkish) in color and often covered with a conspicuous gravelly desert pavement.

After sufficient winter precipitation the bare ground between and under shrubs will be carpeted with annuals in the early spring months: sand verbena (*Abronia*), evening prim-

rose (*Oenothera*), heliotrope (*Phacelia*), tickseed or coreopsis (*Coreopsis*), California poppy (*Eschscholzia*), gilia (*Gilia*), etc. These disappear with hot dry weather in May. In rocky terrain brittle-bush or incienso (*Encelia*), yucca (*Yucca*), and krameria (*Krameria*) are common. Species of *Atriplex* are found in saline soils. The principal phreatophyte is mesquite (*Prosopis*), which depends upon groundwater at depths of 50 ft. or more.

Cottonwood (*Populus*) (see Fig. 11), willow (*Salix*), desert willow (*Chilopsis*), and baccharis (*Baccharis*) may occur along permanent streams and near springs or in areas where permanent water is present near the surface. These comprise the Riparian or Fluvial subclimax community, and often this community includes species not found elsewhere within the Hot Desert.

## GENERAL PUBLICATIONS ABOUT ANTS

For the taxonomy of Nearctic ants, Creighton's "The Ants of North America" (1950) is the standard work. Its great value is attested by the fact that it soon rendered itself obsolete in many genera, i.e., it made possible numerous generic revisions and the discovery of new species. It should not be used for the following genera: *Neivamyrmex*, *Pseudomyrmex*, *Acanthomyops*, *Lasius*, *Crematogaster*, *Myrmecocystus*, *Pheidole*, *Pogonomyrmex*, *Stenamma*, and *Veromessor*, nor for the *fusca* group of *Formica*. Otherwise, it is still essential.

D.R. Smith (1979) cites references about species and gives ranges.

For information about ants in general and about methods of studying them, we suggest "The Ants of North Dakota" (Wheeler and Wheeler, 1963) obtainable, together with "North Dakota Ants Updated" (1977), from the University of North Dakota Bookstore, Grand Forks, North Dakota 58202. For the desert ants we suggest "Ants of Deep Canyon" (Wheeler and Wheeler, 1973), obtainable from Boyd Center, Department of Biology, University of California, Riverside, California 92502.

For a scholarly treatment of the ants of the World we recommend the classic "Ants" by W.M. Wheeler (1910a). Although published in 1910, it is still the best. (Out of print for many years, but reprinted several times, it is often incorrectly cited by a reprint date; Wheeler never revised it.)

Ants are given a more recent treatment by Wilson (1971) in "The Insect Societies."

The species of the California deserts, including some of those found in Nevada, are treated by Snelling and George (1979) in a report that is not generally available.

## GLOSSARY

**ABDOMEN.** The hindmost of the 3 body regions, or tagmata, of an insect; in ants it is subdivided into epinotum, petiole, gaster.

**ANTENNAL FOSSA.** The depression in which the antenna is attached.

**CASTE.** The various forms of mature individuals among social insects. The female castes are reproductives and

- workers; the egg-laying reproductives in a colony are termed "queens." Potential female reproductives are called "winged females." Workers are usually sterile wingless females. See **QUEEN** and **SUBCASTE**.
- CHEEK**. See **GENA**.
- CI (CEPHALIC INDEX)**. Head width  $\times$  100/head length.
- EPINOTUM**. The 1st abdominal somite is firmly fused to the thorax in many Hymenoptera; in ants this segment is called the epinotum. See **PROPODEUM**.
- FACET**. One of the divisions of the surface of the compound eye.
- FLEXOR SURFACES**. The surfaces brought closer together when a jointed structure is flexed at a joint.
- FRONT (FRONS)**. The facial area above the clypeus and between the frontal carinae; dorsally it passes without definite boundary into the vertex.
- FUNICULUS**. All that portion of the antenna distal to the scape; it is composed of numerous short segments.
- GASTER**. The hindmost body region or tagma of an ant (i.e., the subovoid portion posterior to the pedicel).
- GENA** (pl. **GENAE**). The lateral portion of the head between the eye and the insertion of the mandible and from the frontal carina to the gula.
- GULA**. The posterior surface of the head.
- HAIR**. This term is loosely used in entomology; in general, a hair is isolated, somewhat stiff and more or less erect. A downy covering of fine soft hairs which generally lie against the integument is called "pubescence."
- HYPOGNATHUS**. Having the head vertical and the mouth directed ventrally, as in ants.
- INDEX SPECIES**. A plant or animal species so well adapted to its habitat that it rarely occurs elsewhere and hence can be used as an indicator of that habitat, although it may not necessarily be found in all parts thereof.
- INFUSCATED**. Darkened.
- LABRUM**. The upper lip in insects, a movable sclerotized plate attached to the ventral border of the clypeus; vestigial in ants and not visible in anterior view.
- LARREA**. A common name for *Larrea tridentata*, also known as creosote bush.
- MAJOR (WORKER)**. A worker of the largest subcaste.
- MEDIA (WORKER)**. A worker of intermediate size between major and minor.
- MESO-EPINOTAL SUTURE**. The transverse seam separating mesonotum and epinotum.
- MESONOTUM**. The dorsal surface of the mesothorax.
- MESOPLEURON** (pl. **MESOPLEURA**). Lateral surface of the mesothorax.
- MINOR (WORKER)**. A worker of the smallest subcaste.
- MYRMECOLOGY**. The division of entomology that deals with ants.
- MYRMECOPHILOUS**. Ant-loving.
- OCCIPITAL**. Pertaining to the occiput or uppermost part of the head.
- OI (OCULAR INDEX)**. The longest diameter of the eye  $\times$  100/head width.
- PEDICEL**. The 1 or 2 somites between the thorax and the gaster which are much reduced and in ants bear either a node or scale.
- PETIOLE**. A pedicel formed of only 1 segment; or, the 1st segment of a 2-segmented pedicel.
- PHREATOPHYTE**. A deep-rooted plant that obtains its water from the water table or the layer of soil just above it.
- POLYCALIC**. Having many homes or nests (= polydomous, an incorrectly derived term).
- POSTPETIOLE**. The 2nd segment of a 2-segmented pedicel.
- PROMESONOTAL SUTURE**. The transverse seam separating the pronotum from the mesonotum.
- PRONOTUM**. The dorsal surface of the prothorax.
- PROPODEUM**. A term used elsewhere in the Hymenoptera for the area here called **EPINOTUM**, and now used by some myrmecologists. We prefer to use the traditional term.
- PSAMMOPHORE**. The fringe of long hairs on the posterior surface of the head (found in some harvesting ants and honey ants).
- PUBESCENCE**. A covering of fine soft hairs, usually lying on the surface of the integument.
- PUNCTATE**. Dotted with minute shallow impressions. Punctuation is common on the integument of ants.
- PYGIDIUM**. The tergite of the last somite of the gaster.
- QUEEN**. An actively reproductive female in a colony of social insects; an inappropriate anthropomorphism in ants.
- SCAPE**. The elongate basal segment of the antenna.
- SCAPE LENGTH**. The straight length of the scape from apex to base, excluding the condyle.
- SCROBE**. A groove for the reception of an appendage.
- SCULPTURE**. The relief pattern (elevations and/or depressions) on the surface of the body of an insect.
- SI (SCAPE INDEX)**. Scape length  $\times$  100/head length (*sensu* Snelling, 1976, not Wilson, 1955 and others).
- SOMITE**. A body segment of the adult insect.
- SPECIES**, *caution*—"species" is both singular and plural.
- STERNITE (STERNUM)**. The ventral sclerite of a somite.
- SUBCASTES**. The various forms of the mature individuals of a caste. Subcastes of the worker caste in ants are termed major (or soldier), media, and minor.
- TAGMA** (pl. **TAGMATA**). One of the major divisions of the arthropod body. A tagma results from the embryonic fusion of 2 or more somites. The tagmata of an ant are head, thorax, pedicel, and gaster.
- TERGITE (TERGUM)**. The dorsal sclerite of a somite.
- THORAX**. Whenever the term thorax is applied to ants, it should be understood to mean the 2nd tagma of the body; it comprises the prothorax, mesothorax, metathorax, and epinotum.
- VERTEX**. The top of the head below the occiput and above the eyes and front.



## THE NEVADA ANT FAUNA

The ants of Nevada are listed in Table 1 by their scientific names. The scientific names of organisms consist of two parts; they may be derived from Latin or may be in Latinized form from another language and both names are printed in italics. The first part is the generic name (e.g., *Pogonomyrmex*, *Tapinoma*, *Formica*, etc.); the generic name is always capitalized and may be abbreviated in general discussions of species, once the genus being discussed has been established (thus, *Pogonomyrmex* may be abbreviated when discussing *P. barbatus* and *P. californicus*).

The second part of the scientific name is that of the species. This name is, in zoological literature, never capitalized, even though it may be based on a proper noun, such as a person's surname. The specific name is always fully spelled out. Within a genus, a species name may be used only for a single species. For example, there is only one species to which the name *Pogonomyrmex occidentalis* may be applied. If a taxonomist inadvertently describes a previously unnamed species as *P. occidentalis*, new species, the name is invalid (preoccupied) and a new name must be proposed for the second species.

It may also transpire that a genus or species may be described more than once as new under different names. When such cases are recognized the oldest available name is the name to be used and all subsequent names for that taxon are synonyms. Thus, *Myrmica incompleta*, described in 1881, has also been described as *M. brevinodis* (1895), *M. canadensis* (1907), and *M. subalpina* (1907). All these names apply to the same taxon, but *M. incompleta*, being the first proposed name, has priority and therefore is the correct name to be used. When a name is formally placed in synonymy for the first time, it is marked N. SYN. or NEW SYNONYMY.

Populations of widely distributed species may be different from one part of the range to the next and these different populations have often been formally named as subspecies or varieties, such as *Pheidole californica pyramidensis*. Since these variants usually grade evenly from one form to the next, we do not recognize them as being substantially different and treat them as synonyms. A few seem to be consistently different (do not intergrade) from the "typical" form;

these we treat as valid species (e.g., *Formica planipilis*, previously believed to be a subspecies of *F. integroides*).

A final component of a name may be that of its author (the original describer). The name of the author ordinarily appears only at the first mention of the name, is never italicized, and is always capitalized. If an author's name appears in parentheses, it means that the species was originally described in a genus other than that in which it is now placed: *Pogonomyrmex barbatus* Emery was described in *Pogonomyrmex*, but *P. occidentalis* (Cresson) was first described as a species of *Myrmica* and later transferred to *Pogonomyrmex*. The author of a generic name is never placed in parentheses.

The list in Table 1 gives only the name and the author. Indented names preceded by an equal sign (=) are nomenclatural synonyms of the valid name preceding, i.e., these are names proposed by other authors but now considered invalid for various reasons. Further detailed information on names has been given by D.R. Smith (1979).

### Family Formicidae

Ants belong to the family Formicidae—all ants and only ants. They are distinguished from other families of the order Hymenoptera by the following combination of characters: social insects, with the reproductive individuals usually winged and the worker caste female and wingless; antennae sharply elbowed, with the basal segment very long in females; abdominal pedicel of one or two somites, each with a dorsal swelling (which may be scale-like); ovipositor a sting or lacking; mouth parts chewing-lapping; an infrabuccal pocket opening immediately behind the mouth; metapleural glands present; carnivorous, fungivorous or omnivorous. [The most useful of these characters is the dorsal swelling on each somite of the pedicel.]

The family is subdivided into 10 subfamilies, five of which are represented in Nevada: Ponerinae, Dorylinae, Myrmicinae, Dolichoderinae, and Formicinae; two others (indicated by \* in the keys) may occur in the state, but they have not yet been reported. In Nevada the Formicinae are the most numerous both in species and in individuals; the Myrmicinae are a close second; the Dolichoderinae have few

Table 1. The Nevada ant fauna.

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Family Formicidae
Subfamily Ponerinae
Genus <i>Amblyopone</i> Latreille
<i>pallipes</i> (Haldeman)
= <i>serratum</i> Roger
= <i>binodosus</i> Provancher
= <i>wheeleri</i> Santschi
= <i>arizonense</i> W.M. Wheeler
= <i>montigena</i> Creighton
= <i>subterranea</i> Creighton
Genus <i>Hypoponera</i> Santschi
<i>opaciceps</i> (Mayr)
= <i>perkinsi</i> Forel
= <i>andrei</i> Emery
<i>opacior</i> (Forel)
Subfamily Dorylinae
Genus <i>Neivamyrmex</i> Borgmeier
<i>californicus</i> (Mayr)
= <i>obscura</i> Forel
<i>minor</i> (Cresson)
<i>nyensis</i> Watkins
Subfamily Myrmicinae
Genus <i>Myrmica</i> Latreille
<i>americana</i> Weber
<i>brevispinosa</i> W.M. Wheeler
= <i>decedens</i> W.M. Wheeler
<i>emeryana</i> Forel
= <i>latifrons</i> Starcke
<i>fracticornis</i> Emery
<i>incompleta</i> Provancher
= <i>brevinodis</i> Emery
= <i>canadensis</i> W.M. Wheeler
= <i>subalpina</i> W.M. Wheeler
<i>lobifrons</i> Pergande
= <i>glacialis</i> Forel
<i>tahoensis</i> W.M. Wheeler
Genus <i>Manica</i> Jurine
<i>bradleyi</i> (W.M. Wheeler)
= <i>calderoni</i> Forel
<i>hunteri</i> (W.M. Wheeler)
= <i>aldrichi</i> W.M. Wheeler
<i>mutica</i> (Emery)
Genus <i>Pogonomyrmex</i> Mayr
Species Group <i>barbatus</i>
<i>apache</i> W.M. Wheeler
= <i>sancti-hyacinthi</i> W.M. Wheeler
<i>colei</i> Snelling
<i>rugosus</i> Emery
= <i>fuscatus</i> Emery
= <i>marfensis</i> W.M. Wheeler
= <i>similis</i> Olsen

---

Table 1. Continued.

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= <i>curvispinosus</i> Cole
= <i>spadix</i> Cook
Species Group <i>occidentalis</i>
<i>brevispinosa</i> Cole
<i>occidentalis</i> (Cresson)
= <i>seminigra</i> Cresson
= <i>opaciceps</i> Mayr
= <i>ruthveni</i> Gaige
= <i>utahensis</i> Olsen
<i>owyhee</i> Cole
<i>salinus</i> Olsen
<i>subdentatus</i> Mayr
<i>subnitidus</i> Emery
Species Group <i>maricopa</i>
<i>californicus</i> (Buckley)
= <i>estebaninus</i> Pergande
= <i>longinodis</i> Emery
= <i>hindleyi</i> Forel
= <i>nitratu</i> s Cook
<i>magnacanthus</i> Cole
<i>maricopa</i> W.M. Wheeler
= <i>barnesi</i> M. Smith
= <i>sinaloanus</i> Olsen
Genus <i>Ephebomyrmex</i> W.M. Wheeler
<i>imberbicus</i> W.M. Wheeler
= <i>townsendi</i> W.M. Wheeler
Genus <i>Stenamma</i> Westwood
<i>diecki</i> Emery
= <i>impressum</i> Emery
<i>heathi</i> W.M. Wheeler
<i>smithi</i> Cole
= <i>knowltoni</i> Gregg
<i>wheelerorum</i> Snelling
Genus <i>Aphaenogaster</i> Mayr
<i>boulderensis</i> M. Smith
<i>cockerelli</i> (E. André)
= <i>sonorae</i> Pergande
<i>megommata</i> M. Smith
<i>occidentalis</i> Emery
= <i>borealis</i> W.M. Wheeler
= <i>manni</i> W.M. Wheeler
<i>uinta</i> W.M. Wheeler
Genus <i>Veromessor</i> Forel
<i>andrei</i> (Mayr)
= <i>flavus</i> Wheeler and Creighton
= <i>castaneus</i> Wheeler and Creighton
<i>lariversi</i> M. Smith
<i>lobognathus</i> (Andrews)
<i>pergandei</i> (Mayr)
<i>smithi</i> Cole

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Table 1. Continued.

Genus *Pheidole* Westwood

- barbata* W.M. Wheeler
- californica* Mayr
  - = *incenata* W.M. Wheeler
  - = *satura* W.M. Wheeler
  - = *nevadensis* W.M. Wheeler
  - = *pyramidensis* Emery
- cerebrosior* W.M. Wheeler
- ceres* W.M. Wheeler
- clydei* Gregg
- creightoni* Gregg
- desertorum* W.M. Wheeler
  - = *comanche* W.M. Wheeler
  - = *maricopa* W.M. Wheeler
- gilvescens* W.M. Wheeler
- hyatti* Emery
  - = *ecitonodora* W.M. Wheeler
- inquilina* (W.M. Wheeler)
- paiute* Gregg
- pilifera* (Roger)
  - = *pennsylvanica* Roger
  - = *septentrionalis* W.M. Wheeler
  - = *simulans* W.M. Wheeler
- tucsonica* W.M. Wheeler
- vistana* Forel
  - = *longipes* Pergande
  - = *grallipes* W.M. Wheeler

Genus *Crematogaster* Lund

- californica* Emery
- coarctata* Mayr
- colei* Buren
- depilis* W.M. Wheeler
- emeryana* Creighton
- hespera* Buren
- larreae* Buren
- mormornum* Emery
- mutans* Buren
- nocturna* Buren
- opuntiae* Buren

Genus *Monomorium* Mayr

- minimum* (Buckley)

Genus *Solenopsis* Westwood

- aurea* W.M. Wheeler
  - = *amblychila* W.M. Wheeler
- maniosa* W.M. Wheeler
- molesta* (Say)
  - = *minuta* Say
  - = *exigua* Buckley
  - = *debilis* Mayr
  - = *validiuscula* Emery

Table 1. Continued.

Genus *Leptothorax* Mayr

- andrei* Emery
- carinatus* Cole
- crassipilis* W.M. Wheeler
- muscorum* (Nylander)
  - = *canadensis* Provancher
  - = *yankee* Emery
- = *kincaidi* Pergande
- = *sordidus* W.M. Wheeler
- = *convivialis* W.M. Wheeler
- = *obscurus* Viereck
- = *calderoni* Forel
- = *septentrionalis* W.M. Wheeler
- nevadensis* W.M. Wheeler
- nitens* Emery
  - = *occidentalis* W.M. Wheeler
  - = *heathi* W.M. Wheeler
- obliquicanthus* Cole
- rugatulus* Emery
  - = *cockerelli* W.M. Wheeler
  - = *annectens* W.M. Wheeler
  - = *mediorufus* W.M. Wheeler
- tricarinatus* Emery

Genus *Tetramorium* Mayr

- caespitum* (Linnaeus)
- = *transversinodis* Enzmann

## Subfamily Dolichoderinae

Genus *Liometopum* Mayr

- luctuosum* W.M. Wheeler

Genus *Iridomyrmex* Mayr

- humilis* (Mayr)

Genus *Forelius* Emery

- foetidus* (Buckley)
  - = *mccooki* Forel
  - = *andrei* Forel
- pruinosis* (Roger)
  - = *anale* André
  - = *testaceus* Cole

Genus *Conomyrma* Forel

- = "*Dorymyrmex*" of North American literature
- bicolor* (W.M. Wheeler)
- insana* (Buckley)
  - = "*pyramicus*" of authors
  - = *flavus* McCook
  - = *nigra* Pergande
  - = *smithi* Cole
  - = *wheeleri* Kusnezov

Genus *Tapinoma* Foerster

- sessile* (Say)
  - = *boreale* Roger
  - = *gracilis* Buckley



Table 1. Continued.

---

	= <i>parva</i> Buckley
	= <i>boreale</i> Provancher, not Roger
Subfamily Formicinae	
Genus <i>Brachymyrmex</i> Mayr	
	<i>depilis</i> Emery
	= <i>nanellus</i> W.M. Wheeler
	= <i>flavescens</i> Grundmann
Genus <i>Camponotus</i> Mayr	
Subgenus <i>Camponotus</i> Mayr	
	<i>herculeanus</i> (Linnaeus)
	= <i>whymperi</i> Forel
	<i>laevigatus</i> (F. Smith)
	<i>modoc</i> W.M. Wheeler
Subgenus <i>Myrmentoma</i> Forel	
	<i>essigi</i> M.R. Smith
	= <i>nevadensis</i> Gregg
	<i>hyatti</i> Emery
	<i>sayi</i> Emery
	= <i>bicolor</i> Pergande
	= <i>californica</i> Emery
Subgenus <i>Tanaemyrmex</i> Ashmead	
	<i>ocreatus</i> Emery
	= <i>primipilaris</i> W.M. Wheeler
	<i>sansabeanus</i> (Buckley)
	= <i>bulimosus</i> W.M. Wheeler
	= <i>torrefactus</i> W.M. Wheeler
	<i>semitestaceus</i> Emery
	= "maccooki" of authors
	<i>vicinus</i> Mayr
	= <i>nitidiventris</i> Emery
	= <i>infernalis</i> W.M. Wheeler
	= <i>luteangulus</i> W.M. Wheeler
	= <i>maritimus</i> W.M. Wheeler
	= <i>plorabilis</i> W.M. Wheeler
	= <i>subrostrata</i> Forel
	= <i>berkeleyensis</i> Forel
	? = <i>tejonina</i> Buckley
Genus <i>Paratrechina</i> Motschulsky	
	<i>vividula</i> (Nylander)
	? = <i>perminuta</i> Buckley
	? = <i>picea</i> Buckley
	? = <i>terricola</i> Buckley
	<i>hystrix</i> Trager
	undescribed species?
Genus <i>Prenolepis</i> Mayr	
	<i>imparis</i> (Say)
	? = <i>polita</i> F. Smith
	? = <i>wichita</i> Buckley
	= <i>americana</i> Forel
	= <i>minuta</i> Emery
	= <i>testacea</i> Emery

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Table 1. Continued.

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	= <i>pumila</i> W.M. Wheeler
	= <i>californica</i> W.M. Wheeler
Genus <i>Lasius</i> Fabricius	
Subgenus <i>Lasius</i> Fabricius	
	<i>alienus</i> (Foerster)
	= <i>lasioides</i> Emery
	= <i>fuscus</i> Emery
	= <i>fumatus</i> Emery
	= <i>americanus</i> Emery
	= <i>grandis</i> Forel
	= <i>alieno-americanus</i> W.M. Wheeler
	= <i>turcicus</i> Santschi
	= <i>barbara</i> Santschi
	= <i>flavidus</i> Kusnetzov-Ugamskij
	= <i>turkmenus</i> Kusnetzov-Ugamskij
	= <i>obscurata</i> Stitz
	= <i>illyricus</i> Zimmermann
	= <i>pannonica</i> Roszler
	= <i>pontica</i> Starcke
	<i>crypticus</i> Wilson
	<i>neoniger</i> Emery
	<i>pallitarsis</i> (Provancher)
	= <i>sitkaensis</i> Pergande
	<i>sitiens</i> Wilson
Subgenus <i>Cautolasius</i> Wilson	
	<i>flavus</i> (Fabricius)
	= <i>brevicornis</i> Emery
	= <i>myops</i> Forel
	= <i>flavoides</i> Forel
	= <i>fuscoides</i> Ruzsky
	= <i>odoratus</i> Ruzsky
	= <i>flavo-myops</i> Forel
	= <i>microps</i> W.M. Wheeler
	= <i>claripennis</i> W.M. Wheeler
	= <i>morbosa</i> Bondroit
	= <i>apennina</i> Menozzi
	= <i>ibericus</i> Santschi
	= <i>sancho</i> Santschi
	= <i>olivacea</i> Karawajew
	= <i>helveolus</i> Cook
	= <i>helvus</i> Cook
Subgenus <i>Chthonolasius</i> Ruzsky	
	<i>humilis</i> W.M. Wheeler
	<i>nevadensis</i> Cole
	<i>subumbratus</i> Viereck
	<i>umbratus</i> (Nylander)
	= <i>mixta</i> Nylander
	= <i>affinis</i> Schenck
	= <i>aphidicola</i> Walsh
	= <i>mixto-umbratus</i> Forel
	= <i>exacutus</i> Ruzsky

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Table 1. Continued.

- = *mixto-affinis* Ruzsky
- = *mixto-bicornis* Ruzsky
- = *affino-umbratus* Donisthorpe
- = *przewalskii* Ruzsky
- = *distinguenda* Emery
- = *hybrida* Emery
- = *nuda* Bondroit
- = *sabularum* Bondroit
- = *belgarum* Bondroit
- = *citrina* Emery
- = *viehmeyeri* Emery
- = *silvestrii* W.M. Wheeler
- = *dalmatica* Starcke
- = *hirtiscapus* Starcke
- = *cereomicans* Starcke
- = *osakana* Santschi
- = *nyaradi* Roszler
- = *epinotalis* Buren
- vestitus* W.M. Wheeler
- = *pilosus* M.R. Smith

Genus *Acanthomyops* Mayr

- californicus* (W.M. Wheeler)
- coloradensis* (W.M. Wheeler)
- latipes* (Walsh)

Genus *Myrmecocystus* WesmaelSubgenus *Endiodictes* Snelling

- depilis* Forel
- flaviceps* W.M. Wheeler
- kennedyi* Cole
- koso* Snelling
- mendax* W.M. Wheeler
- = *orbiceps* W.M. Wheeler
- mimicus* W.M. Wheeler
- = *jesuita* W.M. Wheeler
- = *lomaensis* W.M. Wheeler
- romainei* Cole
- semirufus* Emery

Subgenus *Eremnocystus* Snelling

- arenarius* Snelling
- creightoni* Snelling
- hammettensis* Cole
- lugubris* W.M. Wheeler
- yuma* W.M. Wheeler

Subgenus *Myrmecocystus* Wesmael

- ewarti* Snelling
- mexicanus* Wesmael
- = *hortus-deorum* McCook
- navajo* W.M. Wheeler
- pyramicus* M.R. Smith

Table 1. Continued.

- testaceus* Emery
- = *mojave* W.M. Wheeler
- = *idahoensis* Cole
- Genus *Formica* Linnaeus
- Species Group *neogagates*
- lasioides* Emery
- = *picea* Emery
- = *vetula* W.M. Wheeler
- limata* W.M. Wheeler
- manni* W.M. Wheeler
- neogagates* Emery
- = *vinculans* W.M. Wheeler
- perpilosa* W.M. Wheeler
- Species Group *rufa*
- ciliata* Mayr
- coloradensis* W.M. Wheeler
- dakotensis* Emery
- = *specularis* Emery
- = *wasmanni* Forel
- = *montigena* W.M. Wheeler
- = *saturata* W.M. Wheeler
- densiventris* Viereck
- = *spicata* W.M. Wheeler
- = *pinetorum* W.M. Wheeler
- haemorrhoidalis* Emery
- = *ravida* W.M. Wheeler
- = *tahoensis* W.M. Wheeler
- integroides* Emery
- = *subcaviceps* W.M. Wheeler
- laeviceps* Creighton
- microgyna* W.M. Wheeler
- = *recidiva* W.M. Wheeler
- nevadensis* W.M. Wheeler
- obscuripes* Forel
- = *melanotica* Emery
- = *rubiginosa* Emery
- = *agerrans* W.M. Wheeler
- obscuriventris* Mayr
- = *dryas* W.M. Wheeler
- = *gymnomma* W.M. Wheeler
- oreas* W.M. Wheeler
- planipilis* Creighton
- propinqua* W.M. Wheeler
- querquetulana* Kennedy & Dennis
- subnitens* Creighton
- whymperi* Forel
- = *pullula* W.M. Wheeler
- = *californica* W.M. Wheeler
- = *hybrida* W.M. Wheeler
- Species Group *fusca*
- aerata* Francoeur

**Table 1. Continued.**

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<i>argentea</i> W.M. Wheeler
<i>fusca</i> Linnaeus
= <i>subaenescens</i> Emery
= <i>marcida</i> W.M. Wheeler
= <i>accreta</i> Francoeur
<i>hewitti</i> W.M. Wheeler
<i>microphthalma</i> Francoeur
<i>moki</i> W.M. Wheeler
= <i>occidentalis</i> W.M. Wheeler
= <i>occidua</i> W.M. Wheeler
<i>neoclara</i> Emery
= <i>pruinosa</i> W.M. Wheeler
= <i>lutescens</i> W.M. Wheeler
<i>neorufibarbis</i> Emery
= <i>algida</i> W.M. Wheeler
= <i>gelida</i> W.M. Wheeler
<i>sibylla</i> W.M. Wheeler
<i>subelongata</i> Francoeur
<i>subpolita</i> Mayr
= <i>rufiventris</i> Emery
= <i>flammiventris</i> W.M. Wheeler
= <i>camponoticeps</i> W.M. Wheeler
= <i>ficticia</i> W.M. Wheeler
<i>subsericea</i> Say
= <i>glacialis</i> W.M. Wheeler
= <i>lecontei</i> Kennedy & Dennis
= <i>podzolica</i> Francoeur
<i>xerophila</i> M.R. Smith
= <i>grundmanni</i> Cole
Species Group <i>sanguinea</i>
<i>curiosa</i> Creighton
= <i>parcipappa</i> Cole
<i>obtusopilosa</i> Emery
= <i>munda</i> W.M. Wheeler
= <i>alticola</i> W.M. Wheeler
<i>puberula</i> Emery
<i>subnuda</i> Emery
= <i>aserva</i> Forel
<i>wheeleri</i> Creighton
Genus <i>Polyergus</i> Latreille
<i>breviceps</i> Emery
= <i>bicolor</i> Wasmann
= <i>silvestrii</i> Santschi
= <i>montezuma</i> W.M. Wheeler
= <i>umbratus</i> W.M. Wheeler
= <i>laeviceps</i> W.M. Wheeler
= <i>fusciventris</i> W.M. Wheeler

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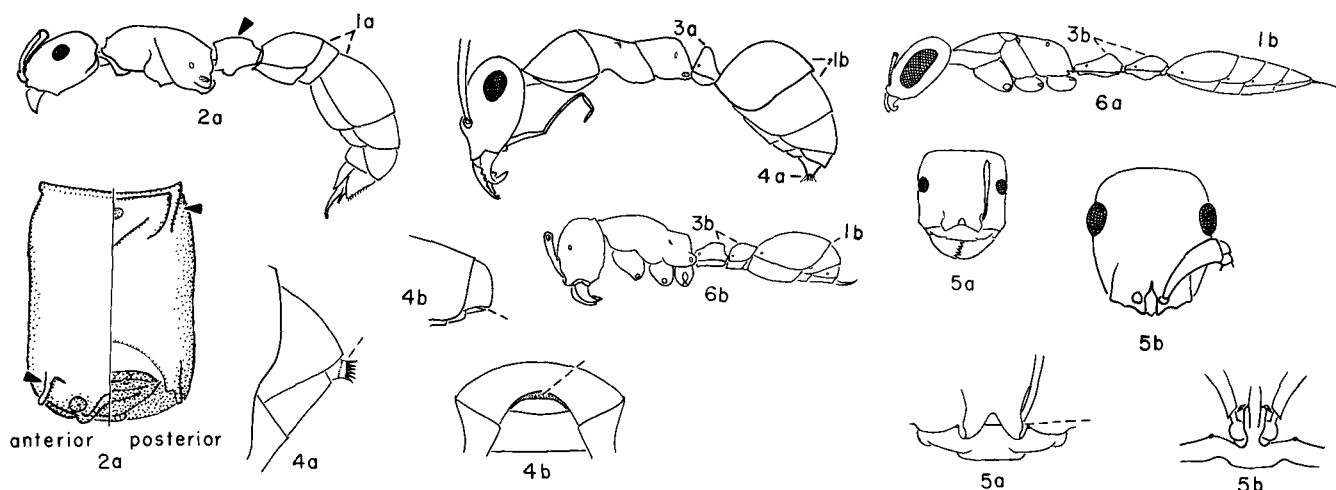
species, but the individuals are abundant; Ponerinae and Dorylinae are rare.

**KEY TO THE SUBFAMILIES:  
WORKERS AND FEMALES**

- 1a. Gaster with a distinct constriction between 1st and 2nd somites ..... 2
- b. Gaster without any constriction between 1st and 2nd somites ..... 3
- 2a. Elongate, slender, and subcylindrical; antennal scape short and very stout; antennal fossa more or less encircled by a lateral carina on gena (rarely obsolete); posterior surface of head with a distinct carina running ventrally from each dorsolateral corner; dorsal surface of thorax with sutures indistinct or absent; pygidium margined laterally and posteriorly with a row of large or small (but always distinct) spinules ..... \*Cerapachyinae
- b. Antennal scape usually long and slender, or at least basal third slender; pygidium without rows of spinules ..... Ponerinae
- 3a. Pedicel of 1 somite; sting vestigial or absent ..... 4
- b. Pedicel of 2 somites; sting usually functional ..... 5
- 4a. Opening at posterior end of gaster (acidopore) terminal, circular and usually surrounded by a fringe of hairs ..... Formicinae
- b. Opening at posterior end of gaster (cloacal orifice) slit-like, not surrounded by fringe of hairs ..... Dolichoderinae
- 5a. Frontal carinae expanded laterally so that antennal insertions are completely, or at least partially, covered; epinotum usually armed with a pair of spines ..... Myrmicinae
- b. Frontal carinae usually short, close together and not expanded laterally, so that antennal insertions are completely exposed; epinotum usually not armed with spines ..... 6
- 6a. Eye large and with numerous fine facets; epinotum without spines ..... \*Pseudomyrmecinae
- b. Eye lacking or vestigial (consisting of only 1 facet) (female wingless) ..... Dorylinae

**KEY TO THE SUBFAMILIES: MALES**

- 1a. Pedicel of 2 somites, petiole and postpetiole ..... 2
- b. Pedicel of a single somite, the petiole ..... 3
- 2a. Clypeus not extending back between frontal carinae; eye large, elongate, subreniform; antenna 12-segmented; elongate, slender ants ..... \*Pseudomyrmecinae
- b. Clypeus extending back between frontal carinae; eye not as above; antenna 10- to 13-segmented ... Myrmicinae
- 3a. A pronounced constriction between 1st and 2nd gastric somites ..... 4
- b. No pronounced constriction between 1st and 2nd gastric somites ..... 5
- 4a. Mandibles well developed; genital appendages entirely retractile; subgenital plate strongly forked; cerci short ..... \*Cerapachyinae
- b. Mandibles often poorly developed; genital appendages



SUBFAMILIES, WORKERS, AND FEMALES

usually not retractile; subgenital plate entire or at most not strongly forked; cerci present but not always clearly visible . . . . . Ponerinae

5a. Large and wasp-like (but with node on petiole); frontal carina not covering antennal insertion; genital appendages entirely retractile; subgenital plate with 2 or 3 apical teeth . . . . . Dorylinae

b. Not unusually large and wasp-like; frontal carina usually covering antennal insertion; subgenital plate not as above . . . . . Formicinae and Dolichoderinae

### Subfamily Ponerinae

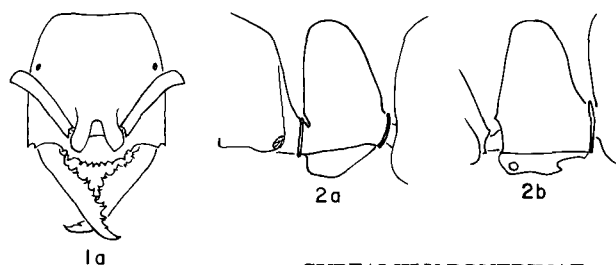
The ants of this subfamily are primitive in structure and habits: the worker caste approaches the queen in size; colonies are small—at most a few hundred individuals; the workers are carnivorous, preying upon insects and other small arthropods, which they cut up and feed directly to the larvae; food regurgitation (if employed at all) is less important than in the higher ants; the colony-founding queen (unlike most higher ants) forages for the food for her first brood; pupae are in cocoons.

This is essentially a tropical group: 21 native species occur in the United States, mostly in the southernmost states, only three reaching southern Canada. Three species in two genera have been reported in Nevada.

#### KEY TO THE GENERA OF PONERINAE

- 1a. Ventral border of clypeus denticulate; mandible with a row of coarse bidenticulate teeth . . . . . *Amblyopone*
- b. Ventral border of clypeus not denticulate; mandibular teeth (when present) single . . . . . 2
- 2a. Subpetiolar process a simple lobe without a fenestra or teeth; maxillary palp 1-segmented . . . . . *Hypoponera*
- b. Subpetiolar process with anteroventral corner blunt or rounded and posterior bidentate, and with a circular or

oval fenestra or thin area when viewed by transmitted light; maxillary palp 2-segmented . . . . . *\*Ponera*



SUBFAMILY PONERINAE

### Genus *Amblyopone* Erichson

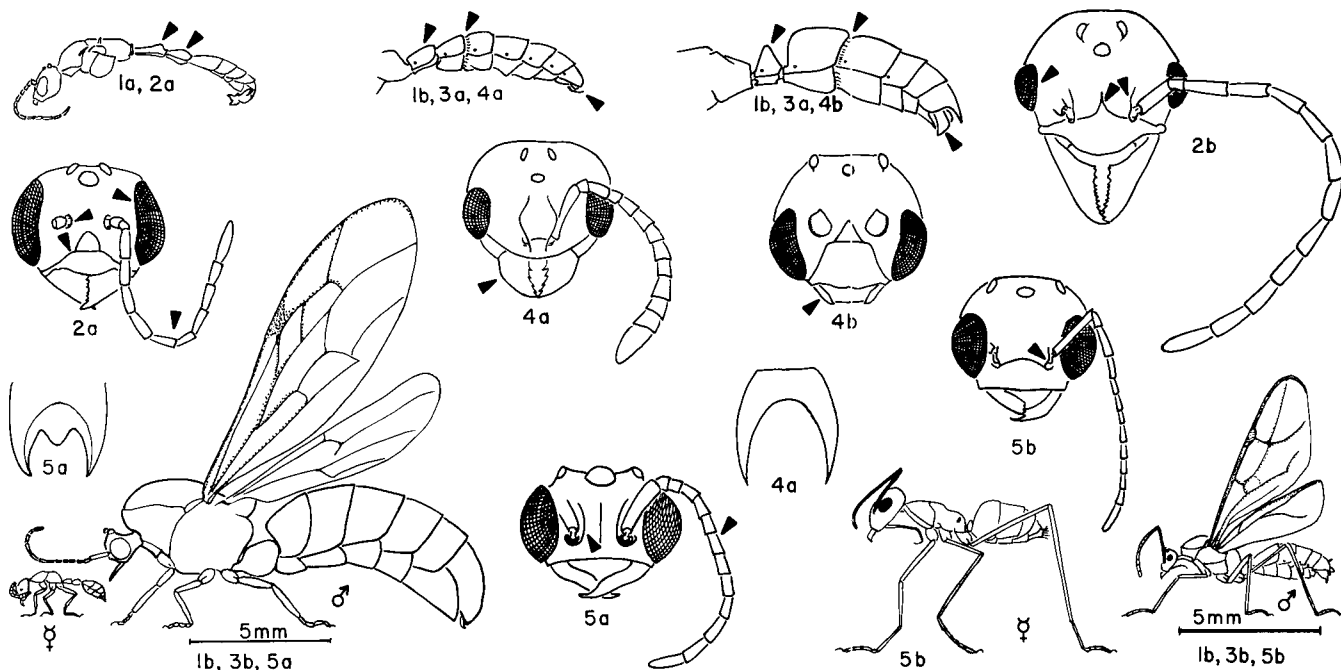
*Amblyopone* is a worldwide genus, but with the majority of the species in the Indo-Australian region. The habits of the two Nearctic species are unremarkable. The subterranean colonies are small, with fewer than 50 individuals. Most collections consist of stray individuals collected under stones or other covering objects or by sifting leaf litter.

#### KEY TO THE SPECIES OF *AMBLYOPONE*

- 1a. Inner border of mandible and ventral border of clypeus straight, or at most feebly convex . . . . . *\*oregonensis*
- b. Inner border of mandible, and usually also ventral border of clypeus, decidedly convex . . . . . *pallipes*

### *Amblyopone pallipes* (Haldeman)

This completely subterranean species is rarely encountered, because its colonies are small (10–30) and the workers are timid and slow. It occurs in wooded areas. Many records are based on single individuals found in the immediate vicinity of the nests of other ants.



SUBFAMILIES, MALES

**WORKER.** Small to medium-sized. Concolorous strong brown to dark reddish brown. Head and thorax dull, gaster shining.

**RANGE.** From southern Ontario and Quebec southward to Georgia, westward to Wisconsin and southwestward to Texas, Arizona, and southern Nevada.

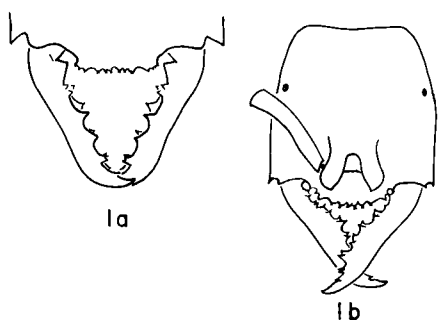
**NEVADA NOTES AND LOCALITY.** Map 1. We have found a single specimen. It was under a stone at the edge of a *Formica* nest in a dense stand of pinyon pine and juniper with an understory of manzanita (*Arctostaphylos* sp.). Clark Co.: Spring Mts., eastern slope of Charleston Peak (27-19S-57) 3 mi. ENE Charleston Park 7,000 ft.

itan genus with a few species extending into temperate regions. Some species are cosmopolitan "tramps" introduced into many parts of the world via commercial shipping.

Colonies are small (usually fewer than 100 individuals) and are located in soil or rotten wood, usually in forested areas. Collections usually consist of stray workers, but winged sexual forms may be attracted to lights.

#### KEY TO THE SPECIES OF *HYPOPONERA*

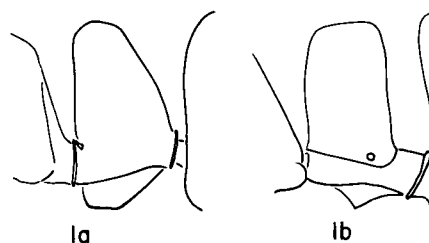
- 1a. Petiole narrowed dorsally in profile ..... *opacior*
- b. Petiole subrectangular in profile ..... *opaciceps*



GENUS *AMBLIOPONE*

#### Genus *Hypoponera* Santschi

The species of *Hypoponera* have been included within *Ponera* until recently (Taylor, 1967). This is a primarily tropicopol-



GENUS *HYPOPONERA*

#### *Hypoponera opaciceps* (Mayr)

**WORKER.** Small. Black to very deep brown, with somewhat reddish to yellowish mouthparts and appendages. Feebly shining.

**RANGE.** Southern states from South Carolina to Florida, westward to Colorado and southern Nevada; southward to Argentina; West Indies; Polynesia.

**NEVADA NOTES AND LOCALITY.** Map 1. *Lincoln Co.*: LaRivers Coll., labeled Pahrnagat Valley, Hiko Springs.

### *Hypoponera opacior* (Forel)

**WORKER.** Small. Concolorous reddish brown to dusky red and feebly shining to dull.

**RANGE.** Virginia to Florida, westward to Ohio, Iowa, Colorado, and California; sporadic west of Texas; southward to Chile and Argentina; West Indies.

**NEVADA LOCALITY.** Map 1. *Clark Co.*: Las Vegas.

### Subfamily Dorylinae

The ants of this tropicopolitan subfamily are known as army ants, driver ants or legionary ants. They have no permanent abode and hence are called nomadic. Since they are highly (if not exclusively) carnivorous, it was formerly thought that their wandering resulted from exhaustion of the food supply near the nest. But Schneirla (1971) has shown that in the tropical genus *Eciton* it is due to the powerful stimulation of the workers by a massive (50,000–1,000,000) brood all at the same stage in development. Nevertheless, emigration does forestall food scarcity which might result from the sojourn of such an enormous population for a long period in the same territory.

The outstanding characteristics of the Dorylinae are: (1) queens are physogastric, i.e., have a swollen gaster; they are sometimes referred to as dichthadiigynes, i.e., they lack eyes, ocelli, and wings and they have exceedingly large gasters resulting from the presence of very large numbers of mature ova. (2) The males do not even resemble ants but look more like wasps. Only by the node on the petiole can they be recognized as ants. They are seldom found in the colony but are often taken at lights by night. (3) The army ants practice group predation, i.e., they hunt in groups and bring back freshly killed prey. (4) Army ants are nomadic. Nomadism means that they have no permanent nests but move from place to place. (5) The colony cycle is usually divided into two phases—statory and nomadic.

In the nomadic phase a daily raid from the concealed bivouac begins at dawn and increases in intensity and distance until dusk. Then the colony migrates along one of the main trails established during the day's raiding to a new bivouac site.

At the beginning of the nomadic phase an all-worker brood emerges from cocoons; in fact, this simultaneous emergence of many callows is the stimulus that initiates the phase. The next all-worker brood is in an early larval stage and it is the appetites of thousands of growing larvae that sustains the nomadic phase. When they are fully grown and spin their cocoons, the nomadic phase ends.

The statory phase follows and lasts about 20 days, during which the colony remains in the same well-sheltered camp (such as a hollow log or tree). With the brood represented by

eggs, young larvae, and pupae, the colony now requires less food and only small-scale daily raids are mounted.

At the middle of the statory phase the queen lays 60,000–130,000 eggs during one week and lays no more until the next statory phase. During the last part of this phase the brood consists only of young larvae and of the pupae from eggs laid in the previous statory phase.

### Genus *Neivamyrmex* Borgmeier

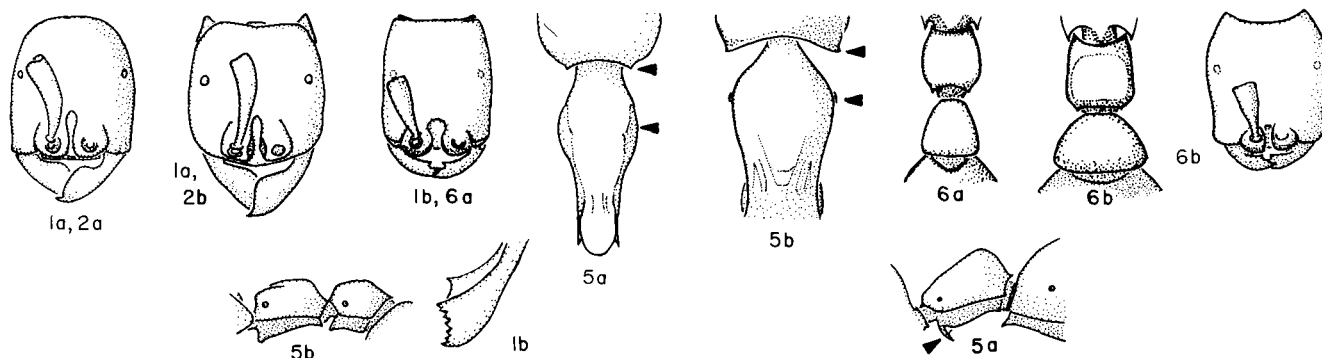
This genus, which ranges widely in the New World, is the only doryline group well represented (23 species) in the United States. One species (*nigrescens*) is found as far north as Illinois, Iowa, and Nebraska; the others are more southern.

It is difficult to generalize about *Neivamyrmex*. Some species are hypogaecic and some are epigaecic and some are both; some raid by day and some by night and some both; some bivouacs are subterranean and some aboveground. The same species may behave differently in different localities and in different climates. Species in cold climates become inactive in winter.

#### KEY TO THE SPECIES OF *NEIVAMYRMEX*

(Adapted from Watkins, 1976)

- 1a. Basal edge of mandible gradually curved into masticatory border (= without a distinct angle or tooth at junction); eye always with a distinct convex cornea (may be very small) ..... 2
- b. Basal edge of mandible straight (or with a distinct tooth) and forming a distinct tooth or sharp corner at junction of basal and masticatory borders; cornea present or absent ..... 3
- 2a. Head shining and smooth; dorsal corners of head rounded; yellowish red or reddish brown ..... *californicus*
- b. Head dull, densely and strongly rugulose; each dorso-lateral corner of head moderately projecting or with out-turned tooth ..... *\*nigrescens*
- 3a. Eye with distinct convex cornea ..... 4
- b. Eye reduced to a yellow spot without distinct convex cornea, or eye lacking ..... 6
- 4a. Node of petiole subquadrate in dorsal view; dorsal corners of head angular and projecting; lamella ventral to antennal fossa broad and translucent; anteroventral tooth of petiole moderately developed; largest worker more than 4 mm long ..... *\*harrisi*
- b. Node of petiole elongate in dorsal view ..... 5
- 5a. Concave posterior portion of head slightly narrower than width of thorax; head and thorax dark brown or blackish; anteroventral tooth of petiole large and with an acute spine directed posteriorly ..... *\*pilosus*
- b. Concave posterior portion of head as wide as, or wider than thorax; head and thorax reddish brown, gaster slightly lighter; anteroventral tooth present on petiole but lacking posteroventrally directed spine ..... *\*opacithorax*
- 6a. Petiole distinctly elongate in dorsal view; postpetiole subquadrate, slightly trapezoidal and with rounded cor-



GENUS *NEIVAMYRMEX*

ners in dorsal view; apex of scape reaching above middle of head ..... *nyensis*

- b. Petiole subquadrate in dorsal view (sometimes longer than wide but node distinctly quadrate); postpetiole in dorsal view with width about 1½ times length, sides rounded; apex of scape distinctly below middle of head ..... *\*leonardi*

### *Neivamyrmex californicus* (Mayr)

**WORKER.** Small. Bright reddish brown. Shining.

**RANGE.** Utah, Nevada, and California.

**NEVADA NOTE AND LOCALITY.** There is only one record from Nevada: Map 2. *Churchill Co.*: Sand Springs Dune, 24 June 1959. Nocturnal. Coll. Ira LaRivers, det. M.R. Smith.

### *Neivamyrmex minor* (Cresson)

This species is known only from males, which are 9 mm long, among the smallest males in the subfamily.

**RANGE.** Kansas, Oklahoma, and Texas westward to California and southward into Mexico.

**NEVADA NOTE AND LOCALITY.** There is only one record from Nevada: *Nye Co.*: Map 2. Test Site. "A few males of this species were attracted to black light on July 21 in Pinyon-Juniper on Ranier Mesa" (Cole, 1966:26).

### *Neivamyrmex nyensis* Watkins

**WORKER.** Minute to small. Yellowish to yellowish brown. Shining.

**NEVADA NOTE AND LOCALITY.** Known only from type colony (Watkins, 1977). *Nye Co.*: Map 2. 5½ mi. S and 3 mi. E Beatty; coll. G.C. and J. Wheeler #797; 16 April 1970 (not 15 May 1970); 3,500 ft.; on western slope of Bare Mt. in very rocky terrain. The bivouac was under two contiguous slightly buried stones each about 15 × 20 × 30 cm.

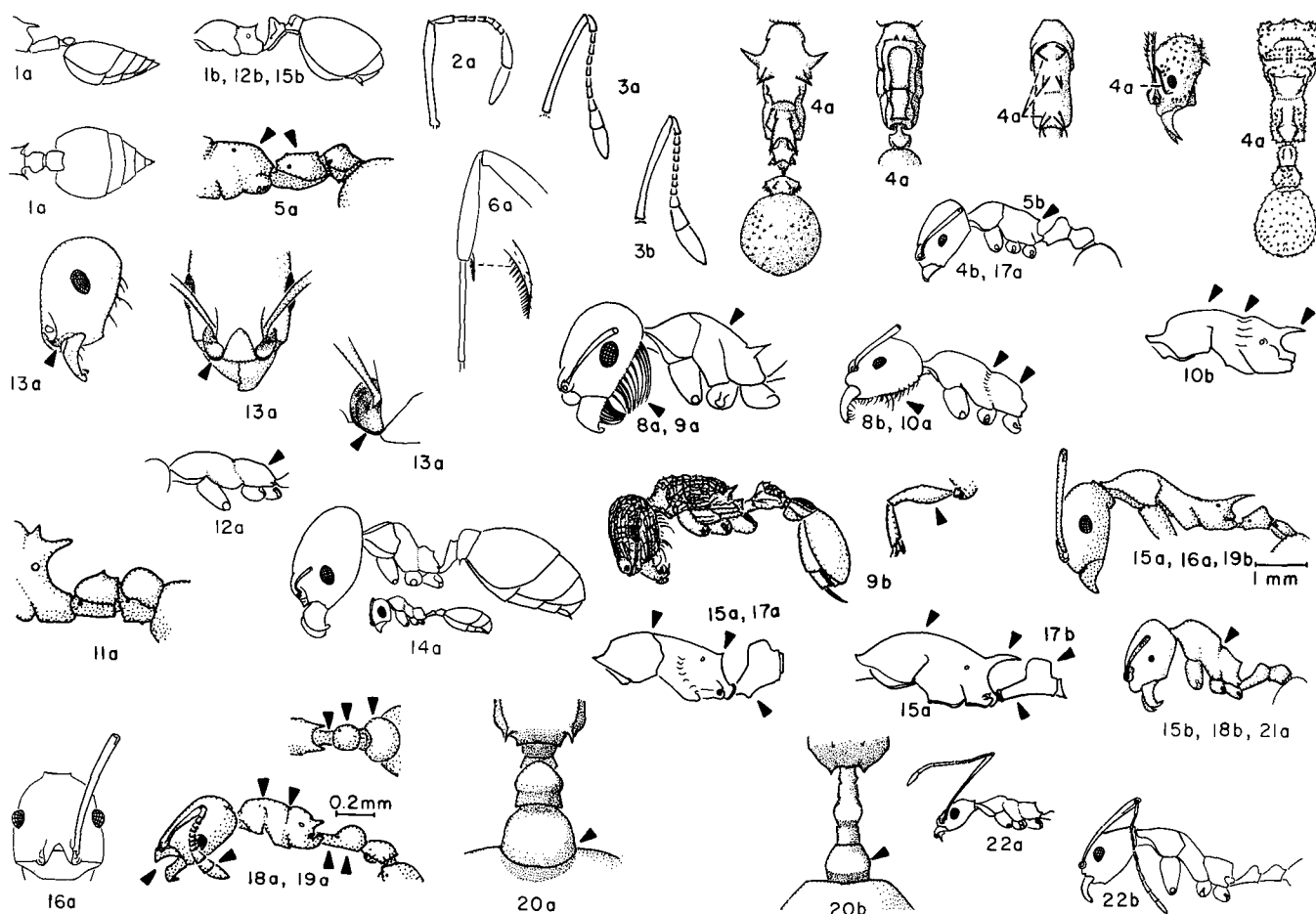
## Subfamily Myrmicinae

This is by far the largest subfamily of Formicidae, although in Nevada there are fewer species of Myrmicinae (76) than of Formicinae (92) and it barely surpasses the Formicinae in number of collections (Formicinae, 2,115; Myrmicinae, 2,166). In North America it is best represented in the central and southern states, diminishing rapidly northward where the Formicinae become dominant. The behavior is so varied that no generalization can be made. The only really interesting habit in Nevada is seed-harvesting in the genera *Pogonomyrmex*, *Ephebomyrmex*, *Veromessor*, and *Pheidole*.

## KEY TO THE GENERA OF MYRMICINAE

- 1a. Postpetiole attached to dorsal surface of base of gaster; gaster flattened dorsally, but more convex ventrally, and (in dorsal view) with an acute tip ..... *Crematogaster*
- b. Postpetiole attached to anterior end of gaster; gaster about equally convex above and below, tip (in dorsal view) not notably acute ..... 2
- 2a. Antenna with 10 segments, the last 2 forming a distinct club; epinotum unarmed ..... *Solenopsis*
- b. Antenna with more than 10 segments ..... 3
- 3a. Antenna with 11 segments ..... 4
- b. Antenna with 12 segments ..... 6
- 4a. Dorsum of pronotum, mesonotum, and epinotum with spines, teeth, rounded bosses or prominent ridges; antennal fossa always bounded by a delicate carina which runs diagonally inward from insertion of mandible past medial border of eye ..... *\*Tribe Attini*
- b. Dorsum of thorax with spines or teeth (when present) confined to epinotum; carina not as above ..... 5
- 5a. Epinotum unarmed; petiolar peduncles short, node feebly developed ..... *\*Xenomyrmex*
- b. Epinotum armed with spines or short teeth; node of petiole well developed ..... *Leptothorax*
- 6a. Spurs of middle and hind tibiae very finely pectinate, the teeth regular but often too small to be seen at magnifications of less than 100 ..... 7





# SUBFAMILY MYRMICINAE

- b. Spurs of middle and hind tibiae simple or absent . . 11
- 7a. Node of petiole in profile truncate; postpetiole distinctly transverse from above; antennal club distinct and 3-segmented . . . . . *Tetramorium*
- b. Node of petiole in profile more or less conoid; postpetiole from above broadest behind and little if any broader than long; antennal club indistinct, 4-segmented . . . . . 8
- 8a. Thorax not impressed at meso-epinotal suture; dorsal thoracic sutures obsolescent or absent . . . . . 9
- b. Thorax impressed (at least feebly) at meso-epinotal suture; psammophore absent . . . . . 10
- 9a. Psammophore well developed; thoracic sculpture may be heavy but not strongly reticulorugose; femora not incrassate; epinotal spines when present not connected by a transverse ridge . . . . . *Pogonomyrmex*
- b. Psammophore absent or feebly developed; thoracic sculpture reticulorugose; femora incrassate; epinotal spines connected by a transverse ridge; worker about 4 mm long . . . . . *Ephebomyrmex*
- 10a. Epinotum unarmed; promesonotal suture visible on thoracic dorsum; meso-epinotal suture strongly impressed . . . . . *Manica*
- b. Epinotum armed with spines of teeth; promesonotal suture absent on thoracic dorsum; meso-epinotal suture moderately impressed . . . . . *Myrmica*
- 11a. Petiole without distinct peduncles, node feebly developed . . . . . \**Myrmecina*
- b. Petiole with a distinct node, the anterior peduncle distinct even when short . . . . . 12
- 12a. Epinotum unarmed; antennal club of 3 segments . . . . . *Monomorium*
- b. Epinotum usually armed with spines or teeth, but, if unarmed, basal face distinctly lower than mesonotum . . . . . 13
- 13a. Portion of clypeus below antennal fossa elevated to form a carina or ridge . . . . . *Tetramorium*
- b. Portion of clypeus below antennal fossa not elevated to form a carina or ridge . . . . . 14
- 14a. Worker caste dimorphic (rarely polymorphic), majors with disproportionately large head . . . . . *Pheidole*
- b. Worker caste monomorphic or, if polymorphic, head of majors not disproportionately large . . . . . 15
- 15a. Thoracic dorsum with meso-epinotal suture faint or absent . . . . . 16

- b. Thoracic dorsum with meso-epinotal suture well marked ..... 18
- 16a. Large ants (10–12 mm long); scape projecting well beyond occipital border ..... *Aphaenogaster cockerelli*
- b. Small ants (not more than 4 mm long); scape usually not surpassing occipital border or never projecting much beyond it ..... 17
- 17a. Thoracic dorsum flat or feebly convex in profile; anterior peduncle of petiole short, thick and not sharply set off from node; epinotal spines short or at most moderately long ..... *Leptothorax*
- b. Thoracic dorsum distinctly convex in profile; anterior peduncle of petiole long, unusually thin and always sharply set off from node; epinotal spines long ..... *\*Macromischa*
- 18a. Antennal club distinct and 3-segmented; promesonotal suture obsolete; meso-epinotal suture distinctly impressed ..... 19
- b. Antennal club indistinct, of 4 or 5 segments; epinotum depressed below level of pronotum, in profile mesonotum forming a sloping declivity between them .... 20
- 19a. Clypeus strongly projecting downward in front of the mandibles; middle and hind tibiae without spurs; petiole with a long cylindrical peduncle and broad oval node; postpetiole usually large; length 1.5–2.5 mm ..... *\*Cardiocondyla*
- b. Clypeus not strongly projecting downward in front of mandibles ..... *Leptothorax*
- 20a. Postpetiole only slightly constricted behind, node low and not sharply set off from thick posterior peduncle; head quadrate, not notably narrower above eyes than below; psammophore often present ..... *Veromessor*
- b. Postpetiole more strongly constricted behind; psammophore never present ..... 21
- 21a. Small ants (2–4 mm long); scape not reaching occipital border; promesonotum rather strongly convex and prominent; eye usually vestigial or small .. *Stenamma*
- b. Larger ants (3–7 mm long); scape usually surpassing occipital border; thorax usually with distinct promesonotal suture; eye usually prominent ..... 22
- 22a. Antennal club indistinct, of 3 segments (each of which is approximately 2 times as long as any other funicular segment); the 3 terminal segments equal in length to remainder of funiculus; scape at least 1½ times as long as head ..... Minor worker of *Pheidole desertorum* or *Ph. vistana*
- b. Antennal club indistinct, of 4 or 5 subequal segments, each of which is not much longer than any other funicular segment; the 3 terminal segments together much shorter than remainder of funiculus; scape of minor scarcely longer than head ..... *Aphaenogaster*

## Genus *Myrmica* Latreille

“This holarctic genus is found as far north as Labrador and Alaska in North America and is restricted to higher elevations in the southern parts of its range .... The moderate

sized colonies nest in soil, rotten wood or under cover of various objects. Workers are carnivorous but also feed on honeydew of Homoptera and exudates of plants” (D.R. Smith, 1979:1347).

In Nevada, which has 8 of the 14 described native species, *Myrmica* is largely a montane genus, preferring damp localities in coniferous forests above 6,000 ft. and nesting chiefly under stones.

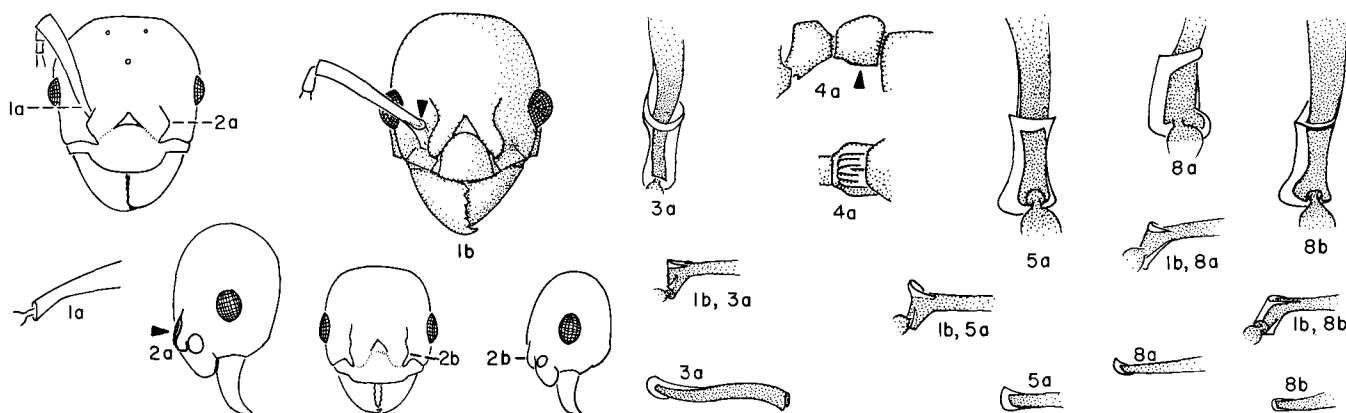
The New World species of *Myrmica* are presently being revised by André Francoeur. Until his revision is published we will have to make do with the following key. If a member of this genus does not fit in this key, it may well be one of a number of presently undescribed species.

## KEY TO THE SPECIES OF *MYRMICA*

- 1a. Scape gradually and evenly bent at base and never forming a right angle at bend ..... 2
- b. Scape suddenly bent at base and forming right angle at bend ..... 3
- 2a. Frontal carina with an angular lobe which is thick and slightly but definitely deflected toward the head ..... *incompleta*
- b. Frontal carina with a rounded lobe which is thin and moderately to strongly elevated ..... *brevispinosa*
- 3a. Bend of scape with large wide lamina which extends along basal third of scape ..... *\*monticola*
- b. Bend of scape with a small transverse lamina or with a lamina that surrounds bend like a collar and does not extend along basal third of scape ..... 4
- 4a. Ventral surface of postpetiole seen in profile flat or nearly so, flat portion forming a plate with longitudinal rugae ..... *americana*
- b. Ventral surface of postpetiole seen in profile convex .. 5
- 5a. Lamina of scape forming a high or wide semicircular flange which surrounds scape at bend ..... *lobifrons*
- b. Lamina of scape not as above ..... 6
- 6a. Concolorous yellowish red ..... spp. nov.
- b. Not concolorous ..... 7
- 7a. Thorax yellowish red, head and gaster dark brown or black ..... *tahoensis*
- b. Colored otherwise ..... 8
- 8a. Lamina of scape small and diagonally transverse on anterior surface but continuing as a prominent transparent flange along inner surface of scape below bend ..... *emeryana*
- b. Lamina of scape small but encircling bend, forming an angular tooth-like projection on inner side of bend and continuing as a prominent transparent flange below bend ..... *fracticornis*

## *Myrmica americana* Weber

**WORKER.** Medium-sized. Head dark red to yellowish red, thorax yellowish red to red, gaster bicolored (dark reddish brown with light red or yellowish red). Head and thorax dull, gaster strongly shining.



GENUS MYRMICA

**RANGE.** Maine and Quebec southward to North Carolina, westward to Manitoba, North Dakota, Colorado, Nevada, and Arizona.

**NEVADA NOTES.** We have 7 records from 6 localities; 6,400–10,400 ft. Two were in the Coniferous Forest Biome, 1 from the bristlecone ecotone, 3 from the Pinyon-Juniper Biome, and 1 from the Cool Desert. All nests were under stones.

**NEVADA LOCALITIES.** Map 3. *Clark Co.*: Spring Mts. (18-18S-55) 7,000 ft.; Charleston Peak 10,400 ft. *Eureka Co.*: 8 mi. SSE Eureka 6,800 ft. *Mineral Co.*: Wassuk Ra. (-8N-28) 8,000 ft. *White Pine Co.*: White Pine Mts. Ellison Ranger Sta. (27-17N-59) 6,900 ft.; Newark Valley (1-16N-56) 6,400 ft.

### *Myrmica brevispinosa* W.M. Wheeler

**WORKER.** Small to medium-sized. Head dark reddish brown to yellowish red, thorax yellowish red to reddish yellow, gaster very dusky red to dark reddish brown. Head and thorax dull, gaster strongly shining.

**RANGE.** From Newfoundland and Nova Scotia westward to Alberta, Idaho, Nevada, and New Mexico.

**NEVADA NOTE AND LOCALITY.** Map 4. *Mineral Co.*: Corey Peak 9,000 ft.

### *Myrmica emeryana* Forel

**WORKER.** Medium-sized. Head and gaster very dusky red, thorax dark red. Head and thorax dull, gaster strongly shining.

**RANGE.** Newfoundland to Georgia and westward to Manitoba, Idaho, Colorado, Arizona, and Nevada.

**NEVADA NOTES.** We have 3 records from 3 localities: 1 was in the Coniferous Forest Biome and 1 was in the ecotone above. Both nests were under stones.

**NEVADA LOCALITIES.** Map 4. *Clark Co.*: Charleston Peak 10,400 ft. *White Pine Co.*: South Schell Peak 9,000 ft.; Snake Creek 2 mi. above Fish Hatchery.

### *Myrmica fracticornis* Emery

**WORKER.** Medium-sized. Concolorous black varying to head very dusky red, thorax yellowish red, gaster reddish black. Head and thorax dull, gaster strongly shining.

**RANGE.** Newfoundland southward to Tennessee and westward to the Rocky Mountains; Utah, Arizona, and Nevada.

**NEVADA NOTES.** We have 37 records from 27 localities for this species, but we have data for only a few: 9 from the Coniferous Forest Biome, 3 from the bristlecone ecotone and 1 from the Pinyon-Juniper Biome. Twelve nests were under stones; 1 was under a dead branch lying on the ground. The records are scattered sporadically throughout the state; 6,400–10,800 ft.

**NEVADA LOCALITIES.** Map 4. *Clark Co.*: Charleston Park 8,100 ft.; Charleston Peak 9,800 ft.; Kyle Canyon. *Elko Co.*: Contact (Weber, 1948:283); Harrison Pass; 5 mi. NE Lamoille; Lamoille Canyon 8,200 ft.; 4 mi. S Jarbidge 6,600 ft., 6,700 ft.; Pole Canyon in East Humboldt Ra. *Esmeralda Co.*: Boundary Peak 9,800 ft. *Humboldt Co.*: Onion Reservoirs in Pine Forest Ra. 8,000 ft. *Lander Co.*: Austin; Bob Scott Summit 7,000 ft.; Hall Creek Canyon (30 mi. N and 10 mi. E Austin) 6,700 ft. *Nye Co.*: E side Troy Peak 10,800 ft.; 5 mi. NE Currant; Scofield Canyon in Quinn Canyon Ra. *Washoe Co.*: Whites Canyon on Mt. Rose 6,800 ft.; Little Valley 6,400 ft.; Tahoe Meadows on Mt. Rose 8,400 ft. *White Pine Co.*: 3 mi. E Ellison Ranger Sta. in White Pine Mts. 6,900 ft.; below Mt. Moriah 10,000 ft.; Mt. Washington 10,400 ft.; Pyramid Peak 10,500 ft.; Wheeler Peak 8,300 ft., 10,000 ft.

### *Myrmica incompleta* Provancher

This species was known as *brevinodis* for 64 years; however this well-known name can no longer be used.

**WORKER.** Medium-sized. Head dark reddish brown, thorax yellowish red to dark reddish brown, gaster dark reddish brown. Head and thorax dull, gaster strongly shining.

**RANGE.** Alaska, Canada, Labrador, and the northern states, with a southern extension down the Rocky Mountains to New Mexico; Nevada.

**NEVADA NOTES.** We have 20 records from 11 localities, all from the Coniferous Forest Biome. Five of the colonies were living in wet meadows and 2 in closely grazed sward near a stream. Eight of the nests were under stones, 5 in or under rotten wood lying on the ground, and 1 was in a rotten stump. Workers were reported tending aphids on false hellebore (*Veratrum viride*). Our records are scattered across the northern half of the state; 5,000–9,700 ft.

**NEVADA LOCALITIES.** Map 3. *Elko Co.*: Lamoille; Pole Canyon in East Humboldt Ra. *Douglas Co.*: Spring Gulch (9-13N-23) 5,400 ft. *Lander Co.*: Birch Creek E side Toiyabe Ra. 7,000 ft., 7,500 ft.; 16 mi. W and 4 mi. N Austin 6,300 ft. *Washoe Co.*: Hwy. 27 nr Mt. Rose 8,800 ft.; Little Valley 6,400 ft.; Peavine Peak 5,000 ft. *White Pine Co.*: SW slope North Schell Peak 9,700 ft.; E side Schell Creek Ra. NE McGill.

### *Myrmica lobifrons* Pergande

**WORKER.** Small. Head and gaster reddish black, thorax reddish yellow to very dusky red. Head and thorax dull, gaster strongly shining.

**RANGE.** New Mexico, Arizona, and Nevada northward to Alaska.

**NEVADA NOTES.** We have 6 collections from 6 localities; 1 from the Coniferous Forest Biome, 3 from the brittlecone ecotone above, and 1 from the Pinyon-Juniper. Four nests were under stones. Nevada records are from the eastern and northwestern parts of the state; 6,200–10,000 ft.

**NEVADA LOCALITIES.** Map 5. *Elko Co.*: Pilot Peak (-36N-70) 8,800 ft.; Wildhorse Reservoir 6,200 ft. *Nye Co.*: Troy Peak (-5N-58) 8,400 ft. *White Pine Co.*: Murry Summit 7,300 ft.; SW slope North Schell Peak 10,000 ft.; North Schell Peak (-18N-66) 9,800 ft.

### *Myrmica tahoensis* W.M. Wheeler

**WORKER.** Small. Head and gaster dark reddish brown to reddish black, thorax reddish yellow to reddish brown. Head and thorax dull, gaster strongly shining.

**RANGE.** Mountains of Montana to Arizona and westward to British Columbia, Oregon, and California.

**NEVADA NOTES.** We have 20 records from 17 localities. Thirteen records were from the Coniferous Forest Biome, 1 from the Pinyon-Juniper, and 1 from the Alpine. Eleven nests were under stones and 1 was under dead wood. In Nevada it has been found in the Lake Tahoe area, in the northeast, and in the south; 5,600–10,300 ft.

**NEVADA LOCALITIES.** Map 5. *Clark Co.*: Kyle Canyon. *Douglas Co.*: Spooner Summit 7,100 ft. *Elko Co.*: Angel Lake 8 mi. SW Wells 8,400 ft.; Lamoille; Lamoille Canyon 8,200 ft.; 7 mi. SW Wells 7,400 ft.; Jarbidge 7,000 ft.; Ruby Dome 10,300 ft. *Lyon Co.*: Old Fort Churchill. *Nye Co.*: Test Site (Cole, 1966:3). *Ormsby Co.*: 8 mi. ESE Carson City 5,600 ft. *Washoe Co.*: Little Valley 6,200 ft., 6,400 ft.; Whites Canyon on Mt. Rose 6,800 ft.; between Mt. Rose and Lake Tahoe

(2-16N-18) 8,000 ft.; Hwy. 27 nr Mt. Rose 8,800 ft.; E side Lake Tahoe at Ormsby Co. line 6,600 ft.

### Genus *Manica* Jurine

In North America, the Holarctic genus *Manica* is a strictly western genus. The four known American species are all found west of the 100th Meridian and north the 34th Parallel. Three of the four species occur in Nevada; *M. parasitica* is known from only two localities in the Sierra Nevada in California, where it is apparently a social parasite in the nests of *M. bradleyi*.

In spite of the remarkable anatomical similarity among the species, it is difficult to generalize about their ecology and habits. *M. bradleyi* and *M. hunteri* are typically found in openings in coniferous forests; *M. mutica* occurs in the greatest variety of habitats, usually unshaded. *M. mutica* is the most xerophilous; the others require moderately moist soil and can even tolerate mud.

The basic nest structure is probably the same for all three species: a reticulum of chambers and galleries connected with chambers under stones and opening to the surface by holes in the bottom of one or more small craters constructed of excavated soil; but great plasticity is manifest in the variations on the basic plan (Figs. 15, 16). The nests are usually polycalic and their limits almost impossible to determine. The nature of their food is an unsolved mystery. Workers take insects into the nest; but, in *M. bradleyi* and *hunteri* only a few workers are out at any one time, for only a few hours during the day and rarely at night; surely they cannot support a flourishing colony.

Our latest hypothesis is that *Manica* feeds on ants of other genera. Our tenuous evidence consists of three bits: (1) In Montana we found a *Formica fusca* mound which contained in one half *Formica* and in the other half *Manica hunteri*. (2) In Wyoming we found a *F. fusca* mound which was occupied only by *M. hunteri*. (3) Their intrageneric tolerance contrasted with their hostility toward other genera. If this hypothesis is correct, raiding must be an underground affair, for we have never witnessed any raids on the surface.

The ants of this genus are not aggressive, but when their nest is disturbed the workers sting promptly and effectively. The effect of the sting has been reported to be very painful, but we have found it only moderately so. The genus is unusual in that workers show no hostility to workers of another colony of the same species or even of a different species of the same genus; but they are murderously hostile toward workers of other genera.

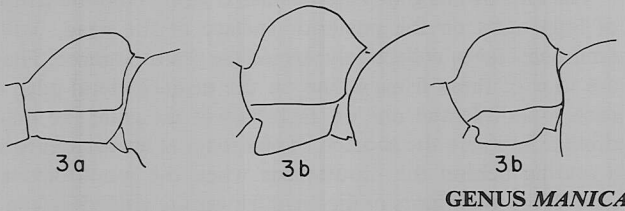
The gait of the workers is characteristic: steady, deliberate and unhurried but never sluggish.

The above account is based upon field studies from North Dakota to the Pacific and from Nevada and California to southern Canada (Wheeler and Wheeler, 1970). We found Little Valley, near Reno, Nevada, especially favorable, because the ranges of two species end there with only a slight overlap: *M. mutica* flourished on the mountain meadow (6,400 ft.), while openings in the coniferous forest above and



**Figure 15.** *Manica bradleyi*. A cluster of craters. Washoe County, Little Valley.

below the meadow seemed ideal for *M. bradleyi*. We found craters of the two species only 15 cm apart.



**Figure 16.** *Manica mutica*. Crater. Washoe County, Little Valley.

WNW Minden 7,000 ft.; Spooner Summit 7,100 ft. *Ormsby Co.*: Kings Canyon 7 mi. WSW Carson City 7,000 ft. *Washoe Co.*: Little Valley 6,400 ft.; Hobart Creek Reservoir (-15N-19) 7,200 ft.; Hwy. 27 nr Mt. Rose 8,000 ft., 8,800 ft.; Whites Canyon on Mt. Rose 6,800 ft.

### *Manica hunteri* (W.M. Wheeler)

**WORKER.** Medium-sized to large. Concolorous yellowish red to dark reddish brown. Head and thorax dull, gaster strongly shining.

**RANGE.** Northern Nevada to central California, thence northward into southern Canada.

**NEVADA NOTES.** This montane species is rare in Nevada and has been found only in Elko County in the northeastern corner of the state; 6,000–9,600 ft. We have 12 records from 7 localities; 11 from the Coniferous Forest Biome and 1 from the ecotone above. Six nests were under stones and 1 was under dead wood. Three were in exposed soil with craters 5–10 cm in diameter; the entrance was 6 mm in diameter.

**NEVADA LOCALITIES.** Map 6. *Elko Co.*: Lamoille Canyon 7,600 ft., 7,700 ft., 8,200 ft.; Angel Lake nr Wells 9,000 ft.; Pole Canyon in East Humboldt Ra.; nr Elko 6,000 ft. (Cole, 1956e:261); Grays Peak in East Humboldt Ra. 9,600 ft.

### *Manica mutica* (Emery)

**WORKER.** Small to medium-sized. Concolorous yellowish red to dark reddish brown. Head and thorax dull, gaster strongly shining.

**RANGE.** From the eastern slopes of the Sierra Nevada and the Cascade Range in California, eastward to northeastern New Mexico, Colorado, Wyoming, the Black Hills of South Dakota and southwestern North Dakota, northward into British Columbia and Alberta, with 1 record from Alaska. *M. mutica* might be called the species of the

### KEY TO THE SPECIES OF *MANICA*

- 1a. Head and gaster black or dark brown; thorax much lighter (light brown to yellowish red); thoracic sculpture prominent, surface scarcely shining ..... *bradleyi*
- b. Concolorous or head and gaster only slightly infuscated and slightly darker than thorax ..... 2
- 2a. Black or very dark brown; shining ..... *\*parasitica*
- b. Red, reddish yellow or yellow ..... 3
- 3a. Postpetiole without a ventral tooth or projection ..... *mutica*
- b. Postpetiole with a distinct ventral projection ... *hunteri*

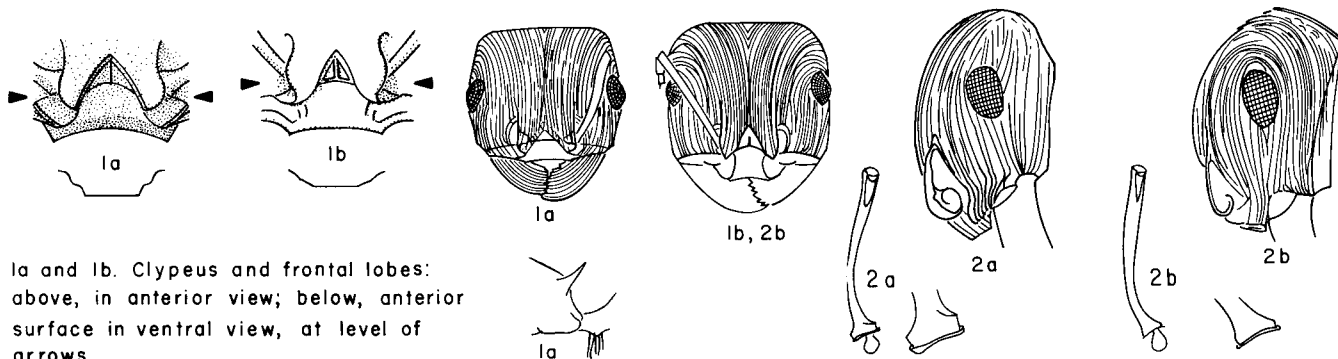
### *Manica bradleyi* (W.M. Wheeler)

**WORKER.** Medium-sized to large. Head very dark gray to black, thorax light brown to yellowish red, gaster black. Head moderately shining, thorax dull, gaster strongly shining.

**RANGE.** Sierra Nevada in California and western Nevada and the Transverse Ranges in southern California.

**NEVADA NOTES.** We have 35 records of this species, but they represent only 8 localities: all in the Sierra Nevada in the vicinity of Lake Tahoe and all in the Coniferous Forest Biome; 6,400–8,800 ft.

**NEVADA LOCALITIES.** Map 6. *Douglas Co.*: 7 mi.



1a and 1b. Clypeus and frontal lobes: above, in anterior view; below, anterior surface in ventral view, at level of arrows.

## SPECIES GROUPS OF GENUS *POGONOMYRMEX*

Great Plains and Great Basin, in contrast to *M. bradleyi* and *M. hunteri*, which are strictly montane, except that *M. mutica* gets into the mountains in several states, e.g., 8,600 ft. in Colorado. But on the average it does occur at lower elevations than the other species.

**NEVADA NOTES.** Not only does *M. mutica* have the greatest range, but it is also the least particular as to habitat. In Nevada it is widely distributed throughout the northern half of the state. There is only 1 record south of the 38th Parallel. We have 130 records from 73 localities: 3,400 ft.–8,000 ft. We have 50 records from the Cool Desert (10 from *Sarcobatus* Subclimax, 13 from cottonwood groves, 4 riparian, 13 from disturbed habitats); 2 from Pinyon-Juniper and 13 from Coniferous Forest; it seems to especially like closely cropped sod and grass which have a coating of salt due to recent flooding. Since it thrives in disturbed areas, *M. mutica* might easily become a minor pest by constructing its messy earthworks on lawns and by stinging children.

*Myrmecophila manni* Schimer (Orthoptera: Gryllidae; det. A.B. Gurney) was found in the nest in Six Mile Canyon, 2 mi. ESE Virginia City 5,200 ft. (Storey Co.) and in Little Valley 6,400 ft. (Washoe Co.). R.C. Bechtel collected *M. manni* 4 mi. NE Carson City (Ormsby Co.) and 25 mi. N Fallon (Churchill Co.). *Araeoschizus armatus* Horn (Coleoptera: Tenebrionidae; det. T.J. Spilman) was in a nest 25 mi. N Fallon (Churchill Co.) 3,900 ft.

**NEVADA LOCALITIES.** Map 6.

### Genus *Pogonomyrmex* Mayr

The ants of this genus are especially common in the southwest, with only one of the 22 United States species occurring east of the Mississippi River. They are famous on two counts: their very painful stings and their seed-harvesting habits.

Although they are notorious for their painful stings, the accounts differ as to the severity of the symptoms. This may be due to individual differences in the susceptibility of the victim or to differences in the amount of venom injected by a single ant or to the number of ants attacking a victim at the same time. The symptoms ordinarily pass without lasting effect, but it is evident that a small child might be dangerously affected.

The staple food for ants of this genus is seeds, but insects

are eaten when available. When seeds are abundant they are harvested in excess of immediate needs and therefore accumulate in the chambers of the nest to be used in periods of scarcity. After excessively wet weather, if the seeds get wet, they are taken out, allowed to dry and returned to storage. If they sprout, they are removed from the nest and discarded. The harvesting habit is characteristic of many ants of arid regions.

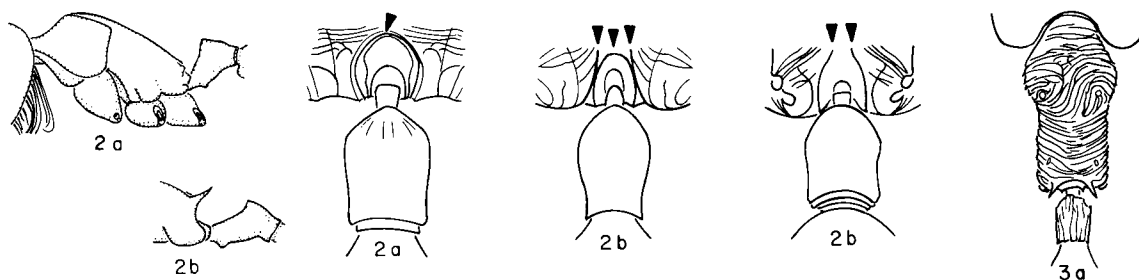
The ants of this genus are furnished with elaborate fringes of long hairs on the posterior surface of the head, called ammochaetae or collectively termed the psammophore. There are four of these fringes: one on the posterolateral edge of each mandible and one on each half of the gula; the mandibular hairs are the shorter, of about equal length and form a grating behind the mouthparts when the mandibles are closed; the gular hairs of the head fringes are graded in length (the longest above) and directed obliquely medially and downward and some of them meet at the midline.

The function of the psammophore is to increase the efficiency of the transportation of fine sand, pebbles, and small seeds. In very fine sand the psammophore can carry more than four times the possible load of the mandibles alone. We have described elsewhere (Wheeler and Wheeler, 1963:117) the technique for loading and unloading the psammophore.

### KEY TO THE SPECIES GROUPS OF *POGONOMYRMEX*

- 1a. Dorsal portion of medial lobe of clypeus deeply depressed below adjacent portions of frontal lobes, to which it is connected by steep side walls; head broader than long; longitudinal cephalic rugae nearly straight and parallel, diverging slightly into posterior corners of head; venter of petiolar peduncle with a few long erect hairs ..... *barbatus* group
- b. Dorsal portion of medial lobe of clypeus only slightly depressed below adjacent portions of frontal lobes, to which it is connected by gradual slopes; head longer than broad; longitudinal cephalic rugae less straight and less parallel, curving above eyes into posterior corners; venter of petiolar peduncle without erect hairs ..... 2
- 2a. Base of antennal scape strongly enlarged, basal flange (when present) wide and with a prominent lip; cephalic





#### BARBATUS GROUP OF GENUS *POGONOMYRMEX*

- rugae usually not forming concentric loops above eye ..... *occidentalis* group
- b. Base of antennal scape not strongly enlarged, basal flange narrow and weak-lipped; cephalic rugae usually forming concentric loops above eye ..... *maricopa* group

#### The *Barbatus* Group

Cole (1968:56) included Nevada in the range of *Pogonomyrmex barbatus*. His single record is based on an error in labeling of specimens; the species has not been taken in the state.

#### KEY TO THE SPECIES OF THE *BARBATUS* GROUP

- 1a. Cephalic rugae extremely fine, very closely set (10 or more per  $\frac{1}{4}$  mm at level of top of frontal area) ..... 2
- b. Cephalic rugae notably less fine, not so closely set (8 or 9 per  $\frac{1}{4}$  mm at level of top of frontal area) ..... 3
- 2a. Epinotum without spines, usually rounded but in some cases with dentiform angles; epinotal declivity very short; dorsal portions of metasternal flanges fused to form a single carina across posterior declivity of epinotum ..... *apache*
- b. Epinotum always armed with 2 erect well-developed spines; epinotal declivity moderately long; dorsal portions of metasternal flanges free (sometimes with feeble branches suggesting a carina); petiolar peduncle with a prominent ventral lobe ..... *\*desertorum*
- 3a. Color generally black or deep reddish black, gaster often contrastingly lighter; cephalic and pronotal rugae very coarse, widely spaced, wavy ..... *rugosus*
- b. Generally concolorous, red to dark reddish brown; cephalic and pronotal rugae notably finer, not widely spaced nor particularly wavy ..... *\*barbatus*

#### *Pogonomyrmex apache* W.M. Wheeler

**WORKER.** Medium-sized to large. Concolorous bright orange to dark reddish brown. Head and thorax moderately shining to strongly shining, gaster strongly shining.

**RANGE.** Central Texas northward to southwestern Kansas, westward across south-central Colorado to the southern tip of Nevada, then southward into northern Mexico.

**LITERATURE NOTES.** This species generally constructs obscure nests in stony soil with no superstructure, but sometimes with craters in very sandy soil. Colonies are small

(about 80 workers). The workers are inoffensive and move with an erratic hesitating gait (Cole, 1968:49-55).

**NEVADA LOCALITY.** Map 7. *Clark Co.*: nr Lake Mead (Cole, 1968:55).

#### *Pogonomyrmex colei* Snelling

This workerless parasite was discovered recently by S.W. Rissing, during his study of the host species, *Pogonomyrmex rugosus*. Since there is no worker caste, the species is not included in the key.

**RANGE.** Southern Nevada and central Arizona.

**NEVADA NOTES.** Both females and males closely resemble those of the host species. The females differ from that of *P. rugosus* by the shape of the petiolar node in profile; it is a weakly truncated cone and the dorsum bears a distinct median impression when seen from above. The head width is less than  $1\frac{1}{4}$  mm. In the males the body hairs are short, stiff and coarse, not long, slender and flexuous as in *P. rugosus*.

A mating flight of *P. colei* and its host *P. rugosus* was witnessed on 15 September 1978.

**NEVADA LOCALITY.** Map 7. *Clark Co.*: Boulder City.

#### *Pogonomyrmex rugosus* Emery

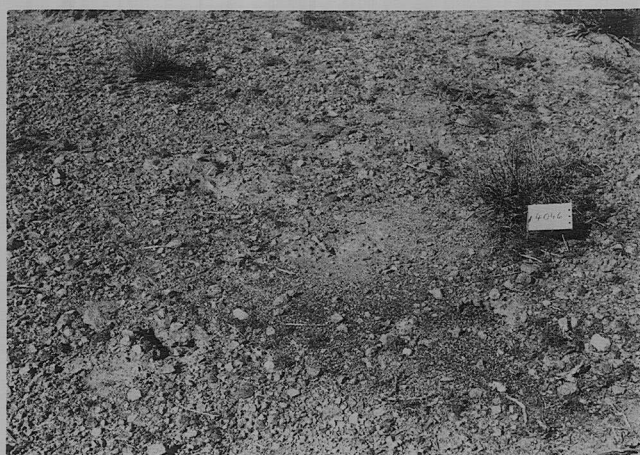
**WORKER.** Large. Color varies from concolorous dark brownish black or brownish red to various combinations of brown, reddish brown, dark red, yellowish red, and brownish black. Head and thorax dull, gaster strongly shining.

**RANGE.** Southern California, Nevada, Utah, and Colorado southward through Arizona, New Mexico, western Oklahoma, and western Texas to central Mexico.

**LITERATURE NOTES.** *P. rugosus* was reported as the host for *P. anergismus* by Cole (1954:115-116) and as the host of *P. colei* (Snelling, 1981:99).

**NEVADA NOTES.** Most Nevada records are concentrated in the southern part of the state; north of that they are few and scattered: 1,200-4,800 ft. We have 67 records from 52 localities; 32 are from the Hot Desert and only 2 from the Cool Desert (1 from a *Sarcobatus Subclimax* and 1 from *Atriplex Subclimax*). Usually the covering of the nest was a scarcely evident gravel disc 61-127 cm in diameter; some had a low mound of gravel in the center of the disc (see Fig. 17). The entrance was 9-13 mm in diameter. Sometimes there was a small chaff pile near the entrance, but this was





**Figure 17.** *Pogonomyrmex rugosus*. Entrance and excavated material. Clark County, Searchlight.

soon blown away. The workers defended the nest pugnaciously.

R.C. Bechtel collected *Myrmecophila manni* Schimer (Orthoptera: Gryllidae) from a nest in Cabin Canyon, Virgin Mts., 4,700 ft. (Clark Co.).

NEVADA LOCALITIES. Map 7.

#### KEY TO THE SPECIES OF THE OCCIDENTALIS GROUP (Adapted from Cole, 1968)

- 1a. Mandible with 6 teeth; venter of petiole with a punctate ventral projection ..... *\*anzensis*
- b. Mandible with 7 teeth; venter of petiole with or without such a ventral projection ..... 2
- 2a. Basal tooth of mandible offset, meeting short basal mandibular margin at a pronounced angle; head distinctly rugose and densely punctate; 1st tergite shagreened ..... *occidentalis*
- b. Basal tooth of mandible in line with other teeth; head sculpture varied ..... 3
- 3a. Interrugal spaces of head opaque, densely and strongly punctate ..... 4
- b. Interrugal spaces of head subopaque or shining and not so densely or strongly punctate ..... 5
- 4a. Dorsum of petiolar and postpetiolar nodes usually with numerous strong, wavy, closely spaced, subparallel transverse rugae; base of 1st gastric tergite frequently densely and strongly punctate ..... *salinus*

- b. Dorsum of petiolar and postpetiolar nodes with or without irregular rugae or striae ..... *owyhee*
- 5a. Interrugal spaces of head distinctly shining; epinotal spines generally medium to long; dorsum of petiolar node generally without transverse rugae ... *subnitidus*
- b. Interrugal spaces of head subopaque; epinotum armed with angles to prominent spines; dorsum of petiolar node usually with prominent transverse rugae; but irregular rugulae or striae sometimes present ..... 6
- 6a. Frontal lobes translucent, very large, broadly convex and completely covering insertion of antennae; epinotum armed with denticles to long spines; venter of petiolar peduncle without a prominent process ... *brevispinosus*
- b. Frontal lobes not especially broad, convex and prominent; epinotal spines short to long; venter of petiolar peduncle with a prominent process ..... *subdentatus*

#### *Pogonomyrmex brevispinosus* Cole

**WORKER.** Medium-sized. Concolorous yellowish brown to yellowish red. Head and thorax dull, gaster strongly shining.

**RANGE.** Central California and midwestern Nevada.

**LITERATURE NOTES.** "At the type locality the nests were in very compact sandy soil and each was marked by a low circular crater 3 to 8 inches in diameter. The single central entrance was surrounded by a broad, low, loose pile of small pebbles and bits of dry twigs and leaves." Nest shallow (13–30 cm deep) and with a central vertical gallery. Population small (fewer than 200 workers). Sluggish and docile; do not sting (Cole, 1968:94).

**NEVADA NOTES.** We have 4 records from 4 localities, all from the Cool Desert (Sarcobatus Subclimax). One nest was surmounted by a 5-cm messy crater.

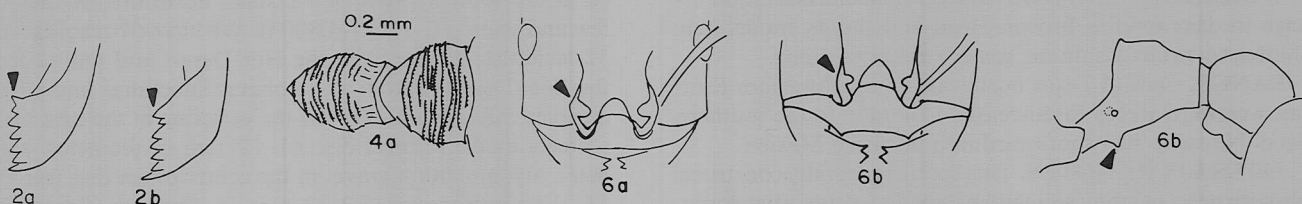
**NEVADA LOCALITIES.** Map 8. *Lyon Co.*: Dayton 4,300 ft., 4,600 ft.; 6 mi. SSE Wabuska 4,300 ft. *Washoe Co.*: Reno.

#### *Pogonomyrmex occidentalis* (Cresson)

**WORKER.** Large. Head and thorax dark reddish brown, gaster dark red to yellowish red. Head and thorax dull, gaster strongly shining.

**RANGE.** A rough rectangle with its corners in southwestern North Dakota, central Oklahoma, southeastern Arizona, and east-central California. The maximum elevation reported is 9,000 ft. in Colorado (Gregg, 1963:331).

**LITERATURE NOTES.** This large handsome red ant is a common inhabitant of the Great Plains and Great Basin



#### OCCIDENTALIS GROUP OF GENUS *POGONOMYRMEX*

where its nests are a conspicuous feature of the landscape. Its large conoidal mounds are typically covered with fine gravel and each is situated near the center of a large bare circular area. The chambers and galleries in the mound and in the ground below it afford "air-conditioning" for the stored seed and the developing brood, since the workers move the seeds and brood to those chambers which have the proper humidity and temperature. That this species harvests the seeds of the plants that grow in the vicinity of the nest has been known since the publication of McCook's classic book in 1882.

*Pogonomyrmex occidentalis* is regarded as a serious pest. Its sting is obnoxious and it can thereby become a nuisance near human habitations. Also it has been known to harvest seeds man has planted (especially those broadcast onto the surface) and that is certainly an annoyance to the planter. On balance, however, it is probably beneficial. Any subterranean ant can improve the tilth of certain soils by mixing. Fertility is improved by the organic refuse which ants pack into chambers near the surface. The soil is aerated by the underground workings of the ants. The number of seeds consumed by the ants is negligible considering the vast surplus of seeds produced by the plants. Furthermore, ants may aid the plants by seed dispersal. The harvesters also consume large quantities of insects—dead or alive; hence they may be useful as scavengers and predators. The main charge against them is the waste of land in their clearings, but the clearings occupy less than 1% of the total area. An increase in vegetation around the clearing partially compensates for the loss.

The mounds of *P. occidentalis* are built of two types of material: (1) the soil which the ants have excavated in the construction of the subterranean portion of the nest and (2) the fine gravel collected from the surrounding soil surface and placed on the mound. Where gravel is not available a wide variety of substitutes is used. In North Dakota we (Wheeler and Wheeler, 1963) found gypsum, selenite, lignite, petrified wood, empty snail shells, plant debris, and pellets of soil. Paleontologists have collected teeth of small extinct mammals from the surface of mounds. It is even rumored that early prospectors found small gold nuggets, but we were never so lucky. The function of the gravel coating of the mound is probably to prevent erosion by strong winds and torrential rains. Because of the large volume of dead air space (chambers and galleries) the mound also serves as a regulator of temperature.

The mounds (in North Dakota) were generally conoidal. Of the nests for which measurements were recorded the mound varied from 30 cm in diameter and 5 cm in height to 135 cm in diameter and 25 cm in height; average 61 and 14 cm (Wheeler and Wheeler, 1963:114).

Surrounding the mound was a bare area or clearing, which (in North Dakota) reached 3 m in diameter; the average was 1½ m. According to Cole (1932a:140) this was "due to the destruction, by the worker ants, of the vegetation closely surrounding the mounds. The plants are literally 'chewed-down', bit by bit, from the apex to the base." He concluded that the clearing protected the mound from grass fires. We would suggest also that the bare area surrounding the mound



Figure 18. *Pogonomyrmex occidentalis*. Mound and clearing. Washoe County, 19 mi. north of Reno.

makes the sunlight more effective earlier in the day. It must be kept in mind that *P. occidentalis* occupies a range of cool nights (even in summer) and hot days. Earlier rising enables the workers to get their day's work done before the midday sun in summer heats the ground to lethal temperatures.

In warm weather in North Dakota the workers of *P. occidentalis* stayed inside the nest during the hottest part of the day, but the entrance remained open. At night the workers retreated into the nest and closed the entrances. Any ant that did not get back in time had to stay outside all night.

Workers and the queen overwinter; there is no brood at this time, nor are winged (sexual) forms present. The workers cluster in masses and in a comatose condition, but they revive quickly when warmed; many will survive freezing temperatures overnight. The greatest depth at which ants were found in winter in Wyoming was 277 cm (Lavigne, 1969).

Lavigne reported (1969:1167) that the actual counts of workers in the 33 nests he excavated varied from 412 to 8,796. There was no direct relation between the size of the mound and the population of the nest. This might be due in part to the fact that small colonies have been known to move into larger abandoned nests.

We had samples of seeds taken from 16 nests in North Dakota. The number of species we found in a nest at the time of collection ranged from 1 to 9. The seeds collected by all the colonies studied were from 30 species of plants (Wheeler and Wheeler, 1963:116).

The enemies of this ant are lizards and birds. Several species of rodents have been reported robbing the seeds stored in the chambers of the mound.

**NEVADA NOTES.** We have 238 records from 180 localities; 4,000–8,700 ft. Most records (56) were from the Cool Desert (of these 2 were from dunes, 2 from cottonwood groves, 1 from *Sarcobatus Subclimax* and 15 from disturbed habitats), and 43 were from the Pinyon-Juniper Biome.

We have measured 27 mounds with circular bases: the diameter ranged from 30 to 180 cm, average 79 cm, mode 91 cm. But many mounds were subelliptical at the base: the average length was 71 cm, width 66 cm. The height of the





**Figure 19.** *Pogonomyrmex salinus*. Mound. White Pine County, 2 mi. north of McGill.

mounds ranged from 5 to 33 cm, average 20 cm, mode 23 cm. Clearings around the mounds ranged from 1½ to 5 m, average 3 m, mode 2.7 m.

On 25 November 1975, S.W. Rissing and the junior author excavated a typical nest 10 mi. north of Reno at 5,000 ft. The total population comprised 4,121 workers and 1 queen. Seeds were found in chambers 51 cm deep. At 64 cm torpid workers were tightly packed in galleries and chambers.

The myrmecophilous beetle *Araeoschizus armatus* Horn (Coleoptera: Tenebrionidae), was found in a colony of this ant in Diamond Valley 3 mi. NNW Eureka (Eureka Co.) 5,900 ft. and in a colony on the Lyon–Mineral Co. line, Hwy. 3C 6,200 ft.

*Margarodes* sp. nr *chukar* LaRivers (Homoptera: Margarodidae; det. D.R. Miller) was in a nest at South Twin River (Nye Co.) 7,100 ft.

NEVADA LOCALITIES. Map 9.

### *Pogonomyrmex owyhee* Cole

**WORKER.** Medium-sized to large. Concolorous strong brown to very dusky red. Head and thorax dull, gaster strongly shining.

**RANGE.** Southern British Columbia, southern Alberta and southern Saskatchewan southwestward to northern Nevada and to the Pacific Coast in Oregon.

**LITERATURE NOTES.** Until 1938 only one northwestern species was recognized. In that year Cole described *P. owyhee* as a subspecies of *P. occidentalis* and in 1950 Creighton raised it to specific rank. Consequently, early information about *P. owyhee* will be under *P. occidentalis*.

According to Cole (1968:106) the nests of *P. owyhee* are “indistinguishable from those of *occidentalis*, and they occur in similar ecological areas and at similar elevations. Workers of the two species seem to be equally antagonistic to intruders and sting with the same vigor.”

**NEVADA NOTES.** It occurs in a zone 100 mi. wide along the northern border of the state, i.e., contiguous to the range of *P. occidentalis*. We have 19 records from Cool Desert (1

from a stabilized sand dune and 2 from disturbed areas) and 3 from the Pinyon-Juniper. Our records show that most mounds from which we collected were low irregular piles of gravel 46–97 cm across. Only 2 mounds were neat conoids 61 cm in diameter; 1 was 15 cm high, the other was 30 cm. Clearings averaged 3 m in diameter. For the state we have 75 records from 49 localities. The altitudinal range is 4,100–6,300 ft.

NEVADA LOCALITIES. Map 9.

### *Pogonomyrmex salinus* Olsen

**WORKER.** Medium-sized to large. Yellowish red with infuscation dark reddish brown varying to dark reddish brown with infuscation very dusky red. Head and thorax dull, gaster strongly shining.

**RANGE.** Nevada, eastern California and southeastern Oregon.

**LITERATURE NOTES.** “In comparison with the offensive and pugnacious workers of *occidentalis* and *owyhee*, the *salinus* worker is indeed a very docile ant. I have collected large samples from many nests of the latter species without ever having been stung, although the ants have run freely over my arms and legs” (Cole, 1968:110).

**NEVADA NOTES.** *P. salinus* is probably the commonest ant throughout its range; it is the Cool Desert ant of Nevada. We have 245 records from 163 localities; 3,300–8,200 ft. It is abundant throughout that portion of the state north of latitude 38°N. We have biome data for 102 records; 79 from the Cool Desert (26 from the Sarcobatus Subclimax, 9 from disturbed areas, and 1 from a cottonwood grove) and 23 from the Pinyon-Juniper. Usually (36 nests) the superstructure was a low gravel mound (see Fig. 19), but in many (25) it was a thin gravel disc. The average diameter of 67 measured superstructures was 69 cm, the mode was 61. Sometimes (18 nests) the superstructure was a gravel crater 8–30 cm in diameter; we suspect that these were young colonies. Clearings ranged from 1½ to 5½ m in diameter; the average was 2.4 m.

A nest 2 mi. E Stillwater 3,900 ft. (Churchill Co.) contained *Notibius* sp. nr *puberulus* LeC. (Coleoptera: Tenebrionidae; det. T.J. Spilman).

NEVADA LOCALITIES. Map 10.

### *Pogonomyrmex subdentatus* Mayr

**WORKER.** Medium-sized to large. Concolorous red with very dusky red infuscation varying to dark reddish brown with very dusky red infuscation. Head and thorax dull, gaster strongly shining.

**RANGE.** California, southwestern Oregon, and western Nevada.

**LITERATURE NOTES.** “All the nests that I have seen were marked by low, irregular beds of sand or gravel with more than one entrance, and contained several hundred workers. . . . This species is one of the most docile in its genus. The workers retreat rather rapidly toward cover when the nest is disturbed. I have never been able to elicit an attack response” (Cole, 1968:113, 114).

**NEVADA NOTES.** We have 16 records from 16 localities but only from the western part of the state; 3,900–5,900 ft. We have habitat data for only 4 colonies, all in the Cool Desert (1 from the *Sarcobatus* Subclimax, 1 in a cottonwood grove, and 1 in a disturbed area). We have data on only 2 nests: 1 was a circular crater of fine sand (on a sand dune) 33 cm in diameter and 5 cm in height; it incorporated the base of a sagebrush plant. The other was under and among stones; there were 4 half-craters of gravel.

We took 11 specimens of *Anthicus lecontei* Champion (Coleoptera: Anthicidae; det. F.G. Werner) from a nest of *P. subdentatus* at Lahontan Reservoir (Churchill Co.) 4,100 ft.

**NEVADA LOCALITIES.** Map 8. *Churchill Co.*: 4 mi. SW Bradys Hot Springs 4,000 ft.; 5 mi. W Fallon 4,000 ft.; 4 mi. W Fallon 4,000 ft.; 3 mi. E Fallon 4,000 ft.; 25 mi. N Fallon 3,900 ft.; Lahontan Reservoir (5-18N-26) 4,100 ft. *Lyon Co.*: nr Carson River (33-17N-23) 4,300 ft.; 6 mi. ENE Fernley (12-20N-25) 4,000 ft.; Wabuska 4,300 ft. *Mineral Co.*: Aurora 7,400 ft.; Schurz 4,200 ft. *Ormsby Co.*: New Empire 4,700 ft. *Pershing Co.*: Lovelock 4,000 ft. *Washoe Co.*: Smoke Creek 4,000 ft.; Washoe Lake (-20N-19) 5,000 ft.; between Nixon and Wadsworth.

### *Pogonomyrmex subnitidus* Emery

**WORKER.** Large. Concolorous yellowish red to dark reddish brown. Head and thorax feebly shining, gaster strongly shining.

**RANGE.** Western Nevada, south-central and southern California, and northern Lower California.

**LITERATURE NOTES.** Nests are in sand or very loose sandy soil and the entrance is surrounded by a semicircular or circular crater or irregular bed of sand.

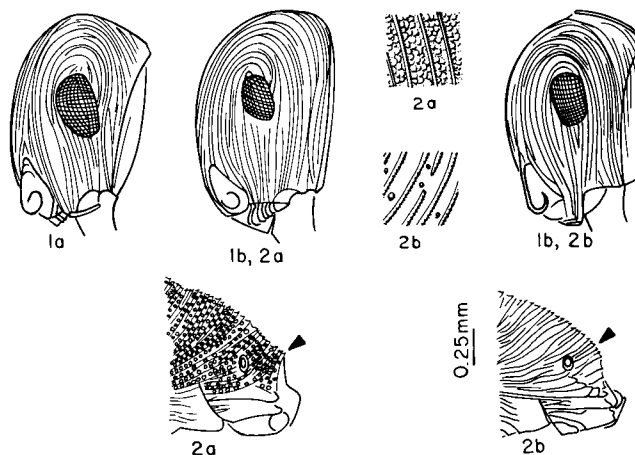
**NEVADA NOTES.** We have 10 records from 10 localities; 4,200–6,100 ft. All records (except 1) were from the western edge of the state; 4 in Cool Desert (1 in *Sarcobatus* Subclimax and 1 in a disturbed roadside) and 1 in the Pinyon-Juniper Biome. One superstructure was a 13-cm crater, 1 was a 15-cm half-crater and 3 were irregular beds of excavated soil.

*Araeoschizus armatus* Horn (Coleoptera: Tenebrionidae; det. T.J. Spilman) was found in a nest at Dayton (Lyon Co.), 4,300 ft.

**NEVADA LOCALITIES.** Map 8. *Lyon Co.*: Dayton 4,300 ft. (Cole, 1968:117); 2 mi. N Smith 4,800 ft. (Cole, 1968:117). *Nye Co.*: Fourmile Spring 5,900 ft. (Cole, 1968:117), 6,100 ft. *Storey Co.*: Tracy 4,300 ft. *Washoe Co.*: Derby Dam (20 mi. ENE Reno) 4,200 ft.; 8 mi. W of S end Pyramid Lake 5,400 ft.; 12 mi. W of S end of Pyramid Lake 4,300 ft.; 7 mi. NNE Sparks 4,500 ft.; 22 mi. N Sparks 4,600 ft.

### The *Maricopa* Group

*Pogonomyrmex californicus* and *maricopa* are certainly two valid species; nevertheless there are specimens which are intermediate in key characters. "It may be admitted that the two insects are closely related but it would seem that there is quite enough structural difference in the two to justify specific status for *maricopa*. In point of fact the two may be



### MARICOPA GROUP OF GENUS *POGONOMYRMEX*

separated at a glance for the deeper color and notably larger and bulkier stature of *maricopa* gives it an appearance quite unlike that of *californicus*. . . . In addition [to sculpture], the epinotum of *maricopa* is more angular [in profile] than that of *californicus* with the mesoepinotal suture usually more distinctly impressed" (Creighton, 1950:127).

### KEY TO THE SPECIES OF THE MARICOPA GROUP

- 1a. Eye unusually large, its greatest diameter approximately equal to distance from it ventral margin to mandibular insertion; small ants (4¾–5½ mm long) . . . . . *magnacanthus*
- b. Eye not unusually large, its greatest diameter notably less than distance from lower eye margin to mandibular insertion; usually larger ants (6¾–8¾ mm long) . . . . . 2
- 2a. Interrugal punctation on head and on sides of epinotum moderate to strong, interrugal spaces subopaque; a distinct angle between base and declivity of epinotum; epinotum without armature or with a pair of angles, denticles, or short to long spines . . . . . *maricopa*
- b. Interrugal punctation on head and on sides of epinotum weak or absent, interrugal spaces strongly shining; junction between base and declivity of epinotum generally smooth and broadly rounded; epinotum unarmed . . . . . *californicus*

### *Pogonomyrmex californicus* (Buckley)

**WORKER.** Medium-sized to large (see Fig. 20). Concolorous red to dark reddish brown; or bicolored with head, thorax, and anterior portion of gaster yellowish red, posterior portion of gaster black. Head and thorax feebly shining, gaster strongly shining. [Diminutive workers are sometimes found even in strong colonies.]

**RANGE.** Nevada, southern California and southwestern Utah to southwestern New Mexico, western Texas, and northern Mexico.

**LITERATURE NOTES.** The workers are assiduous harvesters; they forage all day, except during the hottest hours.



**Figure 20.** *Pogonomyrmex californicus*. Photograph by Kenneth Middleham.

Seeds are harvested in great numbers, notably those of *Phacelia* spp., *Aristida* sp., and *Sarcobatus vermiculatus*; the mounds are often surrounded by the bracts of these and other seeds (Cole, 1932b:115).

**NEVADA NOTES.** This red or red and black harvester is one of the common ants of the Mojave and Sonoran deserts. It is certainly the most irascible, resenting fiercely with a potent sting any intrusion. Unlike most ants (but like the honeybee) the sting is left in the wound.

*Pogonomyrmex californicus* nested in sandy soil. The underground nest was surmounted by a low circular crater of loose excavated sand 25–60 cm in diameter and 2½–5 cm in height. Near the center was a single entrance 2 cm in diameter. The workers made no attempt to clear away vegetation around the mound. If the nest was on a slope the mound of excavated sand was semicircular with the level top surface just below the entrance; the latter was at the geometric center of the hypothetical completed circle. The radius was typically 10 cm. The entrance was a horizontal slit 12 mm across. The mound and entrance were strongly reminiscent of the entrances and tailings of abandoned gold and silver mines on the hillsides near Tonopah and Goldfield.

We have found chambers at a depth of 2½ cm under an area of 30–60 cm<sup>2</sup>; these usually contained seeds or chaff. In a flourishing colony we found brood, seeds, and sexual forms in the same chamber, with the brood lying on the seeds. We also found stored seeds at a depth of 7½ cm.

The workers ran rapidly and erratically, with frequent stops and changes of direction for no apparent reason. Often the gaster was conspicuously elevated; this doubtless had a cooling function. The nest was closed with sand or pebbles at night and in the heat of the day.

We have a total of 261 records from 175 localities; 500–6,300 ft.: 28 from the Hot Desert, 83 from the Cool Desert (45 from *Sarcobatus* Subclimax, 2 from cottonwood groves, 17 from disturbed areas, and 13 from sand dunes).

In Nevada *P. californicus* is common and widely distributed in the southern and western portions of the state. We



**Figure 21.** *Pogonomyrmex californicus*. Crater. Clark County, Boulder City.

have no records from a zone 40 mi. wide along the entire northern border and no records from Elko, White Pine, and Lander counties.

We found the following myrmecophilous beetles in the nests of *P. californicus*: Tenebrionidae (det. T.J. Spilman): *Araeoschizus armatus* Horn, 25 mi. N Fallon (Churchill Co.) 3,900 ft.; *Araeoschizus armatus* and *Notibius* nr *puncticollis* LeC. were in the same nest nr Tracy (Storey Co.) 4,300 ft.; *Notibius puberulus* LeC. in a nest at Las Vegas 2,000 ft. and at Davis Dam 600 ft. (Clark Co.) and 25 mi. N Fallon (Churchill Co.) 3,900 ft.; *Notibius substriatus* Casey in a nest at Deadhorse Wells (Mineral Co.) 4,100 ft. Scydmaenidae (det. J.M. Kingsolver): *Papusus* sp. probably *macer* Casey in a nest at Sandy (Clark Co.) 2,600 ft.

**NEVADA LOCALITIES.** Map 11.

### *Pogonomyrmex magnacanthus* Cole

**WORKER.** Medium-sized. Concolorous reddish yellow to yellowish red. Head feebly shining, thorax dull, gaster strongly shining. Eye relatively large.

**RANGE.** Southern Nevada, western Arizona, southern California, Mexico.

**LITERATURE NOTES.** Nests are in unshaded rather loose sandy soil of open desert. Entrances are surrounded by a circular shallow sand crater 10–15 cm in diameter. Colonies are small, 100–225 workers. The workers forage diurnally at a rather slow and steady gait. They are docile and exhibit none of the erratic and rapid movements of *P. maricopa* and *P. californicus* when disturbed (Cole, 1968).

**NEVADA NOTES.** Three nests had as superstructures downhill tailings below the entrance. Three had craters of fine sand 6–10 cm in diameter. The workers moved slowly. We have 13 records from 10 localities in Nevada, all from the Hot Desert in the southern portion of the state: 1,200–3,400 ft.

**NEVADA LOCALITIES.** Map 12. *Clark Co.*: 2 mi. W Echo Bay 1,300 ft.; 7 mi. SW Echo Bay 1,800 ft.; west base of Mormon Mesa 1,500 ft.; 4 mi. SW Riverside 1,500 ft.;



Valley of Fire State Park 2,000 ft.; 3 mi. W Cottonwood Cove 1,200 ft. Nye Co.; 2 mi. N Pahrump 3,400 ft.; Rock Valley 3,200 ft.; Beatty 3,400 ft. (Cole, 1968:137); Test Site.

### *Pogonomyrmex maricopa* W.M. Wheeler

**WORKER.** Large. Head strong brown, thorax and gaster reddish yellow varying to head and thorax red, gaster dark reddish brown. Head and thorax dull, gaster strongly shining.

**RANGE.** Southeastern California, southern Nevada, southern Utah, and south-central Colorado to western Texas and southwestward into northwestern Mexico.

**LITERATURE NOTES.** *P. maricopa* nests may be surmounted by sand or pebble craters or a dome with a surface covering of gravel, whereas the superstructure of *P. californicus* is of sand only. Otherwise the 2 species are very similar in habits.

**NEVADA NOTES.** We have 16 records from 13 localities in the southern part of the state; 500–3,400 ft. All are from the Hot Desert (1 from a cottonwood grove and 2 from disturbed areas). The superstructure of 3 nests consisted of gravel. One was a large (51 × 91 cm) irregular mound with 3 horizontal slit-like entrances; 2 had piles of tailings below slit-like entrances. The piles of tailings fanned out to 38 cm and 61 cm; the entrances were 12 mm high and 38 mm wide.

**NEVADA LOCALITIES.** Map 12. *Clark Co.*: Mesquite 1,600 ft.; Bunkerville 1,600 ft.; Logandale; Moapa; 5 mi. W Boulder City; U.S. Hwy. 95 7 mi. S jnc. with U.S. Hwy. 93; bank of Colorado River, Fort Mojave Indian Reservation 500 ft.; Las Vegas. *Lincoln Co.*: Carp 2,600 ft.; Vigo 2,400 ft.; Elgin 3,400 ft.; 3 mi. SE Elgin 3,300 ft.; 5 mi. NNW Elgin 3,400 ft.

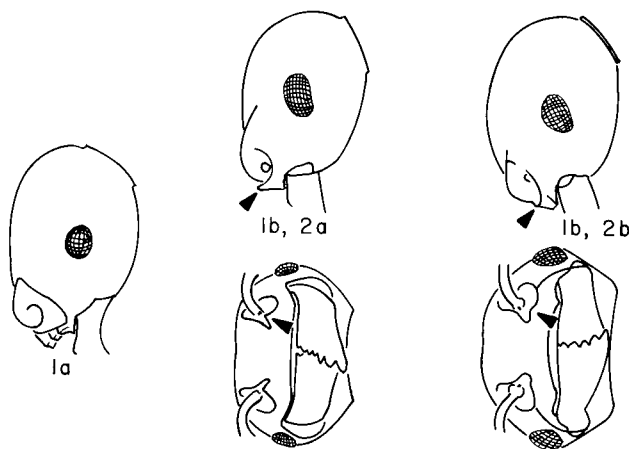
### Genus *Ephebomyrmex* W.M. Wheeler

Although Cole (1968) treated *Ephebomyrmex* as a subgenus of *Pogonomyrmex* we think it is a distinct genus. Most of the species are South American; the five species found in North America are separated in a key by Snelling (1981).

Colonies are smaller than those of *Pogonomyrmex*, usually with fewer than 200 workers, and the ants are much less aggressive. Workers forage individually and seeds are a less conspicuous part of the items brought back to the nest. Stings are much less severe than are those of *Pogonomyrmex*.

#### KEY TO THE SPECIES OF *EPHEBOMYRMEX*

- 1a. Larger ants (length 4½–5½ mm); eye small, not notably longer than wide, the distance from its ventral border to mandibular articulation about 2 times eye length ..... *\*huachucanus*
- b. Smaller ants (length 3–4½ mm); eye larger, notably longer than wide, distance from its ventral border to mandibular articulation only about 1½ times eye length .. 2
- 2a. Clypeus with prominent tooth-like projection below each antennal fossa ..... *imberbiculus*
- b. Clypeus without prominent tooth-like projection below each antennal fossa ..... *\*pima*



### GENUS *EPHEBOMYRMEX*

#### *Ephebomyrmex imberbiculus* (W.M. Wheeler)

**WORKER.** Small. Concolorous strong brown to dark red. Head and thorax dull, gaster strongly shining.

**RANGE.** From central and western Texas, southwestern Oklahoma and southwestern Colorado to southern Nevada and southern California, and southwestward to central Mexico.

**LITERATURE NOTES.** Nests are under stones or exposed; sometimes there is a small crater. Workers store seeds and dead insects; they forage singly, at a slow and steady gait; they are extremely docile. Colonies are small, averaging about 50.

**NEVADA NOTES.** We have 5 records from 5 localities all in the Hot Desert, but we have data on only 3 colonies: 2 were under stones, 1 had a 5-cm crater.

**NEVADA LOCALITIES.** Map 13. *Clark Co.*: Hwy. 68 at California boundary 3,600 ft.; 19 mi. S Searchlight 2,500 ft. *Lincoln Co.*: 15 mi. WSW Crystal Spring 4,700 ft.; 4 mi. NNW Elgin 3,400 ft. *Nye Co.*: Test Site (Cole, 1966:6).

### Genus *Stenamma* Westwood

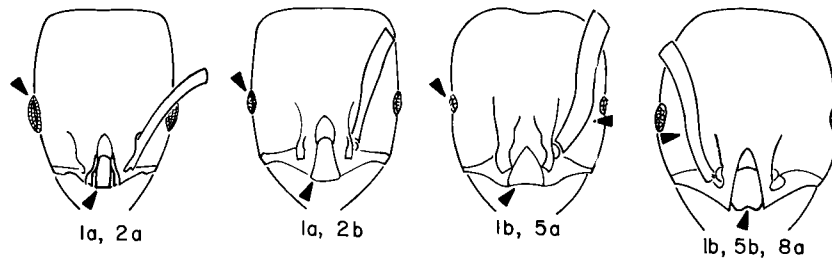
The ants of this genus are carnivorous and occur in small colonies, usually in wooded areas, where they nest under leaf mold, moss, rocks or logs or in rotten wood. They are sluggish and timid and are rarely seen outside the nest. There are 20 Nearctic species, 4 of which have been reported from Nevada.

#### KEY TO THE SPECIES OF *STENAMMA*

(Adapted from Snelling, 1973)

(The following key seems too long and complicated for a genus of small and rarely encountered ants, but it is the best we can do.)

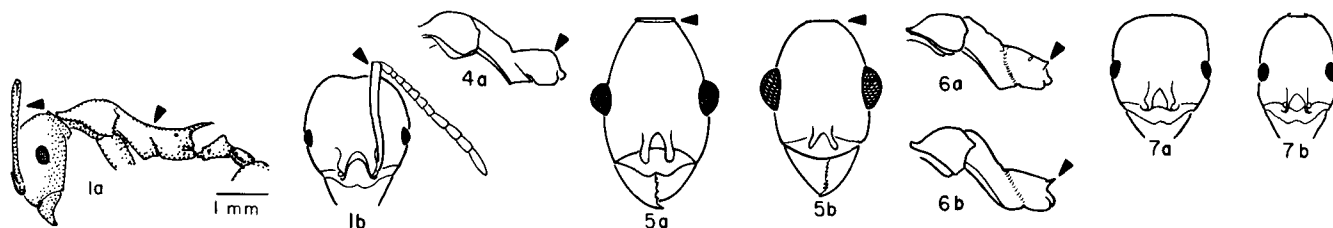
- 1a. Median lobe of clypeus prolonged beyond clypeal margin, apex truncated in full face view; eye relatively large,



# GENUS *STENAMMA*

- oculomandibular distance 1.0–1.8 times eye length . . . . . 2
- b. Median lobe of clypeus short, not exceeding clypeal margin, apex notched in full face view; eye relatively small, oculomandibular distance 2–3 times length . . . 3
- 2a. First gastric sternite wholly smooth and polished; first gastric tergite without conspicuous basal striae; eye large, with 8–12 facets in greatest diameter . . . . . *smithi*
- b. First gastric sternite conspicuously striate, often coarsely so, and often finely and densely punctate, especially at sides; first gastric tergite with conspicuous short fine basal striae; eye with 4–6 facets in greatest diameter; oculomandibular distance 1.3–1.8 times eye length, usually about 1.5 times . . . . . *\*punctatovenstre*
- 3a. Entire first gastric tergite with scattered coarse piligerous punctures; basal half of first gastric tergite with fine striae and dense punctures; head and thorax evenly reticulorugose . . . . . 4
- b. First gastric tergite usually smooth and shining; sculpture (if any) limited to basal third or less, consisting of fine punctures and/or fine divergent basal striae; head and thorax usually not reticulorugose . . . . . 5
- 4a. Sculpture of first gastric tergite extending over most of somite, with only a narrow apical band devoid of punctation; scapes and tibiae with hairs mostly decumbent or subdecumbent; longest head hairs at least 2 times shortest . . . . . *heathi*
- b. Sculpture of first gastric tergite largely confined to basal half; scape and tibiae with abundant fully erect white hairs; erect hairs on front of head even in length . . . . . *\*exasperatum*
- 5a. Front and occiput of head and thoracic dorsum with short hairs, decumbent or subdecumbent; scape flattened toward base, as broad at bend as at apex; head and thorax densely punctate, dull . . . . . *wheelerorum*
- b. Front and occiput of head and thoracic dorsum with conspicuous long erect hairs; scape cylindrical, broadest at apex; head and thorax often with shining areas with little or no punctation . . . . . 6
- 6a. First gastric tergite usually conspicuously sculptured; first gastric sternite conspicuously sculptured, at least at side, with much of somite densely punctate or basal third with conspicuous striae . . . . . 7
- b. First gastric tergite largely smooth and shining (except usual short divergent striae at base); first gastric sternite smooth and shining, without punctures or striae . . . 8
- 7a. Mesopleuron with conspicuous longitudinal or oblique rugulae; upper half of side of epinotum with longitudinal rugulae; basal third of first gastric tergite usually conspicuously and very finely striate, punctures lacking or feeble; basal third of first gastric sternite striate, side sometimes punctate . . . . . *\*dyscheres*
- b. Mesopleuron without conspicuous longitudinal rugulae; upper half of epinotal side densely punctate, without rugulae; basal fourth to third of first gastric tergite densely punctate; basal third or more of first gastric sternite finely and densely punctate . . . *\*californicum*
- 8a. Carinae of medial lobe of clypeus subparallel or slightly divergent; area between carinae concave, apex notched in anterior view; mesopleuron punctate or rugulose; sides of pronotum conspicuously striate and/or rugulose; first gastric tergite with or without conspicuous basal striae . . . . . 9
- b. Carinae of medial lobe of clypeus strongly divergent; area between carinae flattened, apex not notched in anterior view; mesopleuron densely punctate or rugulose; sides of pronotum smooth, without sculpture on lower half; first gastric tergite without basal striae . . . . . *\*huachucanum*
- 9a. Basal striae (if present) of first gastric tergite very short, seldom exceeding 0.05 mm; postpetiole smooth and shining dorsally and on sides (occasionally with a few short inconspicuous rugulae); mesopleuron punctate and/or rugulose . . . . . 10
- b. Basal striae of first gastric tergite conspicuous, 0.12–0.2 mm long; postpetiole shining, with conspicuous longitudinal rugulae; mesopleuron rugulose, interspaces punctate . . . . . *\*sequoiarum*
- 10a. Mesopleuron densely punctate, rugulae feeble or lacking; side of pronotum with conspicuous coarse punctures between rugulae, the latter often lacking; basal striae of first gastric tergite inconspicuous . . . . . *\*occidentale*
- b. Mesopleuron with several rugae, interspaces feebly punctate or impunctate; side of pronotum rugulose, interspaces without punctures or rarely a few fine punctures ventrally; basal striae of first gastric tergite usually distinct . . . . . *diecki*





## GENUS *APHAENOGASTER*

### *Stenammina diecki* Emery

**WORKER.** Small. Head and thorax dark reddish brown to dark red, gaster reddish brown. Head dull, thorax moderately shining, gaster strongly shining.

**RANGE.** The southern boundary of this species is a curved line from North Carolina to Illinois and Iowa and north to North Dakota, thence southwestward to California and Mexico; the northern boundary extends across southern Canada from British Columbia to Quebec.

**NEVADA NOTE AND LOCALITY.** Map 13. We have a single specimen found under a stone in Little Valley (Washoe Co.) 6,400 ft.

### *Stenammina heathi* W.M. Wheeler

**WORKER.** Small. From yellowish brown or light reddish brown to dark reddish brown, gaster usually scarcely darker than the remainder.

**RANGE.** West-central Nevada, California, and Lower California.

**NEVADA NOTE AND LOCALITY.** Map 14. There is a single record in the USNM: *Washoe Co.*: north end of Lake Tahoe 6,400 ft. Under stone in Jeffrey pine forest (Smith, 1957:156).

### *Stenammina smithi* Cole

**WORKER.** Small. Head yellowish red, with infuscation very dusky red, thorax reddish yellow, gaster reddish black varying to concolorous very dusky red. Head and thorax dull, gaster strongly shining.

**RANGE.** Idaho, Utah, and Nevada.

**NEVADA NOTES.** One of our 2 specimens was collected in the Coniferous Forest Biome, the other in the Cool Desert.

**NEVADA LOCALITIES.** Map 14. *Nye Co.*: Test Site (Cole, 1966:7). *Ormsby Co.*: 7 mi. WSW Carson City (Kings Canyon) 7,000 ft. *Washoe Co.*: Lemmon Valley (9 mi. N Reno) 4,900 ft.

### *Stenammina wheelerorum* Snelling

**WORKER.** Small. Concolorous reddish yellow with dark brown infuscation in a ventral band across face, on dorsum of thorax, and on posterior portion of gaster. Head and thorax dull, gaster strongly shining.

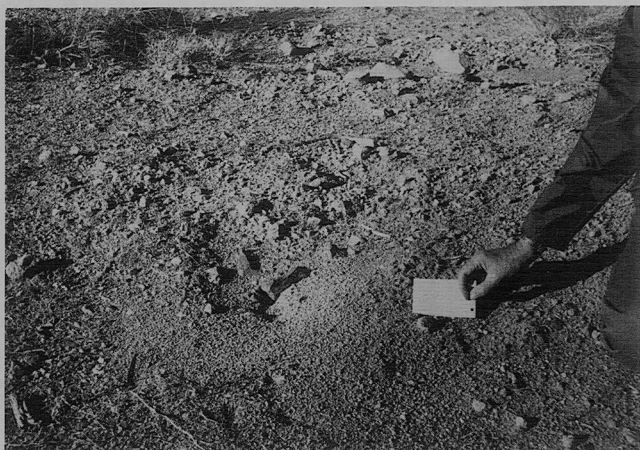
**NEVADA NOTE AND LOCALITY.** Map 14. There is only 1 record for this species—the TYPE NEST, which we collected near Mt. Rose (Washoe Co.) 8,800 ft. It was in the Coniferous Forest Biome and the nest was under a pile of stones.

## Genus *Aphaenogaster* Mayr

The ants of this genus form small to moderately large colonies both in the soil and in rotten wood. They are largely, if not entirely, carnivorous.

### KEY TO THE SPECIES OF *APHAENOGASTER*

- 1a. Large ants (10–12 mm long); scape projecting well beyond occipital border; thoracic dorsum with meso-epinotal suture faint or absent ..... *cockerelli*
- b. Small ants (not more than 4 mm long); scape never projecting much beyond occipital border; thoracic dorsum with meso-epinotal suture well marked ..... 2
- 2a. Antenna shorter, scape of larger worker surpassing occipital margin by an amount equal to or less than length of first 2 funicular segments ..... 3
- b. Antenna longer, scape of workers surpassing occipital margin by an amount greater than length of first 2 funicular segments ..... 4
- 3a. Head with abundant fine punctate-rugose sculpture between longitudinal rugae; color of head and gaster strong brown to black, thorax strong brown to very dusky red ..... *occidentalis*
- b. Head with very feeble interrugal sculpture; head and thorax red or yellowish red, gaster very dusky red ..... *uinta*
- 4a. Epinotum rounded or angular but without distinct teeth or spines ..... 5
- b. Epinotum armed with distinct teeth or spines ..... 6
- 5a. Head and thorax strong brown, gaster brown; dorsum of epinotum with prominent transverse rugae adjacent to meso-epinotal suture; remainder of epinotum coarsely punctate; occipital flange large and prominent ..... *boulderensis*
- b. Concolorous white to bicolored with head and thorax very pale brown, gaster light yellowish brown; entire epinotum delicately punctate, without rugae; occipital flange poorly developed ..... *megommata*



**Figure 22.** *Aphaenogaster cockerelli*. Entrance and excavated material. Clark County, Searchlight.

- 6a. Epinotum armed with short triangular teeth ..... \**huachucana*
- b. Epinotum armed with spines ..... 7
- 7a. Head of largest worker not more than  $\frac{1}{5}$  longer than broad; head of smallest worker approximately  $\frac{1}{5}$  longer than broad ..... \**rudis*
- b. Head of all workers approximately  $\frac{1}{3}$  longer than broad ..... \**texana*

### *Aphaenogaster boulderensis* M.R. Smith

**WORKER.** Medium-sized. Bicolored: head and thorax strong brown, gaster brown, eye black. Ventral portion of head and posterior portion of thorax feebly shining; dorsal portion of head, anterior portion of thorax, and entire gaster strongly shining.

**RANGE.** Southern California and southern Nevada to western Texas.

**NEVADA NOTES AND LOCALITY.** Map 15. Cole found only 2 stray workers. *Nye Co.*: Test Site (Cole, 1966:9). Cole erred in placing the type locality in Nevada: Horseshoe Island in Lake Mead is in Arizona.

### *Aphaenogaster cockerelli* (E. André)

**WORKER.** Large. Bicolored: head and thorax dark red to very dusky red, bilobed spot on anterior portion of gaster yellowish red, remainder of gaster black. Head and thorax moderately shining, gaster strongly shining.

**RANGE.** Western Texas to southern Nevada and southeastern California and southward into Mexico.

**LITERATURE NOTES.** "In the dry deserts of western Texas, I have seen . . . *cockerelli* bring its larvae and pupae out onto the large crater of the nest about 9 P.M. and carry them leisurely to and fro" (W.M. Wheeler, 1910:69). He also (1910:178) saw straggling workers "returning from all directions to their nests just as the cold December twilight was setting in. Each worker bore in her slender jaws a fellow worker that she had picked up while on her way home."

"It is unlikely that anyone who has seen the nests of these insects could have failed to be impressed with their extraordinary coarseness of construction. There is not a single feature of the nest which does not appear abnormally large in view of the size of the insects themselves. The irregular central opening of the nest may be three or four inches across. Through this one looks down into a steeply descending, roughly constructed tunnel which more nearly resembles a rat's burrow than the entrance to an ant's nest. Around the central opening the insects ordinarily build a disc of very coarse gravel mixed with excavated soil. This disc may be six feet in diameter. . . . Toward the center of the disc there is often a thicker pile of soil and gravel which has been formed into a rude crater" (Wheeler and Creighton, 1934:346-347).

"There is little structural modification and practically no trophic adaptation which would mark them as well developed xerophiles" (Wheeler and Creighton, 1934:344).

"During the summer months the foraging activities of these insects begin late in the afternoon and continue through the night hours. . . . As a rule by the middle of the morning the workers have returned to the nest where they remain during the midday hours. When foraging the workers do not form files. Each stalks slowly about in a deliberate manner, which gives it a ludicrous air of bland solemnity. It may be doubted if these insects are capable of quick movement since, even when disturbed, their best efforts at speed are neither rapid nor sustained. The workers show no particular preference for seeds since, in addition to these, they gather small bits of plant tissue, pieces of fruit, and the disarticulated parts of insects. The latter are probably secured from insects which are dead or in a moribund condition since the slow movements . . . would scarcely permit successful predatism. Little if any of the various substances brought into the nest are stored there" (Wheeler and Creighton, 1934:346-347).

**NEVADA NOTES.** We have 10 records from 7 localities. All are in the Hot Desert in the southern tip of the state. Nest entrances huge and irregular, 12-50 mm across and surrounded by a disc or low crater or half-crater of gravel about 60 cm in diameter (see Fig. 22). Workers bit but did not sting.

R.C. Bechtel collected nymphs of *Arenivaga* sp. (Orthoptera: Polyphagidae) at Searchlight (Clark Co.) in a nest.

**NEVADA LOCALITIES.** Map 13. *Clark Co.*: Nelson 3,200 ft.; Searchlight 3,400 ft.; 19 mi. S Searchlight 2,500 ft.; 8 mi. WNW Searchlight 4,100 ft.; 23 mi. SSE Searchlight 2,700 ft.; 14 mi. SSE Searchlight 2,700 ft.; 9 mi. N Searchlight 3,200 ft. (Creighton, 1955:91).

### *Aphaenogaster megommata* M.R. Smith

**WORKER.** Medium-sized. Concolorous white to bicolored with head and thorax very pale brown and gaster light yellowish brown; eye black. Head, thorax, and gaster shining.

**RANGE.** Western Arizona through California and Nevada to Oregon; northeastern Lower California and northwestern Sonora.

**NEVADA NOTES.** In Nevada it has not been taken in the eastern and northeastern portions. We have 48 records

from 40 localities; 1,100–6,200 ft. Thirteen records are from the Hot Desert, 20 from the Cool Desert (7 from *Sarcobatus* Subclimax and 3 from *Atriplex* Subclimax). Sixteen nests were under stones, with excavated soil around an entrance beside the stone. On 11 nests there was a crater of excavated soil 7–22 cm in diameter. The entrance was usually irregular, its dimensions varying from 6 to 20 mm. This species is a nocturnal forager.

We have found the following myrmecophiles in the nests of this species: (1) *Myrmecophila manni* Schimer (Orthoptera: Gryllidae; det. A. B. Gurney) 6 mi. NW Tule Springs (Clark Co.) 2,900 ft. (2) *Puto atriplicis*? McKenzie (Homoptera: Pseudococcidae; det. D.R. Miller) base of Morey Peak in Hot Creek Valley (Nye Co.) 5,800 ft. (3) *Conibiosoma elongatum* (Horn) (Coleoptera: Tenebrionidae; det. T.J. Spilman) 6 mi. NE Gerlach (Pershing Co.) 3,900 ft.; Thisbe (20 mi. ENE Reno, Washoe Co.) 4,200 ft.; 8 mi. SSE Yerington (Lyon Co.) 4,600 ft. (4) *Araeoschizus armatus* Horn (Coleoptera: Tenebrionidae; det. T.J. Spilman) Thisbe (20 mi. ENE Reno, Washoe Co.) 4,200 ft.; 2 mi. E Stillwater (Churchill Co.) 3,900 ft. (5) *Araeoschizus* sp. (Coleoptera: Tenebrionidae; det. T.J. Spilman) 8 mi. SSE Yerington (Lyon Co.) 4,600 ft. (6) *Trichochrous quadricollis* LeC. (Coleoptera: Melyridae; det. J.M. Kingsolver) Thisbe (20 mi. ENE Reno, Washoe Co.) 4,200 ft. Numbers 3 and 5 were guests in the same nest; likewise 3, 4, and 6.

**NEVADA LOCALITIES.** Map 16. *Churchill Co.*: 5 mi. E Fallon 3,800 ft.; 15 mi. S Fallon 4,000 ft.; 2 mi. E Stillwater 3,900 ft.; Dixie Valley (Mud Springs) 4,000 ft.; Lee Hot Springs 4,100 ft. *Clark Co.*: 6 mi. E Searchlight 2,400 ft.; Valley of Fire State Park 2,000 ft.; 6 mi. W Las Vegas 2,700 ft.; Mormon Mesa 1,900 ft.; Tule Spring 2,800 ft.; 6 mi. NW Tule Spring 2,900 ft.; Granite Spring 1,400 ft.; 1 mi. E Granite Spring 1,100 ft.; Boulder City 2,500 ft.; Las Vegas (Cole, 1966:11); Test Site (Cole, 1966:11; Smith, 1963:245). *Esmeralda Co.*: Death Valley Nat. Mon. Hwy. 72 at state boundary 4,000 ft. *Humboldt Co.*: 12 mi. SW Denio 4,400 ft. *Lyon Co.*: 3 mi. SW Santa Margarita Ranch 5,500 ft.; 8 mi. SSE Yerington 4,600 ft.; 4 mi. S Fernley. *Mineral Co.*: 17 mi. NNW Hawthorne 4,000 ft.; Rhodes Salt Marsh 4,400 ft. *Nye Co.*: Hot Creek Valley (Moores Sta. 6,000 ft., 3 mi. SSW Moores Sta. 6,200 ft., 4 mi. S Moores Sta. 5,900 ft., 5 mi. S Moores Sta. 5,800 ft., base of Morey Peak 5,800 ft.); state boundary 13 mi. SW Beatty 3,800 ft.; Seven Corners, Reveille Valley; Nyala–Warm Springs road between Reveille and Railroad valleys; Test Site (Cole, 1966:9; Smith, 1963:245). *Pershing Co.*: 6 mi. NE Gerlach 3,900 ft.; 10 mi. S Lovelock 4,000 ft. (Smith, 1963:245). *Washoe Co.*: 10 mi. N Nixon 4,000 ft.; 24 mi. S Gerlach 3,900 ft.; Thisbe (20 mi. ENE Reno) 4,200 ft.; 7 mi. W Wadsworth; SW edge Pyramid Lake; 1 mi. N Camp Foster, Pyramid Lake (Smith, 1963).

### *Aphaenogaster occidentalis* (Emery)

**WORKER.** Small. Head strong brown with dark reddish brown infuscation, thorax strong brown, gaster dark reddish brown varying to black and gaster black, thorax very dusky

red. Head dull or posterior portion shining, thorax feebly shining, gaster strongly shining.

**RANGE.** Mountains of California from the latitude of Sequoia Nat. Park northward to British Columbia and eastward through the mountains of Nevada.

**LITERATURE NOTES.** “It often founds its colonies in areas of moderately heavy cover, although it prefers open and rather dry nest sites” (Creighton, 1950:150). “Extremely common in both the Coast Range and the Sierras of California from sea-level to an elevation of 6000 ft.” (W.M. Wheeler, 1917:515). “The ants were slow, and when disturbed, hid in crevices” (Mallis, 1941:67).

**NEVADA NOTES.** To us this is undoubtedly the least interesting ant species in Nevada: (1) it is very abundant; (2) it is drab in color; (3) it possesses no unusual structures; (4) it exhibits only one unusual behavior: it does not sting!

Most of our records are from the northern half of the state; only 1 is below the 38th Parallel; 4,300–8,500 ft. We have 93 records from 57 localities. Eighteen are from the Cool Desert (2 from cottonwood riparian, 5 from riparian, 2 from cottonwood groves, 1 from *Sarcobatus* Subclimax, and 1 from a disturbed habitat), 6 from Pinyon-Juniper Biome, and 18 from the Coniferous Forest Biome. Nineteen nests were under stones. A flight occurred at 5 P.M. on 12 September 1971 near Reno.

The mealybug *Chorizococcus arborvitus* McKenzie (?) (Homoptera: Pseudococcidae; det. D.R. Miller) was in a nest 12 mi. SSE Minden, Douglas Co., 5,600 ft., on the roots of *Artemisia cana*.

**NEVADA LOCALITIES.** Map 15.

### *Aphaenogaster uinta* W.M. Wheeler

**WORKER.** Small to medium-sized. Bicolored: head and thorax yellowish red, gaster very dusky gray varying to head and thorax red, gaster very dusky red. In the field and to the unaided eye the gaster appears black; hence this species exhibits the coloration characteristic of several species of desert ants (Wheeler and Wheeler, 1973:12). Head and thorax partially shining, gaster strongly shining.

**RANGE.** Nevada, southwestern Colorado, southern Idaho, and southern Utah.

**NEVADA NOTES.** In Nevada it is widely scattered throughout the state; 4,500–8,000 ft. We have 37 records from 31 localities. Eight records were from the Cool Desert (2 from disturbed habitats), 15 from the Pinyon-Juniper Biome, 1 from the Coniferous Forest Biome, and 1 from a building. Fifteen nests were under stones, 1 under a log; 2 nests were exposed with craters 6 and 8 cm in diameter.

A mating flight occurred in Tonopah on 13 July.

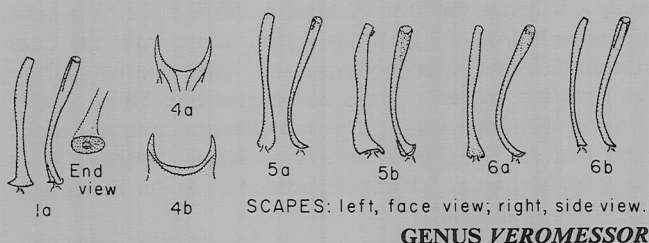
The myrmecophile *Pilopius ocularis* Casey (Coleoptera: Pselaphidae; det. R.R. Snelling) was found with this ant at Panaca Summit, Lincoln Co. 6,700 ft.

**NEVADA LOCALITIES.** Map 16. *Clark Co.*: Kyle Canyon. *Douglas Co.*: 8 mi. SE Minden 5,000 ft.; 12 mi. SE Minden 6,000 ft.; 11 mi. ESE Minden 5,800 ft. *Elko Co.*: 15 mi. SW Elko nr Humboldt River 5,000 ft.; Pilot Peak 7,300 ft. *Eureka Co.*: geysers 7 mi. SW Beowawe 4,800 ft.; 10 mi.



S Eureka 6,300 ft. *Humboldt Co.*: Onion Reservoirs, Pine Forest Ra. 8,000 ft. *Lander Co.*: Big Smoky Valley (6-17N-45) 6,100 ft.; 26 mi. SW Crescent Valley 5,000 ft. *Lincoln Co.*: Atlanta 7,000 ft.; Panaca Summit 6,700 ft. *Mineral Co.*: Lucky Boy Pass 8,000 ft.; Montgomery Pass 7,100 ft. *Nye Co.*: Eden Canyon Mine, E side Kawich Ra.; Ichthyosaur Paleontologic State Mon. 6,700 ft.; 17 mi. NW Mahattan 6,600 ft.; Morey Mine, Hot Creek Valley 7,000 ft.; 2 mi. WSW Silverbow, W side Kawich Ra.; Tonopah 6,000 ft. *Washoe Co.*: Clear Creek 4,500 ft.; 28 mi. N Gerlach 4,900 ft.; Lemmon Valley (9 mi. N Reno); SE edge Pyramid Lake; Pyramid Point E side Pyramid Lake; Pah Rah Ra. nr SW corner Pyramid Lake. *White Pine Co.*: Ely; Lehman Caves Nat. Mon. 6,800 ft.; Lund; Ellison Ranger Sta. in White Pine Mts. 6,900 ft.

### Genus *Veromessor* Forel



This genus comprises eight species, found in western North America from southern Oregon to Lower California and from the coastal islands of California eastward to the western Dakotas, Colorado, and western Arizona. The more specialized species are completely xerophilous and live in areas of high temperature. Seven species live in the United States; five of them in Nevada. All harvest seeds. None can sting, because the sting is vestigial.

#### KEY TO THE SPECIES OF *VEROMESSOR*

- 1a. Base of scape distinctly dilated and trumpet-shaped ... *andrei*
- b. Base of scape of some other shape ... 2
- 2a. Polymorphic; black or reddish black or bicolored (reddish black and black) ... 3
- b. Not strongly polymorphic; concolorous reddish or yellowish brown ... 4
- 3a. Concolorous black or reddish black; head and thorax feebly sculptured and feebly shining, gaster smooth and shining ... *pergandei*
- b. Bicolored, head and thorax reddish black, with prominent rugae, feebly shining or dull; gaster black and shining ... *\*stoddardi*
- 4a. Entire surface of head covered with distinct rugae, dull; epinotal spines longer than distance between their bases ... 5
- b. Anterior surface of head with rugae feeble or lacking dorsal to antennal fossa, head feebly shining to shining; length of epinotal spines equal to or less than distance which separates their bases ... 6



Figure 23. *Veromessor lariversi*. Crater. Washoe County, 24 mi. south of Gerlach.

- 5a. Base of scape wide, flat and strap-like, with feeble sculpture on anterior surface ... *lobognathus*
- b. Base of scape strongly curved, wide and thick, with anterior surface strongly shining ... *\*chamberlini*
- 6a. Base of scape flattened and strap-like, wider than apex ... *smithi*
- b. Base of scape scarcely enlarged, not as wide as apex ... *lariversi*

### *Veromessor andrei* (Mayr)

**WORKER.** Medium-sized to large. Color variable: reddish black varying to clear red except first gastric somite reddish brown, posterior portion of gaster black varying to head and gaster infuscated, only thorax clear red; redder in southern localities, blacker in northern.

**RANGE.** Oregon, western Nevada, California, and Lower California.

**LITERATURE NOTES.** For a good account of this species see Wheeler and Creighton, 1934:362.

**NEVADA NOTE AND LOCALITY.** There is only one record from Nevada. Map 17. *Ormsby Co.* (Wheeler and Creighton, 1934:364).

### *Veromessor lariversi* M.R. Smith

**WORKER.** Small to medium-sized. Very pale brown infuscated with dark yellowish brown varying to head and gaster dark reddish brown, thorax yellowish brown; eye black. Head and thorax shining, gaster strongly shining.

**RANGE.** Nevada and eastern California.

**LITERATURE NOTES.** *V. lariversi* nests in exposed sandy areas with mixed vegetation. The nest is surmounted by a cluster of craters 8-13 cm in diameter. The workers are nocturnal, soft-bodied, slow-gaited, and timid. "One very populous colony, comprising more than 1,000 workers, was studied. The nest was on a slight slope, covered an area of about four square meters, and was marked by nine, small, uncovered entrances without surrounding craters. The galleries

formed a labyrinth in the very hot, dry compact sand and extended to chambers approximately twenty-two inches from the soil surface" (Cole, 1955:51).

**NEVADA NOTES.** We have 54 records from 34 localities in the southern, western, and northwestern parts of the state; the distribution is sporadic but the species may be locally very abundant; 2,600–7,000 ft. Three records are from the Hot Desert and 31 from the Cool Desert (12 of these from *Sarcobatus* Subclimax and 15 from disturbed areas). Nearly all nests were in sandy soil. Craters (Fig. 23) were 5–10 cm in diameter; half-craters (as common as craters) were mostly 8 cm in diameter.

In 1 nest of *V. lariversi* we found *Puto* sp. probably *atriplicis* McKenzie (Homoptera: Pseudococcidae; det. D.R. Miller, 1972) 12 mi. N Gerlach (Washoe Co.) 4,100 ft.

**NEVADA LOCALITIES.** Map 18. *Churchill Co.*: 2 mi. W Frenchman 4,100 ft.; 8-24N-26 4,500 ft.; 16 mi. N Fallon 3,900 ft.; 28 mi. N Fallon 4,000 ft. *Esmeralda Co.*: Goldfield 5,800 ft. (Creighton, 1953:5). *Humboldt Co.*: 10 mi. NNE Winnemucca 4,440 ft. *Lyon Co.*: 6 mi. S Mason 4,400 ft.; 3 mi. E Smith 4,700 ft.; Silver Springs 4,200 ft. (Cole, 1955:51); 2 mi. ESE Silver Springs 4,000 ft. *Mineral Co.*: 31-14N-33 5,800 ft.; Petrified Summit 6,200 ft.; Schurz 4,200 ft. *Nye Co.*: Big Dune (10 mi. W Lathrop Wells) 2,600 ft.; Round Mt. 5,900 ft. (Cole, 1955:51); Big Smoky Valley (17-10N-43) 5,900 ft.; 6 mi. ESE Hot Creek Ranch 5,500 ft.; 7 mi. SSE Beatty 3,000 ft.; 1½ mi. SSW Moores Sta. in Hot Creek Valley 7,000 ft.; Test Site (Cole, 1966, 1968); 10 mi. N Tonopah; Warm Springs. *Pershing Co.*: 11 mi. NW Lovelock 5,000 ft.; Seven Devils Springs 3,800 ft. *Washoe Co.*: 10 mi. N Nixon 4,000 ft.; Gerlach 4,100 ft.; 24 mi. S Gerlach 3,900 ft.; 4,100 ft.; 18 mi. S Gerlach 4,500 ft.; 21 mi. N Gerlach 4,100 ft.; 13 mi. NW Gerlach 4,800 ft.; 3 mi. W Wadsworth 4,200 ft.; 19-23N-20 5,000 ft.; -21N-24 nr Wadsworth 4,300 ft.; Mullen Gap 5 mi. W Pyramid Lake (Smith, 1951:95).

### *Veromessor lobognathus* (Andrews)

**WORKER.** Medium-sized. Concolorous yellowish red varying to head and thorax dark red, each gastric somite red anteriorly and with a band of dark reddish brown posteriorly. Head and thorax dull, gaster strongly shining.

**RANGE.** Southwestern North Dakota, western South Dakota, southeastern Montana, Colorado, Utah, Idaho, and Nevada. We still regard this species as a rare ant, in spite of Cole's flat assertion to the contrary (Cole, 1966:72; Allred and Cole, 1971:242). It can be very abundant locally, but as far as its range is known it is highly sporadic and severely restricted. We once (Wheeler and Wheeler, 1967) described its range as "a sigmoid curve 1300 miles long, extending from southern Nevada to southwestern North Dakota." This is still approximately correct, except that we must insert an Idaho locality (30 mi. W Idaho Falls); and furthermore our intensive collecting has revealed that the curve splays out in Nevada, where the species is widely scattered.

**LITERATURE NOTES.** We have published 4 articles about this interesting species (Wheeler and Wheeler, 1956, 1959, 1965, 1967); here we give only a sketch of our findings:



**Figure 24.** *Veromessor pergandei*. Portion of foraging procession. Clark County, Boulder City.

(1) *V. lobognathus* is a characteristic inhabitant of the Pinyon-Juniper Biome, a semiarid environment. (2) In the Dakotas the nests were found only on steep treeless south-facing slopes where much of the surface was bare. The slopes were always near junipers which were on north-facing slopes. Characteristic plants of the habitats were grasses in clumps, low shrubs, yucca, and prickly pear. (3) Nests in the Dakotas were of 2 types: in sandy loam, under large flat stones (average 8 × 46 × 91 cm) which were only slightly buried; where the soil contained numerous small stones there was a small mound of excavated earth around the entrance. (4) The seeds of grasses were harvested. (5) The workers were aggressive and bit tenaciously. (6) We regarded *V. lobognathus* as a mimic of *Pogonomyrmex occidentalis*.

**NEVADA NOTES.** Four localities are in the Cool Desert and 8 in the Pinyon-Juniper Biome. Seven nests were under flat stones, which were ½ to ¾ buried; the average dimensions of the stones were 52 × 15 × 5 cm. Seven nests had the entrance surrounded by a crater 5–10 cm in diameter. We have 17 records from 14 localities; 4,700–7,500 ft.

**NEVADA LOCALITIES.** Map 18. *Elko Co.*: Palomino Ridge 6,300 ft.; 6 mi. E Wells 6,200 ft. (Wheeler and Wheeler, 1967:241). *Humboldt Co.*: 31 mi. SSW Denio 5,200 ft. *Lyon Co.*: 14 mi. SSE Yerington 5,100 ft.; 16 mi. SSE Yerington 5,200 ft. *Nye Co.*: Test Site 7,000 ft. (Cole, 1963:681; 1966:12); Morey Mine in Hot Creek Valley 7,100 ft.; Currant Summit 6,800 ft. *Storey Co.*: 2 mi. E Clark 4,700 ft. *White Pine Co.*: Ely; 1 mi. E McGill 7,000 ft.; 2 mi. E McGill 7,500 ft.; White Pine Mts. 22-17N-57 6,700 ft.; 45 mi. W Ely 6,900 ft. (Gregg, 1955a:51).

### *Veromessor pergandei* (Mayr)

*Veromessor pergandei* is one of the commonest ants in the Mojave and Sonoran deserts. It is especially noteworthy because of (1) its glistening black color (which is unexpected in a hot dry climate); (2) its strong polymorphism, which is not shared by any of its Nevada congeners; (3) its large craters with their huge chaff piles, which are such conspicuous fea-



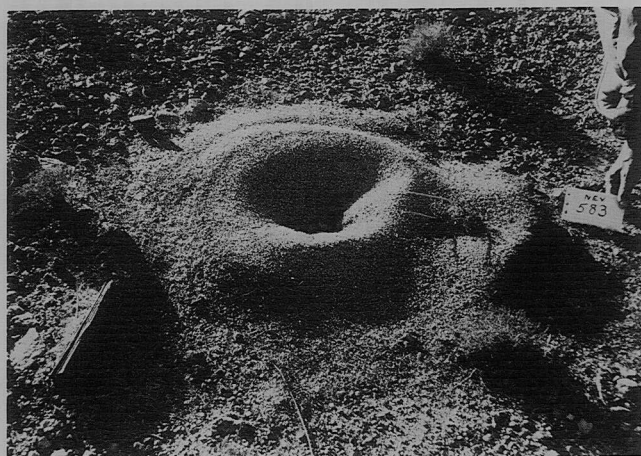


Figure 25. *Veromessor pergandei*. Crater. Note zone of chaff outside the crater.

tures of the desert landscape; and (4) its foraging columns (Fig. 24).

**WORKER.** Small to large. Reddish black to black. Head and thorax shining to strongly shining, gaster strongly shining.

**RANGE.** Deserts of southwestern Arizona, southern Nevada, southeastern California, western Sonora, and northern Lower California.

**LITERATURE NOTES.** A typical nest (Figs. 25, 26) is in an exposed area and is surmounted by a low circular or semicircular crater of excavated soil, which is 30 cm in diameter. There is a single large (16 mm) entrance in the throat of the crater. The chaff pile—a mass of discarded husks from the harvested seeds, other rubbish and a goodly number of viable seeds—forms a crescentic or circular zone at the periphery of the crater. Well-established colonies usually have several craters, often in a cluster but sometimes scattered over an area 3–4 m in diameter. Two or more craters may be active. New craters are opened from below and lack a chaff pile. Extinct craters have the entrance closed and the chaff pile is matted down by the weather.

The following account of foraging is adapted from Creighton's admirable 1953 account. In late spring and early summer *pergandei* starts its daily routine before sunrise. The workers emerge from the entrance and move very slowly (because of the low temperature) over the crater. After sunrise these movements are accelerated. Thirty to 45 minutes after sunlight first strikes the nest a foraging column pushes out from the crater and moves decisively toward the seed supply, which may be 70 or more meters from the nest. Naturally at first all workers are outward bound. Soon, however, homeward bound seed-carriers appear in the column. After 2 or 3 hours (i.e., about midmorning) workers suddenly cease to leave the nest. The column disappears as soon as all the homeward bound workers have reached the nest.

Nest work follows. Workers emerge from the entrance each bearing a piece of gravel, which is dropped on the crater, or a seed husk, which is deposited on the chaff pile. Nest work usually continues until the second foraging period in the late

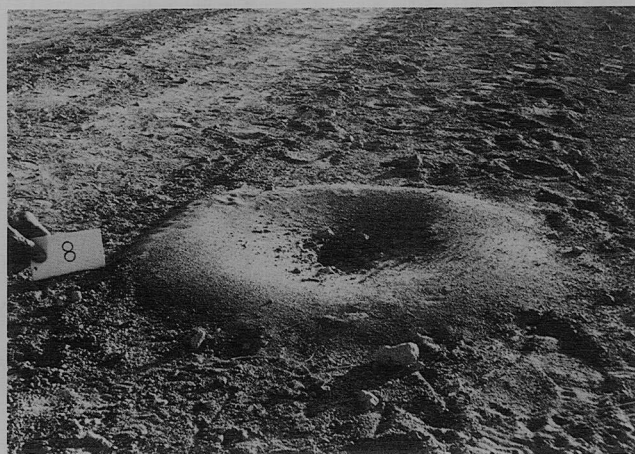


Figure 26. *Veromessor pergandei*. Clark County, Boulder City.

afternoon. But on very hot days all ants disappear into the nest in the early afternoon. In the late afternoon nest work increases suddenly and nest workers soon cover the crater. Then out of the entrance there is a rush of workers carrying nothing, who leave the crater and start a foraging column. Foraging continues until early dusk (i.e., for about 3 hours). Nocturnal nest work may continue until early morning.

**NEVADA NOTES.** In winter foraging may be limited to the middle of the day. The following notes result from the month we spent studying this species at Boulder City: (1) In hot weather some foraging may be done at night, either by moonlight or in total darkness. (2) The width of one observed column increased from 2 cm to 107 cm and then narrowed to 30 cm depending upon the terrain and the plant obstructions. (3) More than one column may operate simultaneously from the same nest, or even from the same entrance. (4) No one has ever counted the population of a *pergandei* colony. This would probably be an impossible task, considering the rocky terrain which the species inhabits. Some idea of its enormity may be grasped from an estimate of 17,000 workers in a column 40 m long (J. Wheeler and Rissing, 1975b). (5) The longest column we have measured was 46 m. (6) We have clocked the speed of workers in a column from 5 mm/sec at 16°C to 66 mm/sec at 42°C soil surface temperature.

The largest crater we have measured was at Davis Dam in Clark Co.: 2 m in diameter; a nearby crater was 1 m and there were numerous other very large craters in the vicinity.

We have 48 records from 33 localities, all in the Hot Desert in the southern fourth of the state; 600–4,000 ft.

**NEVADA LOCALITIES.** Map 17. *Clark Co.*: Davis Dam on Colorado River 600 ft.; El Dorado Canyon 2 mi. W Lake Mohave 1,000 ft.; Searchlight 3,400 ft.; 4 mi. E Sandy 3,500 ft.; Mesquite 1,600 ft.; Bunkerville 1,600 ft.; Cactus Springs 3,300 ft.; Cottonwood Cove on Lake Mead 800 ft.; 3 mi. W Cottonwood Cove 1,200 ft.; 2 mi. SSE Riverside 2,200 ft.; 4 mi. SE Henderson 2,200 ft.; Boulder City 2,500 ft.; nr Colorado River 4 mi. S Davis Dam 600 ft.; 27-32S-65 2,300 ft.; Hiko Springs in Newberry Mts.; Ft. Mohave Indian Reservation; Granite Spring. *Esmeralda Co.*: Hwy. 72 at Cali-

fornia boundary (entrance to Death Valley Nat. Mon.) 4,000 ft. *Nye Co.*: Devils Hole (Death Valley Nat. Mon.) 2,600 ft.; 2 mi. N Pahrump 2,700 ft.; Hwy. 16 3 mi. S US Hwy. 95 (-16S-52) 2,600 ft.; Rock Valley 3,200 ft.; Beatty 3,400 ft. (Creighton, 1953:16); 6 mi. SW Beatty 3,400 ft.; 7 mi. SSE Beatty 3,000 ft.; 9 mi. SSW Beatty 3,000 ft.; 4 mi. ESE Beatty 3,400 ft.; 8 mi. SW Beatty 3,800 ft.; 14 mi. SSE Beatty 2,700 ft.; 13 mi. SW Beatty (California boundary) 3,800 ft.; 10 mi. S Lathrop Wells 2,300 ft.; 4 mi. S Lathrop Wells; Test Site (Cole, 1966:13).

### *Veromessor smithi* Cole

**WORKER.** Medium-sized to large. Concolorous yellow or yellowish red. Head and thorax dull, gaster strongly shining.

**RANGE.** Nevada and southeastern California.

**LITERATURE NOTES.** Nests in sandy exposed areas with mixed vegetation. Nest surmounted by 1 or 2 circular craters about 13 cm in diameter. Galleries penetrated the loose upper layer of sand to chamber up to 60 cm deep in firmer sand. Stored seeds in some chambers. Population of 1 nest: 275 workers, 1 queen, 27 winged females, and 97 males. The workers are crepuscular, timid, and sluggish (Cole, 1963; 1966:14).

**NEVADA NOTES.** We have 22 records from 17 widely scattered localities (4,100–6,200 ft.) but none in the north-eastern quarter nor along the western border. Three were in the Pinyon-Juniper Biome and 12 in the Cool Desert (3 in *Sarcobatus* Subclimax, 3 in *Atriplex* Subclimax, 1 on a revegetating playa, 1 from a disturbed habitat). Six nests were under half-buried stones; 9 were surmounted by craters 5–10 cm in diameter.

**NEVADA LOCALITIES.** Map 17. *Churchill Co.*: 8-24N-26 4,500 ft. *Esmeralda Co.*: Lida Junction 4,800 ft.; 4 mi. NW Pigeon Spring 6,100 ft.; 20 mi. WNW Tonopah 4,800 ft. *Eureka Co.*: 5 mi. SSW Beowawe 4,500 ft. *Humboldt Co.*: 31 mi. SSW Denio 5,200 ft. *Lander Co.*: Big Smoky Valley (6-19N-45) 6,100 ft. *Lincoln Co.*: 6 mi. E Panaca 5,800 ft.; 4 mi. W Caliente 5,600 ft.; 10 mi. SW Crystal Spring 5,500 ft. *Lyon Co.*: 8 mi. SSE Yerington 4,600 ft.; Churchill Butte 6,000 ft. *Mineral Co.*: Deadhorse Wells 4,100 ft.; Petrified Summit 6,200 ft. *Nye Co.*: Hot Creek Valley 10 mi. NE Warm Springs 5,200 ft.; 6 mi. E Tonopah 5,600 ft.; Test Site (Cole, 1963; 1966:13).

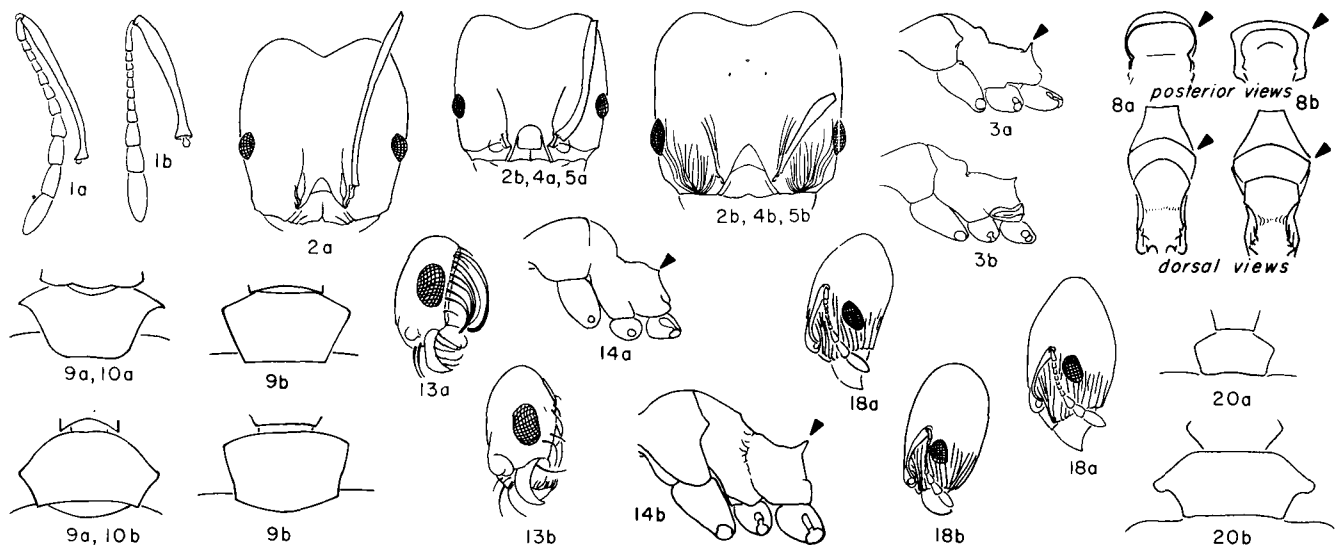
### Genus *Pheidole* Westwood

The ants of this genus are harvesters and feed upon seeds as well as insects. Most species have a dimorphic worker caste, i.e., without transitional forms between major and minor workers. The major workers have grotesquely large heads and are generally believed to do the seed husking for the colony, but they may also have a defensive function. The minor workers are small and normally proportioned. Colonies are small—commonly a few hundred individuals. They usually nest in the soil, either under stones or without cover. Of the 59 species reported for the continental United States, Nevada is represented by 15.

### KEY TO THE SPECIES OF *PHEIDOLE*

(Adapted from Gregg, 1958)

- 1a. Antennal club composed of 4 segments ..... *clydei*
- b. Antennal club composed of 3 segments ..... 2
- 2a. Scape of major reaching or surpassing occipital angle ..... 3
- b. Scape of major not reaching occipital angle ..... 4
- 3a. Anterior surface of head, dorsum of thorax, and tergite 1 of major densely punctate; epinotal spines short, slender and directed upward ..... *vistana*
- b. Anterior surface of head, dorsum of thorax, and tergite 1 of major mostly smooth and shining (feebly punctate in limited areas); epinotal spines short, triangular, and oblique ..... *desertorum*
- 4a. Scape of major abruptly bent at base so that scape turns toward midline of head; basal portion of scape flattened and as broad as, or broader than, distal portion ... 5
- b. Scape of major not abruptly bent at base; not, or only slightly, flattened at base; base never as broad as distal portion ..... 7
- 5a. Scape of major reaching  $\frac{3}{4}$  or more of distance between insertion and occipital angle ..... 6
- b. Scape of major reaching  $\frac{2}{3}$  or less of distance between insertion and occipital angle ..... *\*porcula*
- 6a. Entire anterior surface of head of major covered with reticulorugose sculpture, interrugal spaces granulose ..... *\*cockerelli*
- b. Reticulorugose sculpture of head of major largely confined to ventral half, occipital lobes punctate or feebly granulose, surface moderately to strongly shining, at least on dorsal half of head ..... *hyatti*
- 7a. Tops of occipital lobes of majors, and usually their front faces as well, free from sculpture except for piligerous punctures, the surface in most cases strongly shining ..... 12
- b. Tops of occipital lobes of majors, and usually their front faces as well, covered with sculpture, the surface opaque or feebly shining ..... 8
- 8a. Humeral angles of pronotum of major weakly developed and not distinctly angular ..... *\*sitarches*
- b. Humeral angles of pronotum of major strongly developed and distinctly angular ..... 9
- 9a. Postpetiole of major lenticular, lateral conules well developed ..... 10
- b. Postpetiole of major trapezoidal, lateral conules absent or feebly developed ..... 11
- 10a. Occipital rugae of major straight or wavy, but not reticulate; lateral postpetiolar conules very prominent and sharp ..... *creightoni*
- b. Occipital rugae not as above (either notably coarse and reticulate or finer and resembling striations); lateral postpetiolar conules usually blunt ..... *pilifera*
- 11a. Transverse occipital sculpture of major in form of fine rugules or striations ..... *\*rugulosa*
- b. Occipital sculpture of major more or less coarsely rugulose ..... *californica*
- 12a. Head of major cordate, gradually but distinctly nar-



GENUS *PHEIDOLE*

- rowed toward base of mandibles, broadest at occipital lobes ..... *\*megacephala*
- b. Head of major not cordate, either quadrate or rectangular with sides parallel, or if slightly convergent, broadest portion of head ventral to occipital lobes ..... 13
- 13a. Head of minor with well-developed psammophore on posterior surface, the latter flattened or slightly concave ..... *\*psammophila*
- b. Head of minor without psammophore, its posterior surface convex ..... 14
- 14a. Epinotum of major angular at junction of basal and declivous faces, but not produced into distinct teeth or spines ..... *barbata*
- b. Epinotum of major armed with distinct teeth or spines ..... 15
- 15a. Sculpture of head of major extending to vertex, only occiput smooth and shining ..... 16
- b. Sculpture of head of major largely confined to ventral half, dorsal half smooth and shining ..... 17
- 16a. Longitudinal cephalic striae rather weak, broken and unevenly spaced, diverging into, and fading out at, occipital corners; occiput smooth and without transverse striae or rugae; head a little broader than long ..... *inquilina*
- b. Longitudinal cephalic rugae coarse, dense, confined to ventral  $\frac{2}{3}$ ; dorsal  $\frac{1}{3}$  shining, sparsely foveolate; occiput with transverse ridges in furrow; head a little longer than broad ..... *ceres*
- 17a. Eye of major with 60 or more pigmented facets ... 18
- b. Eye of major with 50 or fewer pigmented facets ... 21
- 18a. Head of major with flattened area extending dorsally from each antennal fossa toward occipital lobe; occipital lobes compressed anteroposteriorly, dorsal  $\frac{1}{3}$  of head, in profile, with anterior and posterior surfaces converging toward crest of lobe ..... 19
- b. Head of major lacking flattened area as above; occipital lobes, in profile, thick and evenly rounded and not sharply set off from ventral portion of head ... *\*yaqui*
- 19a. Major with dorsum of pronotum covered with numerous, coarse reticulate rugae in addition to more nearly parallel transverse rugae on anterior face of neck of pronotum; interrugal surfaces heavily punctate, opaque or subopaque ..... *tucsonica*
- b. Major with dorsum of pronotum bearing few or no rugae, rugae mainly restricted to anterior face and neck of pronotum, not reticulate; interrugal surfaces smooth to slightly punctate, moderately to strongly shining 20
- 20a. Postpetiole of major trapezoidal, lateral conules short and obtuse; golden yellow to dull yellow, head of minor sometimes infuscated ..... *gilvessens*
- b. Postpetiole of major strongly transverse, with long lateral conules; major dark reddish brown, minor black ..... *\*xerophila*
- 21a. Vertex and occiput of minor with small, close-set punctures giving surface a duller appearance than elsewhere on head ..... *cerebrosior*
- b. Vertex and occiput of minor strongly shining or only slightly less shining than remainder, punctures widely scattered over entire head ..... *paiute*

### *Pheidole barbata* W.M. Wheeler

**MAJOR WORKER.** Small. Concolorous yellow with light red infuscation varying to bicolored: head yellowish red, thorax dark reddish brown, gaster dark brown. Shining. **MINOR WORKER.** Minute. Bicolored: head and thorax very dusky red, gaster dark brown or dark reddish brown. Shining.

**RANGE.** Deserts of western Arizona, southern Nevada, and southeastern California.

**NEVADA NOTES.** We have 5 records from 2 localities in the southernmost county; all were in the Hot Desert. All nests were in sand and surmounted by 1-3 craters 7 cm in



diameter, with an entrance 2–10 mm in diameter. We have found the sting of the minor to be slightly annoying.

**NEVADA LOCALITIES.** Map 19. *Clark Co.*: Sandy 2,600 ft.; Valley of Fire State Park 2,000 ft.

### *Pheidole californica* Mayr

**MAJOR WORKER.** Small. Varying from concolorous yellow to bicolored: head and thorax yellowish red with black infuscation, gaster dark reddish brown. Shining. **MINOR WORKER.** Minute. Bicolored: head dark brown to black, thorax brownish yellow to reddish black, gaster reddish black. Shining.

**RANGE.** California to Washington, eastward to Idaho and Utah.

**NEVADA NOTES.** We have 49 records from 37 localities in the western and northwestern parts of the state. Two were in the Coniferous Forest Biome, 8 in the Pinyon-Juniper, 17 in the Cool Desert (1 from a *Sarcobatus* Subclimax, 1 from a cottonwood grove, 1 from a greenhouse, and 4 from disturbed habitats). Fifteen nests were under stones; 7 were in exposed soil with craters 25–50 mm in diameter surrounding a 1-mm entrance; 3,800–6,100 ft.

**NEVADA LOCALITIES.** Map 20.

### *Pheidole cerebrosior* W.M. Wheeler

**MAJOR WORKER.** Small. Bicolored: head strong brown, thorax and gaster yellow. Strongly shining. **MINOR WORKER.** Minute. Bicolored: head and thorax reddish yellow, gaster yellow. Strongly shining.

**RANGE.** Deserts of New Mexico, southern Arizona, southern Nevada, southern California, Chihuahua, and Lower California.

**LITERATURE NOTES.** Creighton and Gregg (1955:5) stated that it was found more often in mountain canyons than on the open desert; it seemed to prefer evergreen oak. The elevational range was 1,800–5,800 ft. Colonies were small, seldom with more than a dozen majors.

**NEVADA NOTES AND LOCALITY.** We have taken this ant only once, 3 mi. NW Goodsprings (*Clark Co.*) 4,400 ft. Map 20. It was in the Hot Desert with *Yucca brevifolia*, *Y. schidigera*, and larrea. The nest was under a half-buried stone 30 × 30 × 15 cm.

### *Pheidole ceres* W.M. Wheeler

**MAJOR WORKER.** Small. Head and thorax reddish yellow with dark reddish brown infuscation, gaster black. Head and gaster strongly shining, thorax dull. **MINOR WORKER.** Minute. Head reddish black, thorax and gaster dark brown varying to thorax very dusky red, gaster reddish black. Strongly shining.

**RANGE.** Colorado, western Texas, New Mexico, Arizona, and eastern Nevada.

**LITERATURE NOTES.** Nests under stones in rather dry sunny localities, 5,000–9,000 ft.; sometimes in exposed soil with small craters. This species is host of the workerless social parasite *Pheidole* (= *Sympheidole*) *elecebra* (W.M. Wheeler);

a parasitized nest contains soldiers and workers of the host and sexual forms of the parasite (W.M. Wheeler, 1904a:9–13).

**NEVADA NOTES AND LOCALITY.** We have taken this ant only once in Nevada: Panaca Summit (*Lincoln Co.*) 8,700 ft. Map 19. It was in the Pinyon-Juniper Biome. The nest was under a nearly buried stone. The colony was populous. Brood and seeds were in the same chamber.

### *Pheidole clydei* Gregg

**MAJOR WORKER.** Small. Head and thorax yellowish red, gaster black except anterior portion of first somite dark reddish brown. Head shining, thorax feebly shining, gaster strongly shining. **MINOR WORKER.** Small. Concolorous dark reddish brown. Strongly shining throughout.

**RANGE.** New Mexico, Arizona, southern Nevada, and southeastern California.

**LITERATURE NOTES.** Gregg (1953:4) found a nest which “appeared to be in crevices between a boulder and the thin laminae of rock sheared from its surface by weathering. The nest seemed to have no direct contact with the soil.” In Deep Canyon Creighton (1964) found nests on the tops of enormous boulders 4½ m high and 6–9 m across. We (Wheeler and Wheeler, 1973:85) found them in the almost solid rock walls of Deep Canyon. The colonies inhabited very narrow horizontal cracks in the rock. The minors did the foraging, bringing home arthropods or fragments thereof, never seeds. The majors did not leave the nests except to assist minors by carving large pieces of foraged food into smaller bits. But their chief function seemed to be guard duty: a group of them stood just inside the entrance, where they savagely attacked any object thrust into the nest entrance. The minors, by contrast, were not aggressive, which suggests that they are scavengers rather than predators.

**NEVADA NOTE AND LOCALITY.** Map 21. There is only one record from Nevada: Devils Hole (in Death Valley Nat. Mon.), *Nye Co.*: 2,400 ft.

### *Pheidole creightoni* Gregg

**MAJOR WORKER.** Small. Bicolored: head and thorax reddish yellow, gaster very dusky red varying to head yellowish red, thorax and gaster dark reddish brown. Strongly shining. **MINOR WORKER.** Minute. Concolorous dusky red to reddish black. Strongly shining.

**RANGE.** Oregon, Nevada, and northern California.

**NEVADA NOTES.** We have 8 records from 8 localities all from the northwestern part of the state; 3,900–4,800 ft. Three records are from the Cool Desert (2 from the Atriplex Subclimax). One nest was surmounted by a 25-cm crater and had an entrance 1 mm in diameter.

We found the beetle *Conibiosoma elongatum* (Horn) (Coleoptera: Tenebrionidae; det. T.J. Spilman) in a nest 6 mi. NE Gerlach (Pershing Co.) 3,900 ft.

**NEVADA LOCALITIES.** Map 21. *Humboldt Co.*: Winnemucca 4,300 ft. (Gregg, 1955b:27). *Lander Co.*: Battle Mountain. *Pershing Co.*: 6 mi. NE Gerlach 3,900 ft. *Washoe*



**Figure 27.** *Pheidole desertorum*. Excavated material around entrances. Clark County, Searchlight.

Co.: Gerlach 4,100 ft.; 17 mi. N Sparks 4,000 ft.; 16 mi. W Nixon 4,000 ft.; Clear Creek 4,500 ft.; Reno 4,800 ft.

### *Pheidole desertorum* W.M. Wheeler

*Pheidole desertorum* does not look like a member of the genus. The major workers superficially resemble *Pogonomyrmex* workers because of their reddish color and large size, and the head is not as grotesquely enlarged as in other *Pheidole*. The minor worker resembles an *Aphaenogaster* worker more closely than a *Pheidole* minor because of its large size and its extremely long and slender legs and antennae.

**MAJOR WORKER.** Small to large. Bicolored: head reddish yellow, thorax and gaster yellow varying to head yellowish red, thorax and gaster yellow with reddish brown infuscation. Strongly shining. **MINOR WORKER.** Small. Concolorous yellow to brownish yellow with dark yellowish brown infuscation on head and gaster. Strongly shining.

**RANGE.** Western Texas and Oklahoma to southern Utah, southern Nevada, and southeastern California; northern Mexico.

**NEVADA NOTES.** We have 52 records from 28 localities, all from the southern part of the state; 1,400–6,000 ft. Twenty-five records are from the Hot Desert and 3 from the Pinon-Juniper Biome. Twenty nests were under groups of several adjacent stones; 7 were in exposed soil surmounted by some sort of messy earthworks (Fig. 27). The entrance was usually a narrow slit. Colonies were populous. Workers fast and aggressive, the majors bite; the minors bite and sting but the sting is only slightly annoying.

*Araeoschizus* sp. (Coleoptera: Tenebrionidae) (det. T.J. Spilman) was taken from a nest in Kyle Canyon (Clark Co.) 4,800 ft.

**NEVADA LOCALITIES.** Map 21. *Clark Co.*: Red Rock Canyon (1 and 11-21S-58) 15 mi. W Las Vegas 4,000 ft.; Bunkerville 1,600 ft.; 14 mi. SE Indian Springs 3,200 ft.; Kyle Canyon (22-19S-58) 4,800 ft.; Newberry Mts., Christmas Tree Pass 4,200 ft.; Ft. Mohave Indian Reservation;



**Figure 28.** *Pheidole gilvescens*. Craters. Nye County, Hot Creek Valley.

McCullough Ra. (34-27S-61) 5,900 ft.; Virgin Mts. (13-15S-70) 5,200 ft.; 19-15S-71 6,000 ft.; Searchlight 3,400 ft.; 10 mi. E Searchlight 1,400 ft.; 23 mi. SSE Searchlight 2,700 ft.; 7 mi. SW Searchlight 3,500 ft.; 13 mi. NW Searchlight 4,200 ft.; 4 mi. NE Gold Butte 3,600 ft.; *Esmeralda Co.*: Roosevelt Well (9 mi. SW Goldpoint) 4,400 ft. *Lincoln Co.*: 1 mi. SE Coyote Summit 5,100 ft.; 12 mi. NW Riverside 3,200 ft.; 11 mi. SSW Caliente 3,500 ft.; 5 mi. NE Caliente 4,800 ft. *Nye Co.*: Daylight Pass 4,200 ft.; Rock Valley 3,200 ft.; Rhyolite 3,800 ft.; 4 mi. ESE Beatty 4,300 ft., 4,500 ft.; 6 mi. SE Beatty (= Bare Mt.) 4,000 ft.; Test Site (Cole, 1966:15).

### *Pheidole gilvescens* W.M. Wheeler

**MAJOR WORKER.** Small. Bicolored: head and gaster yellow with yellowish red infuscation, thorax red; varying to head red, thorax dusky red, gaster yellow on anterior portion of first tergite, with dark reddish brown infuscation elsewhere. Head and gaster strongly shining, thorax moderately shining. **MINOR WORKER.** Small. Bicolored: head dark red, thorax and gaster yellow. Strongly shining.

**RANGE.** Arizona, southern Nevada, and southeastern California.

**NEVADA NOTES.** We have 14 records from 7 localities in the southern part of the state; 1,500–5,700 ft. All records were from the Hot Desert, except 1 from Nye Co., which was in the Cool Desert. Nests were in dry exposed sites and were surmounted by 1–3 craters of fine sand, 25–75 mm in diameter; the entrance was minute (Fig. 28).

**NEVADA LOCALITIES.** Map 22. *Clark Co.*: Valley of Fire State Park 2,000 ft.; Mesquite 1,600 ft.; 4 mi. SW Riverside 1,500 ft.; 4 mi. SE Henderson 2,200 ft.; Boulder City 2,500 ft. *Lincoln Co.*: 13 mi. W Caliente 5,200 ft. *Nye Co.*: Hot Creek Valley (-8N-51) 5,700 ft.

### *Pheidole hyatti* Emery

**MAJOR WORKER.** Small. Concolorous olive yellow, head infuscated with strong brown, gaster with olive brown; vary-

ing to bicolored: head and gaster yellowish brown, thorax strong brown. Head and thorax feebly shining, gaster strongly shining. **MINOR WORKER.** Small. Bicolored: head and thorax brownish yellow, gaster yellowish brown varying to head and thorax yellowish red, gaster very dusky red. Shining throughout. The minors of this species have long slender legs and antennae reminiscent of *P. desertorum* and *P. vistana* but less extreme.

**RANGE.** Western Texas and southwestern Oklahoma and Colorado westward to Nevada and California; adjacent Mexico.

**NEVADA NOTES.** We have 14 records from 13 localities in the western and southern parts of the state. Six were from the Cool Desert (2 of which invaded human habitations), 4 from Pinyon-Juniper, and 2 from the Hot Desert. Nine were reported nesting under stones and 1 under a log.

**NEVADA LOCALITIES.** Map 22. *Clark Co.*: Spring Mts. (36-17S-55) 6,200 ft.; Cabin Canyon in Virgin Mts. 4,000 ft.; Ft. Mojave Indian Reservation. *Douglas Co.*: Walleys Hot Springs. *Esmeralda Co.*: 2 mi. E Lida 5,900 ft.; Tule Spring E side Sylvania Mts. nr California boundary. *Lincoln Co.*: 4 mi. W Caliente 5,600 ft.; 24 mi. W Caliente (Pahroc Summit) 4,900 ft.; 23 mi. WNW Crystal Springs 6,400 ft. *Nye Co.*: Fairbanks Spring. *Storey Co.*: 23 mi. ENE Reno 4,200 ft. *Washoe Co.*: Reno 4,800 ft.; 5 mi. N Pyramid, E side Pyramid Lake.

### *Pheidole inquilina* (W.M. Wheeler)

This species was long regarded as a workerless social parasite of *Pheidole pilifera* and was placed in a separate genus, *Epipheidole*. When Cole (1965) discovered the major workers he transferred the species to *Pheidole*. We have never seen a specimen; so the following is based on the original descriptions.

**MAJOR WORKER.** Much smaller than that of host. Head, epinotum, petiole, postpetiole, and gaster rather light brown; pronotum and mesonotum notably paler. Dorsal surface of head, pronotum, mesonotum, and gaster smooth and shining; epinotum, petiole, and postpetiole moderately shining. **MINOR WORKER.** Minute. Brown, gaster lighter. Dorsal portion of head, portions of pronotum, mesonotum, and entire gaster shining; remainder dull.

**RANGE.** Nebraska, Colorado, and Nevada.

**NEVADA NOTE AND LOCALITY.** There is only 1 record for Nevada. Map 20. *Nye Co.*: Test Site in Pinyon-Juniper Biome (Cole, 1966:15).

### *Pheidole paiute* Gregg

**MAJOR WORKER.** Small. Head yellow dorsally and yellowish red ventrally, thorax and gaster yellow varying to head dark reddish brown, thorax yellowish brown with dark reddish brown infuscation, gaster dark brown. Shining. **MINOR WORKER.** Minute. Head and thorax dark yellowish brown with brown infuscation, gaster dark brown varying to concolorous very dusky red. Shining.

**RANGE.** Nevada, southeastern California, and western Arizona.

**NEVADA NOTES.** We have 65 records from 42 localities (3,000–7,000 ft.) which are widely distributed except in the northern and northeastern parts of the state. Twelve localities were in Hot Desert (2 in cottonwood groves), 28 were in Cool Desert (8 in Atriplex Subclimax, 6 in disturbed habitats), and 2 in Pinyon-Juniper Biome. Twenty-two nests were under stones; 4 were surmounted by craters 25 mm in diameter.

These myrmecophiles were found in the nests of *Pheidole paiute*: Pupae of *Oreasema* sp. (Hymenoptera: Eucharitidae; det. B.D. Burks), 9 mi. SSW Beatty (Nye Co.) 3,000 ft. Fulgorid nymphs (Homoptera: Fulgoridae), 23 mi. ENE Reno (Storey Co.) 4,200 ft. Coleoptera: Tenebrionidae: *Batuloides rotundicollis* (LeC.) and *Araeoschizus sulcicollis* Horn (det. T.J. Spilman), both in the same nest, 7 mi. SSE Beatty (Nye Co.), 3,000 ft.; *Conibiosoma elongatum* (Horn) (det. T.J. Spilman), 6 mi. NE Gerlach (Pershing Co.) 3,900 ft.; 24 mi. ENE Reno (Washoe Co.) 4,200 ft.; 14 mi. SSE Yerington (Lyon Co.) 5,100 ft.

**NEVADA LOCALITIES.** Map 19.

### *Pheidole pilifera* (Roger)

**MAJOR WORKER.** Small. Head and thorax reddish yellow, gaster yellow with yellowish brown infuscation varying to head very dusky red with reddish black infuscation, thorax and gaster reddish black. Head and gaster strongly shining, thorax dull. **MINOR WORKER.** Minute. Head reddish brown, thorax brownish yellow varying to head and thorax black, gaster very dusky red. Head and thorax dull, gaster strongly shining.

**RANGE.** Massachusetts to Florida, westward to North Dakota, Nebraska, California, Nevada, and Arizona.

**NEVADA NOTES.** We have 25 records from 19 localities; 3,400–7,500 ft.; mostly 5,000–7,000 ft.; scattered throughout the state except lacking in the northern and northwestern parts. One was in the Hot Desert, 6 in the Cool Desert (1 in Sarcobatus Subclimax), and 9 in Pinyon-Juniper. All nests were in exposed terrain; 6 were under stones; 9 were surmounted by a crater 25–60 mm in diameter.

Pigmented pupae of *Oreasema occidentalis* Ashmead (Hymenoptera: Eucharitidae; det. B.D. Burks), were found in a nest 4 mi. NNW Elgin (Lincoln Co.) 3,400 ft. in the Hot Desert.

**NEVADA LOCALITIES.** Map 23. *Clark Co.*: 1 mi. N Camp Bonanza in Spring Mts. 6,800 ft.; Kyle Canyon 6,700 ft. (Cole, 1956a:113). *Douglas Co.*: 16 mi. SE Minden 5,700 ft.; 4 mi. WSW Wellington 5,500 ft. *Elko Co.*: Eighteen Mile Ranch (18-42N-68) 5,100 ft. *Esmeralda Co.*: Goldfield. *Lincoln Co.*: 4 mi. NNW Elgin 3,400 ft.; 5 mi. ENE Caliente 4,800 ft.; 8 mi. ENE Caliente 5,500 ft.; Oak Spring Summit 6,200 ft. *Lyon Co.*: 5 mi. NNE Dayton 4,300 ft. *Mineral Co.*: Petrified Summit (-9N-35) 6,300 ft. *Nye Co.*: Big Smoky Valley (21-14N-43) 5,800 ft.; 1½ mi. SSW Moores Sta. in Hot Creek Valley 7,000 ft.; 5 mi. W Moores Sta. in Hot Creek Valley 5,800 ft.; 3 mi. NE Ione (-13N-34) 7,500 ft.;





**Figure 29.** *Pheidole tucsonica*. Crater. Clark County, 3 mi. west of Cottonwood Cove.

Test Site (Cole, 1966). *Washoe Co.*: 9 mi. N Reno 4,900 ft.  
*White Pine Co.*: 25 mi. ESE Eureka 6,500 ft.

### *Pheidole tucsonica* W.M. Wheeler

We follow Snelling and George (1979) in treating this as a separate species from *P. xerophila*.

**MAJOR WORKER.** Small. Head dark reddish brown, thorax dusky red, gaster dark grey. Strongly shining throughout. **MINOR WORKER.** Minute. Reddish black with yellowish red legs and antennae. Strongly shining.

**RANGE.** New Mexico to southern California and Nevada.

**NEVADA NOTES.** We have 15 records from 9 localities, all from the southern tip of the state in the Hot Desert; 800–3,600 ft. Locally it may be very abundant. Nests were in exposed soil and surmounted by a crater of fine sand (Fig. 29) 5–15 cm in diameter; entrances 2–3 mm in diameter. Sometimes we found a ring of chaff around the crater. Chambers near the surface were filled with debris, which included insect fragments.

**NEVADA LOCALITIES.** Map 23. *Clark Co.*: Hwy. 68 at California boundary (–28S–60) 3,600 ft.; Cottonwood Cove 800 ft.; 3 mi. W Cottonwood Cove 1,200 ft.; Searchlight 3,400 ft.; 19 mi. S Searchlight 2,500 ft.; 14 mi. SSE Searchlight 2,700 ft.; 7 mi. SW Searchlight 3,500 ft.; 12 mi. N Searchlight 2,900 ft.; 7 mi. NW Davis Dam 3,000 ft.

### *Pheidole vistana* Forel

This is the correct name for the species formerly known as *P. grallipes*. We regret the necessity of replacing that well known name with one based on a poor description of the minor worker only.

**MAJOR WORKER.** Medium-sized. Concolorous brownish yellow varying to head yellowish red, thorax reddish yellow, gaster yellowish red with dark reddish brown infuscation. Densely and finely punctate and dull. **MINOR WORKER.** Small. Concolorous reddish yellow, head infuscated with brown or black. Feebly shining.

**RANGE.** Arizona, southern Nevada, southern California, and Lower California.

**LITERATURE NOTES.** This species seems to be exclusively entomophagous. Prey is captured by the mandibles, since the sting is vestigial. In attacking a larger insect the workers grasp its appendages and pull backwards stretching the victim and pinning it to the ground. A sticky secretion from the tip of the gaster is smeared on the prey. Surprisingly large pieces of food are transported cooperatively and rapidly to the nest. Workers are most active in the evening and on cloudy days (Pullen, 1961).

Mallis (1941:69) found one “nest at the base of a shrub. . . . The entrance . . . was an irregular opening about 1 in. by 1½ in. in diameter and somewhat hidden by the branches of the shrub.”

In Deep Canyon (California) we (Wheeler and Wheeler, 1973) found only 2 nests of this species. Both were under palo verde (*Cercidium floridum*) trees; one had 2 craters 15 cm in diameter, and the other had 1 crater 30 cm in diameter. The entrance was very large—15–38 mm in diameter. We found the workers active at dusk, but not by day nor at 3:30 A.M. A colony attempted to invade our living quarters; hence *P. vistana* must be regarded as a potential household pest.

**NEVADA NOTES AND LOCALITIES.** There are only 3 records from 3 localities for the state, all from the Hot Desert in Clark County (Map 22): 2 mi. W Logandale 1,400 ft.; Granite Spring 8 mi. W Davis Dam 1,400 ft.; 12 mi. W Davis Dam 2,600 ft. With this last was taken a myrmecophile, *Conibius opacus* (LeC.) (Coleoptera: Tenebrionidae) (det. T.J. Spilman).

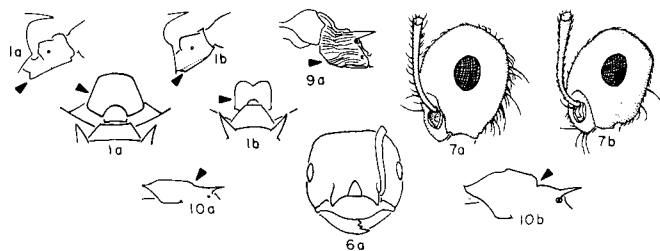
### Genus *Crematogaster* Lund

The ants of this genus are easily recognized by the peculiarities of the gaster: (1) the postpetiole is attached to the dorsal surface (instead of the anterior end) of the gaster; (2) the gaster is flat above, convex below and sharp-pointed behind; (3) the workers' habit of running about scorpion-like with the gaster elevated over the thorax and its tip pointed forward. They nest in the soil under stones or logs, in decaying wood, in plant cavities and in carton nests of their own making. The sting is vestigial, but the workers can bite and can annoy an intruder by crawling on it in large numbers. A drop of viscous secretion from the gastric apex acts as a repellent and can gum up the appendages of arthropod enemies until they become helpless. The colonies are often very populous. Carton is frequently manufactured for nest structures. The workers often tend Homoptera on plant stems and foliage, sometimes traveling in long dense columns.

#### KEY TO THE SPECIES OF *CREMATOGASTER*

(Adapted from Buren, 1968b)

- 1a. Anteroventral tooth of petiole strikingly large; head subquadrate; postpetiole trapezoidal in dorsal view, wider in front, with straight sides . . . . . *mutans*
- b. Without this combination of characters . . . . . 2
- 2a. Erect hairs numerous on most of dorsal surfaces of thorax and gaster; thorax feebly punctate . . . *\*navajoa*



## GENUS CREMATOGASTER

- b. Erect hairs in various restricted patterns on thorax and gaster but not numerous on entire dorsal surface; if thorax punctate, its erect hairs usually sparse or absent ..... 3
- 3a. Thorax densely punctate; thorax without erect hairs or with a single erect hair on each pronotal shoulder .. 4
  - b. Thorax either with some other type of sculpture or else 2 or more hairs on each pronotal shoulder ..... 9
- 4a. Thorax without erect hairs ..... 5
  - b. An erect hair on each pronotal shoulder ..... 6
- 5a. Head and thorax reddish ..... *depilis*
  - b. Head and thorax black or dark brown ..... *larreae*
- 6a. Scape surpassing occipital corner, its thickest portion subapical; hemilobes of postpetiole (in profile) rather sharply angulate behind ..... *colei*
  - b. Scape not surpassing occipital corner, its thickest portion apical; postpetiole (in profile) not sharply angulate behind ..... 7
- 7a. Pubescence suberect on scape and head, rather long on body ..... *californica*
  - b. Pubescence appressed on scape and head, less noticeable on all surfaces ..... 8
- 8a. Thorax dull, with strong deep punctures on all surfaces except epinotal declivity ..... *opuntiae*
  - b. Thorax feebly shining, punctures very shallow except on mesopleuron ..... *nocturna*
- 9a. Lower mesopleuron with distinct striae ..... 10
  - b. Lower mesopleuron without striae ..... 12
- 10a. Scape not, or scarcely, surpassing occipital corner in large specimens; without noticeable mesonotal declivity; thorax weakly punctate ..... *\*marioni*
  - b. Scape surpassing occipital corner by 1 or 2 diameters; mesonotal declivity abrupt and angular ..... 11
- 11a. Head entirely striatopunctate ..... *coarctata*
  - b. Head above eyes smooth and shining or with only weak striae ..... *mormonum*
- 12a. Head and thorax reddish; thorax shining but with fine distinct striae; without distinct declivity at rear of mesonotum ..... *hespera*
  - b. Not as above ..... *emeryana*

### *Crematogaster californica* Emery

**WORKER.** Small. Head dark red, thorax reddish yellow, gaster very dusky red varying to concolorous very dusky red. Head and gaster shining, thorax dull.

**RANGE.** Southern Nevada, southern California, and Lower California.

**LITERATURE NOTES.** "Found at bases and on roots of various plants cultivating aphids and coccids" (Buren, 1968b: 94).

**NEVADA NOTES.** We have 6 records from 5 localities; all in the Hot Desert (1 in a *Sarcobatus Subclimax*); 2 were nesting under desert pavement; 1 was in the base of an *Atriplex* plant; 1 in a sand dune under a large horizontal stem of an old larrea.

**NEVADA LOCALITIES.** Map 25. Nye Co.: 7 mi. SSE Beatty 3,000 ft.; Scottys Junction, 4,000 ft.; Big Dune 10 mi. W Lathrop Wells 2,600 ft.; Rock Valley 3,300 ft.; 6 mi. SW Scottys Junction 4,000 ft.

### *Crematogaster coarctata* Mayr

**WORKER.** Small to medium-sized. Head dark reddish brown with very dusky red infuscation, thorax brown, gaster very dusky red varying to head and thorax reddish black, gaster black. Head and thorax dull, gaster strongly shining.

**RANGE.** Nevada and California.

**NEVADA NOTES.** We have 46 records from 29 localities, all from the western and northwestern areas except for 2 from the southern part of the state; 3,800–6,400 ft.; median 5,300 ft. Sixteen were in the Cool Desert (5 in *Sarcobatus Subclimax*), 12 in the Pinyon-Juniper Biome, and 3 in the Coniferous Forest. Sixteen nests were under stones, 1 was exposed with a 50-mm crater, 1 was in duff at the base of a juniper, 2 were at the base of *Sarcobatus vermiculatus*, 3 were at the base of *Atriplex confertifolia*.

Workers of *C. coarctata* were tending *Phenacoccus sole-nopsis* (Homoptera: Pseudococcidae; det. D.R. Miller) on the bases of stems of *Atriplex confertifolia* just below ground surface, 41 mi. E Lovelock (Pershing Co.) in Pleasant Valley at 3,800 ft.

**NEVADA LOCALITIES.** Map 24. Churchill Co.: 11 mi. NE Stillwater 3,900 ft.; Earthquake Fault (34-16N-34) 6,400 ft. Clark Co.: McCullough Ra. (34-27S-61) 5,900 ft. *Eureka Co.*: 5 mi. S Beowawe 4,500 ft. *Lyon Co.*: 14 mi. SSE Yerington 5,100 ft. *Nye Co.*: Test Site (Cole, 1966:16). *Ormsby Co.*: 3 mi. WSW Carson City 6,100 ft. *Pershing Co.*: 41 mi. E Lovelock in Pleasant Valley (15-27N-38) 3,800 ft. *Washoe Co.*: Clear Creek 4,500 ft.; Coleman Canyon (36-41N-25) 5,800 ft.; 9 mi. NW Gerlach 4,000 ft.; 31 mi. N Gerlach 4,900 ft.; 5 mi. W Mullen Gap at N end Pah Rah Ra.; Peavine Peak; 16 mi. NNE Sparks 4,700 ft.; Verdi: 4 mi. SSW Virginia City 6,300 ft.; 24 mi. SE Vya 6,300 ft.; 7 mi. N Reno 5,000 ft.; 9 mi. N Reno 5,400 ft.; 6 mi. SW Reno 6,400 ft.; 18 mi. NNW Reno 5,800 ft.; 22 mi. N Reno (Freds Mt.) 6,000 ft.; 26 mi. NNW Reno 5,300 ft.; 24 mi. NNW Reno 5,300 ft.; 5 mi. ENE Reno; 12 mi. SSE Reno 4,800 ft.; 23 mi. N Reno (Bedell Flat) 5,000 ft.; 13 mi. NNW Reno 5,000 ft.

### *Crematogaster colei* Buren

**WORKER.** Small. Head and thorax brown infuscated with very dusky red, gaster very dusky red varying to concolorous very dusky red. Head and thorax dull, gaster strongly shining.



**Figure 30.** *Crematogaster hespera*. Nest exposed by splitting rotten log. The dark material is carton manufactured by the workers. Churchill County, 5 mi. south-southwest of Fallon.

**RANGE.** Mountains of Nevada, Arizona, New Mexico, and western Texas.

**NEVADA NOTES AND LOCALITY.** We have 1 record of this species from 12 mi. SE Minden (Douglas Co.) 5,800 ft. Map 25. W.S. Creighton, who determined these specimens, was surprised that it should be taken at so low an elevation. The nest was in an old burn in Pinyon-Juniper Biome; under a stone.

### *Crematogaster depilis* W.M. Wheeler

**WORKER.** Small. Reddish yellow, except gaster very dusky red; head sometimes infuscated with dark reddish brown. Head and gaster shining, thorax dull.

**RANGE.** Western Texas to southern Nevada, southeastern California, and northern Mexico.

**LITERATURE NOTE.** "Nests in and among roots and lower stems of various plants" (Buren, 1968b:93).

**NEVADA NOTES.** We have 13 records from 12 localities; all in the southern part of the state and south of latitude 38°N; all in the Hot Desert; 2,100–5,900 ft. One nest was under a stone; for all other records (when data were given) the workers were at the base of desert plants (1 *Eriogonum*, 4 *Larrea*, 1 *Opuntia*, 1 *Yucca*).

**NEVADA LOCALITIES.** Map 25. *Clark Co.*: 6 mi. NW Tule Spring 2,900 ft.; Kyle Canyon (22-19S-58) 4,800 ft.; Kyle Canyon (7-19S-58) 4,000 ft.; McCullough Ra. (34-27S-61) 5,900 ft.; Sheep Ra. (14-17S-60) 4,400 ft.; Rogers Spring 2,100 ft. *Esmeralda Co.*: Chiatovitch Creek in Fish Lake Valley. *Lincoln Co.*: 4 mi. NNW Elgin 3,400 ft. *Nye Co.*: Test Site (Cole, 1966:16); 4 mi. ESE Beatty (Flourspar Canyon) 3,400 ft., 4,200 ft.; 7 mi. SSE Beatty 3,000 ft.

### *Crematogaster emeryana* Creighton

**WORKER.** Small. Head dark reddish brown, thorax and gaster brown varying to head and thorax brown, gaster dark

reddish brown with bands of very dusky red infuscation. Head and gaster strongly shining, thorax feebly shining.

**RANGE.** Colorado and western Texas westward to Nevada and Arizona and southward into Mexico.

**NEVADA NOTES.** The two Caliente colonies were nesting under stones in a deep narrow canyon filled with shrubs and trees which were not indicative of any biome.

**NEVADA LOCALITIES.** Map 24. *Clark Co.*: 3 mi. W Logandale; Rogers Spring 2,100 ft. *Lincoln Co.*: Pioche 6,100 ft.; 2 mi. S Caliente 5,000 ft.

### *Crematogaster hespera* Buren

**WORKER.** Small. Head and thorax yellow, gaster very dusky red varying to head and thorax reddish yellow, gaster very dusky red with reddish black infuscation. Head and gaster shining, thorax moderately shining.

**RANGE.** Western Texas to southern California; Sonora and Lower California.

**LITERATURE NOTE.** "Usually arboreal in cottonwood trees along rivers and streams" (Buren, 1968b:94).

**NEVADA NOTES AND LOCALITIES.** Map 26. We have 5 records from 5 localities; 3,900–6,300 ft. *Churchill Co.*: 5 mi. SSW Fallon 3,900 ft., in cottonwood grove in an irrigated farmyard; the nest was in an exposed cottonwood root and in a piece of rotten wood in a cavity under the bark (Fig. 30). *Lyon Co.*: 6 mi. SE Wabuska 4,300 ft., in a cottonwood grove, workers in a procession up and down a cottonwood trunk. *Nye Co.*: Fairbanks Spring. *Washoe Co.*: Washoe Lake 5,100 ft., on a sand dune in loose sand at base of *Prunus andersonii*; Incline Village, in house, producing frass, 6,300 ft.

### *Crematogaster larreae* Buren

**WORKER.** Small. Head yellowish red with reddish yellow infuscation, thorax reddish yellow, gaster dark reddish brown varying to concolorous dark reddish brown. Head moderately shining, thorax dull, gaster strongly shining.

**RANGE.** Western Texas to southern Nevada and southeastern California; Mexico.

**LITERATURE NOTES.** "Restricted entirely as far as known to nesting in the lower stems and among roots of the desert plant *Larrea divaricata*" (Buren, 1968b:93–94).

**NEVADA NOTES.** We have 7 records from 6 localities in the southern part of the state; 2,800–5,800 ft. All are from the Hot Desert. Workers were found in the soil around the bases of desert plants (2 *Larrea* and 3 *Ephedra*).

**NEVADA LOCALITIES.** Map 24. *Clark Co.*: Tule Spring 2,800 ft.; Sheep Ra. (7-17S-61) 5,000 ft.; Sheep Ra. (27-16S-61) 5,800 ft. *Lincoln Co.*: 2 mi. NE Crystal Spring 4,200 ft.; 10 mi. WSW Crystal Spring 4,700 ft. *Nye Co.*: Rock Valley 3,200 ft.

### *Crematogaster mormonum* Emery

**WORKER.** Small. Head dark red, thorax red, gaster black. Head shining, thorax dull, gaster strongly shining.



**RANGE.** Southern Idaho and Utah to southern Nevada, California, and Lower California.

**LITERATURE NOTES.** Lives in large colonies under stones or logs. Predaceous and scavenging.

**NEVADA NOTES.** We have 107 records from 86 localities which are widely distributed, except absent from the northeastern quarter of the state; 3,800–8,000 ft.; median 5,800 ft. Thirty-six records were in the Cool Desert (14 in *Sarcobatus* Subclimax, 5 in *Atriplex* Subclimax, and 1 in cottonwood riparian), 1 from the Hot Desert, and 34 from the Pinyon-Juniper Biome. Forty-eight nests were under stones (Fig. 31), 5 were under wood, 1 was in a stump, 1 was in exposed soil surmounted by a crater, and 1 was in soil at the base of an *Atriplex* shrub. In 16 records workers were taken at the base of shrubs (1 *Artemisia*, 4 *Atriplex*, 1 *Coleogyne*, 3 *Ephedra*, 7 *Sarcobatus*), where Homoptera were tended, but no nests were found.

A teneral *Anthicus punctulatus* LeC. (Coleoptera: Anthicidae; det. F. Werner) was taken in the nest of *C. mormonum* at Denio (Humboldt Co.) 4,300 ft. The following myrmecophilous mealybugs (Homoptera: Pseudococcidae; det. D.R. Miller) were tended by *C. mormonum*: *Puto atriplicis* McKenzie on *Atriplex confertifolia*, 10 mi. NE Stillwater (10-20N-32) (Churchill Co.) 3,900 ft.; *Phenococcus solenopsis* Tinsley on *Atriplex confertifolia*, 41 mi. E Lovelock in Pleasant Valley (Pershing Co.) 3,800 ft. A colony at Dyer (Esmeralda Co.) 5,100 ft. was tending both *Aphis bonnevillensis* Knowlton (Homoptera: Aphididae; det. L.M. Russell) and *Orthezia sarcobati* Morrison (Homoptera: Ortheziidae; det. D.R. Miller) at the base of *Sarcobatus vermiculatus*.

**NEVADA LOCALITIES.** Map 27.

### *Crematogaster mutans* Buren

**WORKER.** Small. Bicolored: head and thorax reddish yellow with dark reddish brown infuscation, gaster dark reddish brown varying to head and thorax yellowish brown with dark reddish brown infuscation, gaster very dusky red. Head and gaster shining, thorax dull.

**RANGE.** Nevada and the mountainous regions of California.

**LITERATURE NOTES.** "The females of *mutans* can be separated from all other North American species by the very long, silky, yellowish, appressed pubescence, the compressed thorax, depressed gaster, and the proportionally very large head" (Buren, 1968b:116).

**NEVADA NOTES.** We have 8 records from 6 localities in the western part of the state; 5,800–7,400 ft. All records with adequate notes are from Pinyon-Juniper Biome and all nests were under stones.

The workers from one colony were tending the scales *Eriococcus* sp. (Homoptera: Eriococcidae; det. D.R. Miller) at ground-surface level on an unhealthy plant (*Eriogonum* cf. *fasciculatum polifolium*) at Lida Summit (Esmeralda Co.).

**NEVADA LOCALITIES.** Map 27. *Douglas Co.*: 12 mi. SE Minden 6,000 ft. *Esmeralda Co.*: Lida 6,500 ft.; Lida Summit 7,400 ft. *Lander Co.*: Copper Canyon. *Washoe Co.*:



**Figure 31.** *Crematogaster mormonum*. Nest exposed by removing stone. Note the carton partitions manufactured by workers. Douglas County, 4 mi. west-southwest of Wellington.

21 mi. N Gerlach 5,800 ft.; between Carson City and Reno (Buren, 1968b:116).

### *Crematogaster nocturna* Buren

**WORKER.** Small. Head and thorax yellow, gaster dark reddish brown varying to head dark reddish brown, thorax brownish yellow, gaster dark reddish brown with darker infuscation. Head and gaster shining, thorax feebly shining.

**RANGE.** Northern Arizona, southern Utah, and southern Nevada.

**NEVADA NOTES.** We have 5 records from 4 localities, all in the Hot Desert; 2,700–3,200 ft. Three of the nests were at the bases of larrea stems, and 4 had craters.

**NEVADA LOCALITIES.** Map 26. *Clark Co.*: 3 mi. E Hidden Ranch 2,900 ft. *Nye Co.*: Lathrop Wells 2,700 ft.; Rock Valley 3,200 ft.; Test Site.

### *Crematogaster opuntiae* Buren

**WORKER.** Small. Head and thorax yellow, head infuscated with dark yellowish brown; gaster dark brown anteriorly and very dusky red posteriorly varying to head strong brown with dark reddish brown infuscation, thorax brown, gaster black. Head and gaster strongly shining, thorax dull.

**RANGE.** Arizona, southern Nevada, and southeastern California.

**NEVADA NOTES.** We have 4 records from 3 localities, all in the Hot Desert. We found 1 nest at the base of an *Ephedra* plant; our other 2 records were workers in the soil at the base of desert shrubs.

**NEVADA LOCALITIES.** Map 26. *Clark Co.*: 1 mi. E Hidden Ranch 2,900 ft. *Nye Co.*: Scottys Junction 4,000 ft.; Test Site.

### Genus *Monomorium* Mayr

"All the species of *Monomorium* which occur in North America are exceptionally adaptable in the matter of nest sites.

They will utilize all manner of preformed cavities . . . or adapt themselves equally well to nesting in the soil. This adaptability is coupled with a wide tolerance for various sorts of environment. Our native species seem equally at home in the arid semi-desert regions of the west and the humid, heavily wooded areas of the eastern and southern states" (Creighton, 1950:217).

*Monomorium pharaonis* (Linnaeus) is a cosmopolitan tramp; it has been carried by commerce from its original home in the Old World Tropics to heated buildings in cities all over the world and has become established outdoors in the New World Tropics. It is strange that it has not been reported in Nevada.

#### KEY TO THE SPECIES OF *MONOMORIUM*

- 1a. Light reddish yellow; head and thorax densely punctate, dull or feebly shining . . . . . *\*pharaonis*
- b. Brownish black to black; head and thorax mostly, or entirely, smooth and strongly shining . . . . . *minimum*

#### *Monomorium minimum* (Buckley)

**WORKER.** Minute. Concolorous black or reddish black. Strongly shining.

**RANGE.** Canada, the lower 48 states and Mexico; rare over much of the Pacific Northwest.

**LITERATURE NOTES.** This ant is a common household pest feeding on many foodstuffs. Colonies usually have several queens and may become very populous. The food consists of honeydew, insects (living or dead), and the secretions of plants.

**NEVADA NOTES.** Nevada records are concentrated in the midwestern and southeastern parts; there are none from a zone 130 mi. wide along the northern border. We have 66 records from 53 localities; 1,800–8,000 ft.; mostly 4,500–7,000 ft. Only 1 record from the Hot Desert (disturbed), 18 from Cool Desert (2 from disturbed areas, 2 from cottonwood groves, 1 was a pest in an apiary, 1 from a residence), 18 from the Pinyon-Juniper Biome, and 5 from the Coniferous Forest. Thirty-one nests were under stones, 3 were in exposed soil with a crater 2½–5 cm in diameter, 1 had many craters, and 1 was in rotten wood. May be very abundant locally. Timid; move fast. One colony had 31 queens.

**NEVADA LOCALITIES.** Map 28. *Clark Co.*: 3 mi. ENE Charleston Park 7,000 ft.; Potosi Mt. 6,200 ft.; Wheeler Spring in Spring Mts. 6,600 ft.; Roger Spring 1,800 ft.; 4 mi. W Mountain Spring Summit 4,600 ft.; Las Vegas 2,000 ft. *Douglas Co.*: 8 mi. SE Minden 5,200 ft.; 6 mi. SE Minden 5,000 ft.; 12 mi. SE Minden 6,000 ft.; 9 mi. SE Minden 5,400 ft.; 11 mi. SE Minden 5,800 ft.; 4 mi. WSW Wellington 5,500 ft.; Spring Gulch (9-13N-23) 5,400 ft.; Walleys Hot Spring nr Genoa. *Esmeralda Co.*: E side Sylvania Mts. *Lincoln Co.*: Oak Spring Summit 6,200 ft.; 11 mi. NW Pioche 6,000 ft.; Coyote Summit 5,600 ft.; Modena Summit 6,700 ft. *Lyon Co.*: Sweetwater Summit 7,100 ft.; Rye Grass Spring 7,200 ft.; Sonoma Stage Sta. (site) (-7N-26) 6,300 ft.; 3 mi. SW Santa Margarita Ranch 5,550 ft.; Smith; 3 mi. E Smith 4,700

ft.; 8 mi. NW Smith 4,700 ft.; 12 mi. WSW Wabuska 5,300 ft.; W end Wilson Canyon; Hwy. 3C at Mineral Co. line 6,200 ft. *Mineral Co.*: Lucky Boy Pass 8,000 ft.; Mud Spring 4,500 ft.; Fletcher, 20 mi. SW Hawthorne. *Nye Co.*: Monitor Valley at mouth of Meadow Creek 7,200 ft.; Test Site (Cole, 1966:16). *Ormsby Co.*: 3 mi. SSW Carson City 6,100 ft. (= Kings Canyon); 5 mi. SSW Carson City 6,800 ft. (= Kings Canyon). *Storey Co.*: 2 mi. WSW Virginia City 6,500 ft.; nr Tracy 4,300 ft.; 20 mi. E Reno 4,800 ft.; Virginia City 6,000 ft. *Washoe Co.*: Washoe Lake 5,100 ft.; Davis Creek Park 5,100 ft.; 6 mi. SW Reno 6,400 ft.; 5 mi. SW Reno 5,600 ft.; 17 mi. N Sparks 4,440 ft.; 1 mi. N Steamboat 4,600 ft.; Pah Rah Ra. nr Pyramid Lake; Mullen Gap (3 mi. W of S end Pyramid Lake); between Wadsworth and Nixon; Wadsworth; Washoe Valley. *White Pine Co.*: Lehman Caves Nat. Mon. 6,700 ft.; Ellison Ranger Sta. (27-14N-54) 6,900 ft.

#### Genus *Solenopsis* Westwood

*Solenopsis* is a large, cosmopolitan, and taxonomically difficult genus of mostly minute, monomorphic, wholly subterranean species. These minute species frequently live as thief ants within the colonies of other larger species of ants or termites. Some New World species are larger and are polymorphic; the colonies may be very large and the workers are aggressive surface foragers. These larger species are called "fire ants" because of the intense, burning sensation caused by their stings. The fire ants are important pest species (see M.R. Smith, 1965).

#### KEY TO THE SPECIES OF *SOLENOPSIS*

- 1a. Minute and monomorphic; eye minute (3–6 facets) . . . . . *molesta*
- b. Polymorphic; eye large (20 or more facets) . . . . . 2
- 2a. Concolorous golden yellow . . . . . *aurea*
- b. Not concolorous . . . . . 3
- 3a. Head, thorax, pedicel, and portion of 1st gastric somite red or yellowish red, remainder of gaster blackish; biting edge of mandible of major with 3 teeth . . . . . *maniosa*
- b. Head, thorax, and pedicel brown or reddish brown; gaster mostly or entirely black; biting edge of mandible of major with 4 teeth . . . . . *\*invicta*

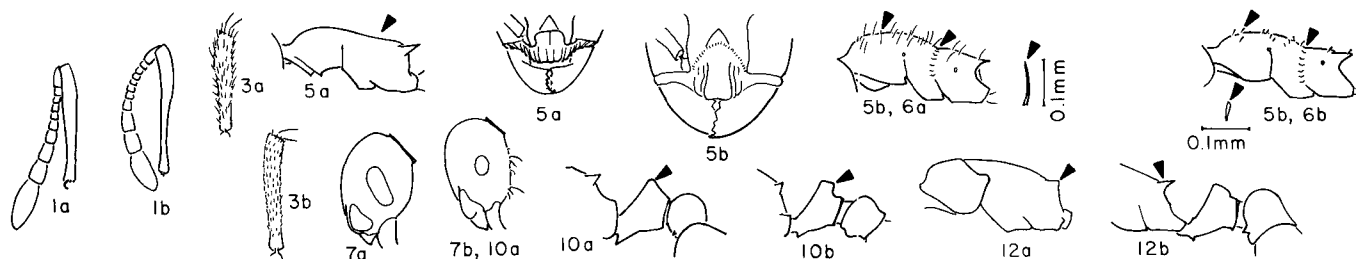
#### *Solenopsis aurea* W.M. Wheeler

We have not taken this species, but Cole reported it (1966: 17) from the Test Site in Nye County (Map 29): "The colonies were small and few."

#### *Solenopsis maniosa* W.M. Wheeler

All our material belongs to what W.M. Wheeler (1915:396) called "*Solenopsis geminata maniosa* subsp. nov." He commented: "This is the common and perhaps the only form of *geminata* in southern California." Creighton (1930:102) made it a variety of *S. xyloni* and gave its range as New Mexico to southern California; later (Creighton, 1950:232) he synonymized it with *S. xyloni*. We agree with Snelling and George (1979) that it is a separate species.





## GENUS *LEPTOTHORAX*

- regularly present on dorsum and usually slightly depressed below level of remainder of thorax ..... 6
- 6a. Erect body hairs numerous, long, and usually pointed; interrugal punctures on thorax heavy and dense, the surface feebly shining or opaque ..... *crassipilis*
- b. Erect body hairs sparse, short and usually clavate; interrugal punctures on thorax shallow and rather sparse, the surface moderately shining ..... *muscorum*
- 7a. Eye extraordinarily large, subreniform, placed obliquely on side of head ..... *obliquicanthus*
- b. Eye not as above ..... 8
- 8a. Dorsum of thorax devoid of sculpture, very smooth, and highly shining ..... *\*schmitti*
- b. Dorsum of thorax variously sculptured, never entirely smooth and shining ..... 9
- 9a. Dorsal half of head in large part smooth and shining, with a broad central strip free from sculpture extending down to frontal lobes ..... 10
- b. Head largely or entirely sculptured, surface feebly shining or completely opaque ..... 11
- 10a. Petiolar node in profile strongly cuneate, apex rather sharp; gular region with numerous, short, scattered, uneven, erect, and suberect hairs ..... *nitens*
- b. Petiolar node in profile not strongly cuneate, apex rather blunt; gular region with few (1-3) long, erect hairs ..... *carinatus*
- 11a. Dorsum of thorax densely and evenly punctate, rugae (if present) very feeble; side of thorax with heavy punctures which largely obscure the rugae ..... 12
- b. Dorsum of thorax with punctures interrupted by prominent rugae on the epinotum and mesonotum and often on the pronotum as well; rugae on sides of thorax not obscured by punctures ..... 13
- 12a. Epinotal spines reduced to short stumpy angles ..... *andrei*
- b. Epinotal spines well developed ..... *nevadensis*
- 13a. Node of petiole with dense punctures and feeble rugae, which do not break the even outlines of the node ..... *\*furunculus*
- b. Node of petiole with very coarse rugae, which give a rough outline to the node ..... 14
- 14a. Dorsum of thorax completely covered with coarse longitudinal rugae except for a small heavily punctate area on the mesonotum ..... *nevadensis*
- b. Rugae on dorsum of thorax largely confined to epi-

notum and rear of mesonotum, anterior portion punctate only ..... *tricarinatus*

### *Leptothorax andrei* Emery

**WORKER.** Small. Head and thorax brownish yellow, anterior part of gaster yellowish brown and posterior part reddish brown. Head and thorax dull, gaster shining.

**RANGE.** New Mexico, Arizona, Nevada, and California; Lower California.

**NEVADA NOTES.** We have 4 records of this species from 4 localities. Two records were in the Cool Desert, 1 in the Pinyon-Juniper, and 1 in the Coniferous Forest. Three nests were under stones.

**NEVADA LOCALITIES.** Map 31. *Clark Co.*: Lee Canyon in Spring Mts. 7,200 ft. (Cole, 1958:537). *Nye Co.*: Test Site (Cole, 1966:17). *Washoe Co.*: nr Reno (34-20N-19) 5,000 ft.; Peavine Peak 8,100 ft.

### *Leptothorax carinatus* Cole

**WORKER.** Small. Yellow, gaster with a band of dark yellowish brown posteriorly on 1st somite varying to reddish yellow, gaster with a band of strong brown posteriorly on 1st somite. Head and thorax dull, gaster strongly shining.

**RANGE.** Western Texas, Arizona, and Nevada.

**NEVADA NOTE AND LOCALITY.** We have only 1 record for this ant in Nevada: *Clark Co.*: Lee Canyon. Map 30.

### *Leptothorax crassipilis* W.M. Wheeler

**WORKER.** Small. Bicolored: head and gaster darker than thorax: head brown with dark reddish brown infuscation, thorax yellow, gaster dusky red; varying to head and gaster very dusky red, thorax strong brown. Head and thorax dull, gaster strongly shining.

**RANGE.** Wyoming, Colorado, Utah, Nevada, Arizona, and New Mexico.

**NEVADA NOTES.** We have only 7 records from 4 localities. Two were from the Coniferous Forest Biome. Three nests were under stones.

**NEVADA LOCALITIES.** Map 30. *Clark Co.*: Charleston Park in Spring Mts. 8,100 ft.; Kyle Canyon. *Nye Co.*: Scofield

Canyon on E side Quinn Canyon Ra. *White Pine Co.*: Lehman Caves Nat. Mon.

### *Leptothorax muscorum* (Nylander)

**WORKER.** Small. Dark reddish brown varying to head and thorax reddish black or thorax yellowish red, gaster very dusky red. Head and thorax dull, gaster strongly shining.

**RANGE.** Canada, Alaska, and the northern states with a southward extension in the Rocky Mountains to New Mexico; Nevada; northern Eurasia.

**LITERATURE NOTES.** This small ant "is one of the very few truly boreal-alpine members of its family. It is known from a very wide area in the northern Palearctic" (Brown, 1955:43). "Of all ants occurring in North America, *Leptothorax muscorum* is the species best able to survive in extreme Arctic-alpine conditions. Throughout boreal and alpine North America within the limits of the timbered areas, *L. muscorum* is found in company with *Camponotus herculeanus* (Linnaeus) and *Formica neorufibarbis* Emery, the two dominant ants of the region" (Brown, 1955:47). Brown (p. 49) reported *L. muscorum* from an island at the mouth of the Mackenzie River, lat. 69°32'N, long. 133°47'W, which "seems to be the northernmost record for ants in the Western Hemisphere."

Gregg (1963:397) reported this ant in Colorado from dry tundra and a variety of forest types; 5,345–12,000 ft.

**NEVADA NOTES.** We have 25 records from 18 localities 6,400–11,000 ft. Four records were in the Alpine Biome, 14 were in the Coniferous Forest. In the Alpine 1 nest was under a stone and 1 in dead wood; in the Coniferous Forest 7 nests were in and under rotten wood and 2 were in and under loose bark on dead trunks.

**NEVADA LOCALITIES.** Map 30. *Douglas Co.*: 17 mi. ESE Carson City (-14N-22) 7,600 ft. *Elko Co.*: Harrison Pass 7,200 ft.; 4 mi. S Jarbidge 8,000 ft.; Lamoille; Lamoille Canyon Road 8,200 ft.; Lamoille Lake (-31N-58) 9,700 ft.; Pole Canyon in East Humboldt Ra. (-34N-61). *Esmeralda Co.*: Boundary Peak 11,000 ft. *Nye Co.*: Table Mt. 10,000 ft., 10,500 ft., 10,800 ft. *Washoe Co.*: Little Valley 6,400 ft.; Hwy. 27 nr Mt. Rose 8,800 ft.; California boundary (31-17N-18) 8,600 ft.; Ophir Grade 6 mi. WSW Virginia City 5,500 ft.; Peavine Peak 7,400 ft. *White Pine Co.*: Lehman Caves Nat. Mon. 7,500 ft.; Pyramid Peak (-12N-68) 9,800 ft.

### *Leptothorax nevadensis* W.M. Wheeler

**WORKER.** Small. Head dark reddish gray, thorax very dusky red, gaster reddish black varying to concolorous reddish black. Head and thorax dull, gaster shining.

**RANGE.** Western Montana to Washington and southward to southern California; mostly in mountains.

**NEVADA NOTES.** Statewide in Nevada. There are 43 records from 36 localities; 4,100–10,000 ft., mostly 6,000–8,000 ft. Fourteen records were in the Cool Desert (1 in *Sarcobatus Subclimax*), 10 were in the Pinyon-Juniper Biome, 13 in the Coniferous Forest, and 1 in the Alpine. Nine nests

were under stones, 2 had a small disc of excavated soil around the exposed entrance, 1 was in an old dry root of *Artemisia tridentata*, 1 had a minute opening among pebbles and pine needles, 1 was in the edge of a nest of *Formica puberula*, and 1 in the edge of a nest of *F. subpolita*. Entrances were usually 2 mm in diameter.

**NEVADA RECORDS.** Map 31. *Clark Co.*: Spring Mts. (21-18S-55) 7,000 ft.; Kyle Canyon. *Elko Co.*: Lamoille Canyon Road 7,000 ft., 8,200 ft.; 24 mi. ESE Wells 5,800 ft.; Secret Pass 6,400 ft. *Esmeralda Co.*: Boundary Peak 8,800 ft., 8,900 ft. *Humboldt Co.*: 34 mi. NE Vya 6,300 ft.; 6 mi. W Orovida 4,100 ft. *Lander Co.*: 14 mi. SSE Eastgate 6,700 ft.; Austin. *Lincoln Co.*: Atlanta 7,000 ft. *Mineral Co.*: Lucky Boy Pass 8,000 ft. *Nye Co.*: Test Site (Cole, 1966:17); South Twin River in Toiyabe Ra. 6,800 ft.; S side Mt. Jefferson 10,000 ft. *Ormsby Co.*: 3 mi. WSW Carson City (Kings Canyon) 6,100 ft.; Kings Canyon (W.M. Wheeler, 1903:254). *Storey Co.*: 4 mi. N Virginia City 6,200 ft. *Washoe Co.*: Little Valley 6,400 ft., 6,500 ft.; Peavine Peak 6,900 ft., 8,100 ft.; Hwy. 27 nr Mt. Rose 8,800 ft.; 20 mi. NNE Vya 6,300 ft.; 6 mi. SW Reno 6,400 ft.; 10 mi. NW Reno 6,500 ft., 7,000 ft.; 10 mi. WNW Reno 6,500 ft. *White Pine Co.*: 14 mi. NW Ely 7,100 ft.; 10 mi. SW Ely 7,000 ft., 7,500 ft.; 19 mi. SW Ely 6,000 ft.; Jakes Valley (17-18N-60) 6,400 ft.; 2 mi. E McGill 7,700 ft.

### *Leptothorax nitens* Emery

**WORKER.** Small. Pale yellow, head and thorax infuscated with yellowish brown varying to yellow, head infuscated with brownish yellow, gaster infuscated with dark yellowish brown. Head shining, thorax dull, gaster strongly shining.

**RANGE.** Wyoming, Colorado, and Texas westward to the Pacific.

**NEVADA NOTES.** We have 10 records from 7 localities; 5,300–7,700 ft. Two were in the Pinyon-Juniper Biome, 3 were in the Coniferous Forest. Three nests were under stones.

**NEVADA LOCALITIES.** Map 32. *Clark Co.*: 4 mi. NNE Charleston Park in Spring Mts. 7,700 ft.; Lee Canyon; Kyle Canyon. *Washoe Co.*: Little Valley 6,400 ft.; 4 mi. N Verdi 6,300 ft.; 24 mi. NNW Reno 5,300 ft.; Gerlach.

### *Leptothorax obliquicanthus* Cole

**WORKER.** Small. Concolorous black. Head and thorax feebly shining, gaster strongly shining.

**RANGE.** Southern Colorado, northern New Mexico, and southern Nevada.

**NEVADA NOTES AND LOCALITIES.** Map 31. We have only 2 records from 2 localities for this rare species and field notes on only 1: 3 mi. SSW Moores Sta. in Hot Creek Valley, Nye Co., 6,200 ft.; nest exposed and surmounted by a 10-cm crater. The other record was 2 mi. S Ash Spring in Lincoln Co., 3,800 ft.

### *Leptothorax rugatulus* Emery

**WORKER.** Small. Head reddish black, thorax dark red, gaster dark reddish brown varying to head and gaster dark

reddish brown, thorax yellowish red. Head and thorax dull, gaster strongly shining.

**RANGE.** From the Dakotas to British Columbia and southward to western Texas, New Mexico, Arizona, and California.

**NEVADA NOTES.** In Nevada *L. rugatulus* records are widely scattered, but absent from the southern quarter of the state. We have 30 records from 20 localities; 4,700–9,100 ft., mostly 6,000–7,000 ft. Fifteen records were from the Coniferous Forest Biome, 5 from the Pinyon-Juniper Biome, and 4 from the Cool Desert. Five nests were under stones, 8 were in rotten wood. This is a slow-moving ant.

*Amecocerus* sp. (Coleoptera: Melyridae; det. J.M. Kingsolver) was taken in a nest of Peavine Peak (Washoe Co.) at 6,800 ft.

**NEVADA LOCALITIES.** Map 32. *Douglas Co.*: 7 mi. WNW Minden 6,000 ft., 7,000 ft.; Pine Nut Mts. (28-11N-22) 6,600 ft. *Elko Co.*: 7 mi. SW Wells 7,400 ft. *Lander Co.*: Austin. *Nye Co.*: E side Kawich Ra.; W side Kawich Ra.; 8 mi. ENE Gabbs 6,700 ft. *Washoe Co.*: Little Valley 6,400 ft., 6,800 ft.; between Little Valley and Lake Tahoe 7,800 ft.; 6 mi. SW Reno 6,400 ft.; 4 mi. N Verdi 6,300 ft.; Duck Flat 4,700 ft.; Peavine Peak 6,800 ft.; Whites Canyon on Mt. Rose 6,800 ft. *White Pine Co.*: nr Murry Summit (Egan Ra.) 7,900 ft., 8,500 ft.; Wheeler Peak (-13N-68) 9,100 ft.; 19 mi. SW Ely (-14N-61) 6,000 ft.

### *Leptothorax tricarínatus* Emery

**WORKER.** Small. Concolorous black. Head and thorax moderately shining, gaster strongly shining.

**RANGE.** From the Dakotas and Iowa southwestward to Arizona and Nevada.

**NEVADA NOTES.** We have 6 records from 5 localities; 4,100–7,700 ft. Three records were from the Cool Desert and 2 from the Pinyon-Juniper Biome. Since all were strays, we know nothing of their nests.

**NEVADA LOCALITIES.** Map 32. *Lyon Co.*: 9 mi. ESE Fernley (19-20N-26) 4,100 ft. *Nye Co.*: 4 mi. SSW Moores Sta. in Hot Creek Valley 5,900 ft. *White Pine Co.*: Lehman Caves Nat. Mon. 6,700 ft.; 2 mi. N McGill 6,000 ft.; Connors Pass 7,700 ft.

### Genus *Tetramorium* Mayr

*Tetramorium* is a largely Old World genus with many species, especially in the Indo-Australian and African regions. Some are "tramp" species, introduced into many parts of the world by commercial traffic, but they are seldom of much economic importance.

### *Tetramorium caespitum* (Linnaeus)

**WORKER.** Small. Appearing black in the field. Head strong brown to dark reddish brown ventrally, mostly infuscated with black, thorax dark brown to dark reddish brown laterally and very dusky red dorsally, gaster reddish black. Head and thorax feebly shining, gaster strongly shining.

**RANGE.** Europe and Asia; introduced into United States,

most abundant in states bordering the Atlantic, becoming sporadic westward.

**LITERATURE NOTES.** "Nests are usually constructed in exposed soil, or under the cover of stones, pavement, or other objects, and in rotting wood . . . also in houses, most commonly around or between the lower masonry walls of the foundation . . . Colonies are moderately large to large . . . The ants are almost omnivorous and feed on both dead and live insects, honeydew, seeds, the sap of plants, and various household foods such as meats, grease, nuts, potato chips, cheese, honey and bread, but the ants seem to show a preference for meat or grease. Workers steal seeds from seed beds and girdle, scar, or scarify the roots or stems of tomatoes, cabbages, peppers, eggplants, carrots, beets, radishes, turnips, parsley, *Gaillardia*, *Coreopsis*, and *Aster* . . . Workers are also known to gnaw into Irish potato tubers" (M.R. Smith, 1965:46).

The colonies of *T. caespitum* are hosts to the socially parasitic ant genera *Anergates* and *Strongylognathus* and the workers are intermediate hosts of the poultry tapeworm (*Raillietina* spp.) (Smith, 1965:47).

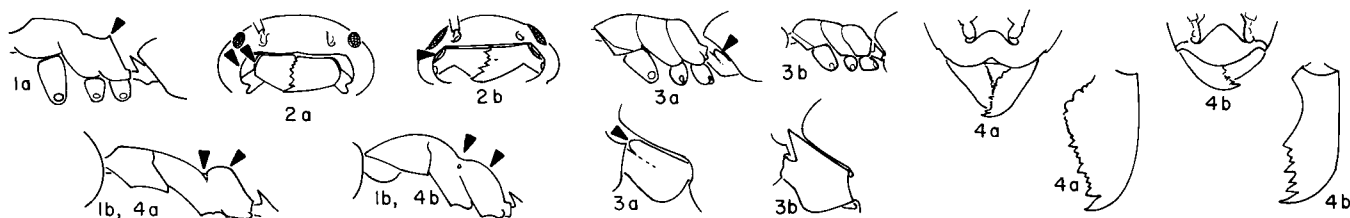
**NEVADA NOTES.** We have 22 records from 8 localities; most from Reno and vicinity. One nest was under 3 large contiguous stones. Three nests were under sidewalks; the entrances were in cracks in the sidewalks and were surrounded by messy piles of excavated soil. One was under the floor of our laboratory; the entrance was a crack in the floor; the workers were invading the lunches brought by laboratory personnel. Numerous workers were collected from a discarded soft-drink can; they were feeding on the residue. Workers were collected in an apartment on 28 November 1977; they were apparently moving indoors for the winter. A mating flight occurred in our greenhouse on 20 April 1972, while it was still cold outdoors. In the forenoon of 20 June 1973 a large number of males and winged females (both dead and alive) were found on campus pavements. At 3:30 P.M. on 14 September 1975, after several days of afternoon thunderstorms and rainy nights, we witnessed a mating flight from several exposed nests in a pasture; the rising hordes of winged sexual forms resembled columns of smoke. On 6 July 1978, we witnessed a flight at 4,800 ft.; the nest was under a sidewalk in Reno. In Elko it was a pest in a library.

**NEVADA LOCALITIES.** Map 33. *Elko Co.*: Elko. *Clark Co.*: Las Vegas. *Ormsby Co.*: Carson City. *Washoe Co.*: Reno 4,500 ft., 4,700 ft., 4,800 ft.; Sparks 4,500 ft.; Stead (10 mi. N Reno) 5,000 ft.

### Subfamily Dolichoderinae

The Nearctic species of Dolichoderinae are generalized as to behavior. The usual nest is in the soil, but the ants will utilize other sites occasionally. They feed on honeydew, other insects and almost anything edible. The anal glands of the workers produce a distinctive odor when the gaster is crushed. These volatile compounds are apparently defensive and occur in all our species of dolichoderines. The chemicals (2-heptanone, cyclopentanoid monoterpenes, and certain ketones) are characteristic of the subfamily and "2-methyl-4-





#### SUBFAMILY DOLICHODERINAE

heptanone, . . . is known only as an insect natural product due to its occurrence in the secretion of *Tapinoma* species. Similarly 4-methyl-2-hexanone has a very restrictive distribution in the Dolichoderinae, . . . and has not been isolated from the secretions of species in any other insect taxa" (Blum, 1973:30).

#### KEY TO THE GENERA OF DOLICHODERINAE

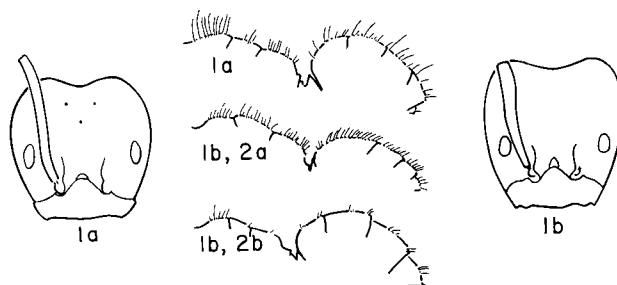
- 1a. Epinotum with a prominent cone projecting upward . . . . . *Conomyrma*
- b. Epinotum without such a cone . . . . . 2
- 2a. Worker caste moderately polymorphic (2½–6 mm); ocelli usually present (at least in larger workers); a distinct gap between lateral margin of clypeus and mandible . . . . . *Liometopum*
- b. Worker caste monomorphic; ocelli usually absent; without a distinct gap between clypeus and mandible . . . 3
- 3a. Petiolar node very small and indistinct, strongly inclined forward and adnate to anterior peduncle; without hairs on dorsum of thorax or head; 1¼–3¼ mm long . . . . . *Tapinoma*
- b. Petiolar node distinct but small, erect or suberect; a few coarse hairs on head and thorax; length 1½–2½ mm . . 4
- 4a. Mandible with 4 or 5 widely spaced teeth, with several minute denticles between them, except between apical and preapical; metanotum sharply depressed below level of epinotum, which is strongly convex . . . *Iridomyrmex*
- b. Mandible with 4 distinct teeth and with denticles between basal and subbasal only; metanotum not depressed below level of epinotum, which is flat . . . . . *Forelius*

#### Genus *Liometopum* Mayr

These ants are decidedly more aggressive than our other dolichoderines, attacking intruders pugnaciously, biting and spraying them with their characteristic dolichoderine secretion. Nests are typically under stones or in hollow trees and may be partly filled with a spongiform mass of chambers and galleries formed of carton manufactured by the workers. The workers forage in files and may tend Homoptera.

Efforts to locate colonies may be very exasperating: "While collecting in Colorado during the summer of 1903, I made repeated attempts to get at the nest of *Liometopum* . . . The files of ants were often seen disappearing under rocks, but when these were lifted in the hope of finding their nests, it was found that only a runway or perhaps a succursal nest

had been uncovered. In vain rocks were removed over large surfaces, only to find the burrow at last disappearing into the ground under the roots of some great tree, immovable boulder or cliff. The fact that in these runways the ants often congregate in numbers . . . is apt to lead the observer to believe that he has found the nest, but these cavities contain no larvae, males, or females, and careful inspection shows that they lead off into a continuation of the runway. The cavities are, in fact, mere temporary resting places for the out- and home-bound companies of workers" (W.M. Wheeler, 1905:330).



#### GENUS *LIOMETOPUM*

#### KEY TO THE SPECIES OF *LIOMETOPUM*

- 1a. Scape of largest workers surpassing occipital corner by an amount at least twice as great as maximum thickness of scape; erect hairs on gastric dorsum very uneven in length, with some of them about as long as those on pronotum . . . . . *\*apiculatum*
- b. Scape of largest workers surpassing occipital corner by an amount which does not exceed maximum thickness of scape; erect hairs on gastric dorsum, when present, short and of approximately equal length . . . . . 2
- 2a. Erect hairs on dorsum of gaster abundant, those on thorax present over most of upper surface; body only moderately shining; thorax in part or entirely yellow . . . . . *\*occidentale*
- b. Erect hairs on dorsum of gaster very sparse or absent, those on thorax mostly confined to pronotum; body rather strongly shining; color always uniformly brown . . . . . *luctuosum*

#### *Liometopum luctuosum* W.M. Wheeler

W.M. Wheeler described *luctuosum* as a subspecies of *apiculatum*, but Creighton (1950:337) said that "as long as *luc-*

*tuosum* is to be considered as a subspecies it must be assigned to *occidentale*." We settle the argument by treating it as a distinct species, because we can find no intergrades in any of our material from Colorado, New Mexico, Arizona, Nevada, or California.

**WORKER.** Small to medium-sized. Concolorous dark reddish brown. Feebly shining.

**RANGE.** Wyoming to western Texas, thence westward to Nevada and California.

**LITERATURE NOTES.** "*L. luctuosum* seems to be associated with pine trees. [The workers ascended] the trunks and had their nests under the large roots of pines" (W.M. Wheeler, 1905:332).

**NEVADA NOTES.** Nevada records are concentrated along the midwestern border and in the extreme south. We have 26 records from 20 localities; 4,500–8,100 ft. Six were in the Coniferous Forest Biome and 7 in the Pinyon-Juniper, while 5 were living in houses; in 2 houses they were reported as producing piles of fine sawdust; in the third they were catching insects attracted to lights; in the fourth they were damaging plasterboard. We found the bite annoying. Cole (1966: 18) reported finding a nest at the Test Site "in the soil beneath light detritus at the base of a juniper."

**NEVADA LOCALITIES.** Map 34. *Clark Co.*: Charleston Park in Spring Mts. 8,100 ft.; Potosi Mt. 5,400 ft., 6,300 ft.; McCullough Ra. (34-27S-61) 5,900 ft.; Mountain Spring Summit 5,500 ft. *Douglas Co.*: Elk Point; 13 mi. SSE Minden 6,000 ft. *Lincoln Co.*: Hiko. *Nye Co.*: Test Site (Cole, 1966: 18); Lockes Warm Springs in Railroad Valley. *Ormsby Co.*: Kings Canyon. *Washoe Co.*: 16-16N-19 5,200 ft.; Little Valley 6,500 ft., 7,100 ft.; Reno 4,500 ft.; 6 mi. SW Reno 6,400 ft.; Geiger Grade 5,200 ft.; Virginia Mts. in Pah Rah Ra. 4,800 ft.; Whites Canyon on Mt. Rose 6,800 ft.; Verdi.

## Genus *Iridomyrmex* Mayr

*Iridomyrmex* is principally an Old World genus, centered in Australia. Most, if not all, of the New World species assigned to *Iridomyrmex* very likely should be removed to other genera, such as *Forelius*.

### *Iridomyrmex humilis* (Mayr)

**WORKER.** Small. Head and thorax dark brown, gaster very dark brown. Feebly shining.

**RANGE.** Maryland to Florida and westward to Illinois, Texas, California, Arizona, and southern Nevada; Mexico; southern Europe, south Africa, Hawaii, and Australia. Native to Brazil and Argentina.

**LITERATURE NOTES.** "This ant's success as a competitive species can be attributed to its ability to nest in diverse types of habitats, to produce prodigious numbers of individuals because of the many reproductive females in a colony, to thrive on a wide variety of foods, to live on a friendly intercolony basis with its own species, and to exterminate other species of ants. . . . It nests in exposed soil and soil under cover, and also occurs in rotten wood, faulty places in trees, refuse piles, bird nests, bee hives, and other places.

. . . New colonies apparently are formed by one or more fertile females, migrating from the mother colony accompanied by a group of workers. . . . Workers are predacious, carnivorous, and granivorous. They feed on the secretions of the floral and extrafloral parts of certain plants, gnaw into the buds of some fruit trees such as citrus, or even into ripened fruits such as figs. Workers tend and foster injurious honeydew-excreting insects such as plant lice, scales, and mealybugs; the resulting damage is severe in citrus groves and sugarcane plantations . . . . The Argentine ant is one of the most persistent and troublesome of all house-infesting ants" (M.R. Smith, 1965).

**NEVADA NOTES.** A recent event we observed illustrates how such a tramp ant gets dispersed: A truckload of candy entered Reno but was not allowed to unload because it was heavily infested with Argentine ants, which had established a nest in concealed crevices in the walls of the truck. The candy, which had not been damaged because it was packaged, was finally unloaded. The truck was fumigated and allowed to proceed. It was thought that the ants entered the truck when it was stored for several months at Little Rock, Arkansas. The truck had arrived in Reno on a weekend and had not been unloaded immediately; therefore a portion of the colony might have escaped into Reno to establish a new colony.

The usually characteristic dolichoderine odor is very weak in this species.

We have 3 records from 3 localities.

**NEVADA LOCALITIES.** Map 34. *Clark Co.*: Boulder City, October 1953, coll. E. Carl, det. M.R. Smith, the first Nevada record; Las Vegas, 20 January 1975, coll. D.F. Zoller. *Nye Co.*: Lockes, 8 August 1966, coll. R.P. Allen, det. M. Wasbauer.

## Genus *Forelius* Emery

Snelling and George (1979:163) have transferred *Iridomyrmex pruinosus* to the genus *Forelius* on the basis of the general habitus and of the structure of the proventriculus. Colonies are populous and are usually in soil under stones; craters may be normal or very messy piles of soil. Long files of workers may be seen foraging during the hot part of the day.

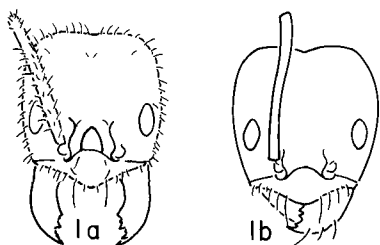
### KEY TO THE SPECIES OF *FORELIUS*

- 1a. Head hairs numerous from dorsal border of eye to occipital corner; scapes and tibiae with numerous erect hairs . . . . . *foetidus*
- b. Hairs on head (if present) limited to a few short hairs on each occipital corner; scapes with few or no erect hairs . . . . . *pruinus*

### *Forelius foetidus* (Buckley)

This species closely resembles *Forelius pruinosus* both in appearance and in behavior.

**WORKER.** Small. Color highly variable, e.g., tip of gaster dark brown, elsewhere yellowish brown; OR head and thorax



#### GENUS FORELIUS

very dusky red, anterior portion of gaster pale yellow, posterior portion very grayish brown. Moderately shining.

**RANGE.** Arkansas, Kansas, Oklahoma, Colorado, and Texas westward to southern California and southward into Mexico.

**NEVADA NOTES.** We have 5 records from 5 widely scattered localities; 3,200–4,900 ft. One was in the Hot Desert, 2 in the Cool Desert, 1 in the Pinyon-Juniper Biome, and 1 in a disturbed habitat. One nest was under a stone; another was in exposed soil and surmounted by a crater 2½ cm in diameter.

**NEVADA LOCALITIES.** Map 35. *Clark Co.*: Nelson 3,200 ft. *Eureka Co.*: geysers near Beowawe (-31N-43) 4,800 ft. *Lyon Co.*: Smith 4,800 ft. *Washoe Co.*: 22 mi. N Sparks (-23N-20) 4,600 ft.; Reno 4,900 ft.

#### *Forelius pruinosus* (Roger)

**WORKER.** Small. Color highly variable, e.g., strong brown except tip of gaster dark reddish gray OR head and thorax strong brown, gaster reddish yellow OR head reddish yellow, thorax yellowish red, gaster very dusky red. Moderately shining.

**RANGE.** New York to Florida, westward to Idaho, Oregon, and California; Mexico, Guatemala, and the West Indies.

**LITERATURE NOTES.** This species prefers open habitats to dense shade. Nests are in exposed soil or under stones or under bark on logs and stumps. Exposed nests usually have a crater of excavated soil around the entrance. Food consists of living and dead insects and honeydew. Conspicuous foraging processions follow scent trails. It is a house pest in the southeastern states, showing a marked preference for sweets. The workers can withstand very high soil temperatures.

**NEVADA NOTES.** *Forelius pruinosus* is one of Nevada's commonest ants. It is widely distributed except that we have no records from Elko and Lincoln counties. We have 94 records from 72 localities; 1,100–7,100 ft. (but mostly 4,000–6,000 ft.). Eleven records were in the Hot Desert, 62 in the Cool Desert (1 on a revegetating playa, 11 in disturbed habitats, 7 in Atriplex Subclimax, 9 in Sarcobatus Subclimax, 1

in a cottonwood grove), and 10 were in Pinyon-Juniper Biome. Eleven colonies were nesting under stones; 33 were in exposed soil with the entrance surrounded by a crater 2.5–8 cm in diameter (mostly 3.75–5 cm). The craters were constructed of dust or fine sand. Some nests had several craters in a cluster. One colony had 15 queens.

**NEVADA LOCALITIES.** Map 35.

#### Genus *Conomyrma* Forel

This genus was formerly included in the genus *Dorymyrmex*.

#### KEY TO THE SPECIES OF *CONOMYRMA*

- 1a. Head and thorax deep reddish yellow, entire gaster brownish black ..... *bicolor*
- b. Color variable but never as above ..... *insana*

#### *Conomyrma bicolor* W.M. Wheeler

**WORKER.** Small. Head and thorax deep red or reddish yellow, gaster brownish black or black. Feebly shining to shining.

**RANGE.** Western Texas to southern California; Nevada, Utah, and northern Mexico.

**LITERATURE NOTES.** A typically desert species; fast moving; forages at high temperatures. Nests in unshaded areas surmounted by a crater of fine sand. Feeds on living and dead insects and honeydew. Occasionally a house pest.

**NEVADA NOTES.** We have 15 records from 11 localities; 2,200–6,500 ft. Seven were in the Hot Desert; 4 were in the Cool Desert; of the latter 1 was on a disturbed roadside and 1 infested an apiary. Nests were in exposed soil and surmounted by a crater or half-crater 8–20 cm in diameter.

**NEVADA LOCALITIES.** Map 37. *Churchill Co.*: Fallon 3,900 ft. *Clark Co.*: Searchlight 3,400 ft.; California boundary 12 mi. SW Searchlight 4,000 ft.; 7 mi. SW Searchlight 3,500 ft. *Lincoln Co.*: 5 mi. S Alamo. *Lyon Co.*: 5 mi. E Smith 4,900 ft.; Artesia Lake (35-13N-23) 4,500 ft. *Mineral Co.*: Mud Spring 6,500 ft. *Nye Co.*: Ash Meadows Ranch 2,200 ft.; Fairbanks Spring; Test Site (Cole, 1966:18).

#### *Conomyrma insana* (Buckley)

This species was formerly named *Dorymyrmex pyramicus* in North American literature (e.g., Creighton, 1950).

**WORKER.** Small. Head reddish brown, thorax and anterior part of gaster very pale brown, posterior part of gaster very dark gray varying to head and thorax dark reddish brown, gaster black. Feebly shining to shining.

**RANGE.** South Carolina to Illinois to North Dakota to eastern Oregon; from this northern limit southward throughout the United States.

**LITERATURE NOTES.** "Wheeler once described [this species] as an 'alert and self-assertive' ant and it would be hard to improve this characterization" (Creighton, 1950:348). The ants are very active and predaceous but will feed on honeydew whenever they can get it. They forage in files. They



**Figure 32.** *Conomyrma insana*. Crater. Clark County, 5 mi. east-northeast of Charleston Park.

move with extreme rapidity, especially in hot sunshine. Colonies are small to moderate (up to a thousand workers). They sometimes invade dwellings, where they prefer sweets.

**NEVADA NOTES.** In Nevada *C. insana* is one of the commonest ants south of the 40th Parallel; we have no records north of that latitude. We have 95 records from 76 localities; 1,500–8,000 ft., mostly 4,000–7,000 ft. Of these 15 were in the Hot Desert (1 in *Atriplex* Subclimax and 1 in a cottonwood grove), 42 were in Cool Desert (13 in *Sarcobatus* Subclimax, 1 in *Atriplex* Subclimax, 1 in a cottonwood grove, 1 on a revegetating playa, 2 on sand dunes, and 6 in disturbed habitats), and 13 were in the Pinyon-Juniper Biome. All nests were in unshaded soil and were surmounted by a crater (Fig. 32) of excavated soil 2.5–15 cm in diameter; craters were often clustered and either discrete or confluent. The entrances were small, 2 to 4 mm in diameter.

**NEVADA LOCALITIES.** Map 37.

### Genus *Tapinoma* Foerster

The one North American species of *Tapinoma* is most common in forested areas. Superficially it resembles the Argentine ant and, in urban areas, has been confused with it; since the Argentine ant does not have the strong dolichoderine odor, so strong in *Tapinoma*, the two are easily separated on this alone.

#### *Tapinoma sessile* (Say)

**WORKER.** Minute to small. Concolorous dark reddish brown to black. Dull to moderately shining.

**RANGE.** Transcontinental, southern Canada, and United States, rare in southwestern deserts; sea level to over 11,000 ft.

**LITERATURE NOTES.** This is one of the commonest, most wide ranging and versatile species on this continent. It lives in a wide variety of habitats. It nests in soil under stones and other objects, under loose bark of logs and stumps, in

plant cavities, in refuse heaps, etc. Colonies range from small to many thousands of workers and with many queens. Workers do not exhibit the usual intraspecific hostility between colonies. Mating usually occurs in the parental nest between brothers and sisters. Workers are inordinately fond of honeydew, but they also feed upon the secretions of floral and extrafloral nectaries and upon living and dead insects. This is regarded as an important household pest.

**NEVADA NOTES.** In Nevada *T. sessile* is one of the commonest ants, but it has not been reported from Hot Desert habitats. We have a total of 137 records from 104 localities; 3,800–11,320 ft. This elevation of 11,320 ft. on Boundary Peak is the highest record for the species. The majority of our Nevada records are between 5,000 and 8,000 ft. Two of the localities are in the Alpine Biome, 8 in the ecotone below, 27 in the Coniferous Forest Biome, 17 in the Pinyon-Juniper Biome, and 31 in the Cool Desert Biome (of these, 3 were in the *Sarcobatus* Subclimax, 2 in a riparian cottonwood grove, 1 in an isolated cottonwood grove, 2 in disturbed habitats, and 2 in buildings). Of the 74 nests the overwhelming majority (50) were under stones, 10 were under logs, 4 were under objects lying on the ground, 4 were in rotten wood, 2 were in soil at the base of plants, and 4 were in houses. It is an occasional household pest in the state.

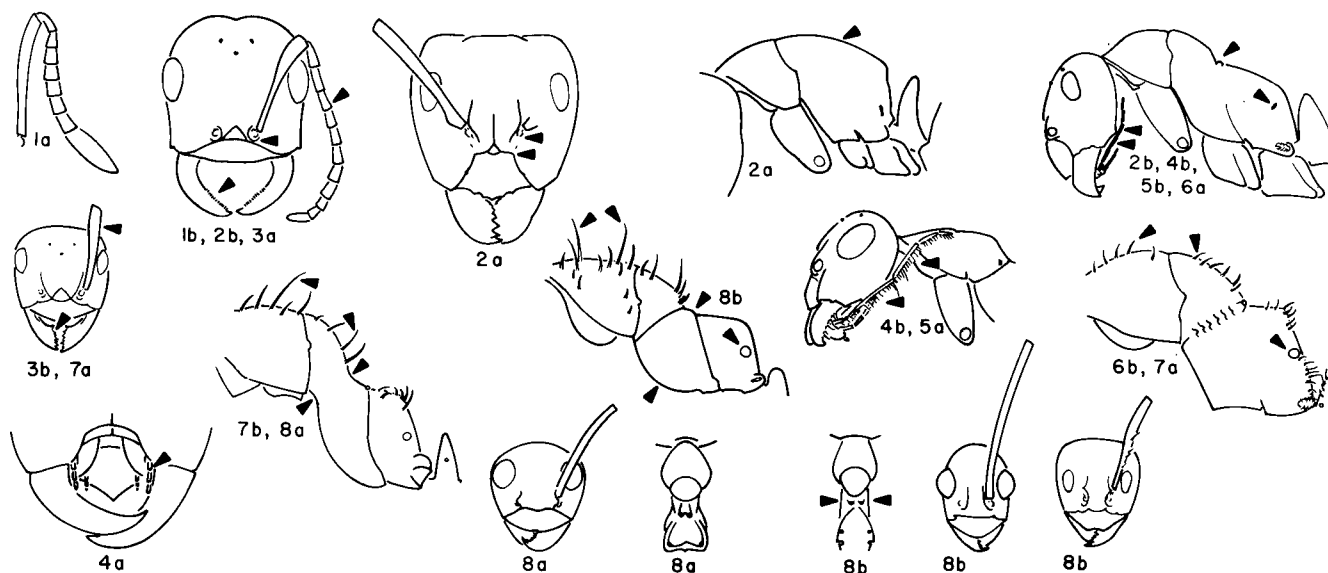
**NEVADA LOCALITIES.** Map 36.

### Subfamily Formicinae

This is the second largest subfamily of Formicidae, but in Nevada it surpasses the Myrmicinae in species (92 to 76) and is almost equal in number of collections. It is generally regarded as the most highly evolved subfamily with respect to behavior. (1) Ants of the genus *Myrmecocystus* store liquids in the distended crops of some of their sisters, called honey pots. (2) Some species of *Formica* in the *sanguinea* group are facultative slave-makers, using slaves when convenient. Ants of the genus *Polyergus* are obligatory slave-makers; the queen must enter a *Formica* nest to start her colony. Her workers are the slave-makers par excellence; the colony cannot survive without its slaves. (3) Some ants of the genus *Camponotus* carve elaborate chambers in wood for their nests, earning the name carpenter ants. (4) Weaver ants use the salivary secretion of the larvae to weave leaves together to make their nests: i.e., ants of the genus *Oecophylla* and a few species of *Camponotus*; none of these occurs in Nevada.

#### KEY TO THE GENERA OF FORMICINAE

- 1a. Antenna with 9 segments ..... *Brachymyrmex*
- b. Antenna with 12 segments ..... 2
- 2a. Profile of thoracic dorsum evenly convex, epinotum not depressed below level of mesonotum; meso-epinotal suture not impressed or very slightly impressed; antenna inserted well above dorsal edge of clypeus; polymorphic ..... *Camponotus*
- b. Profile of thoracic dorsum with epinotum distinctly depressed below level of mesonotum; meso-epinotal suture



#### SUBFAMILY FORMICINAE

- always distinct, often deep; antenna inserted at or near dorsal border of clypeus ..... 3
- 3a. Mandible sickle-shaped, its medial border with very minute teeth ..... *Polyergus*
- b. Mandible triangular, its inner border distinctly dentate ..... 4
- 4a. Maxillary palp very short and consisting of 3 segments ..... *Acanthomyops*
- b. Maxillary palp longer and consisting of 6 segments .. 5
- 5a. Maxillary palp longer than head, 3rd and 4th segments very long, each as long as or longer than 2 terminal segments combined; psammophore present ..... *Myrmecocystus*
- b. Maxillary palp not longer than head, 3rd and 4th segments not unusually long; psammophore absent ... 6
- 6a. Larger ants (2½–9 mm long, usually 4½–9 mm); epinotal spiracle a narrow slit; frontal carina prominent, its lateral margin slightly raised; ocelli conspicuous .... *Formica*
- b. Smaller ants (2–4½ mm long, usually 2–3½ mm); epinotal spiracle round; frontal carina feebly developed, its lateral margin rounded or nearly flat; ocelli small or absent ..... 7
- 7a. Scape surpassing occipital margin by less than ⅓ its length, often much shorter; erect body hairs not coarse, but short and golden ..... *Lasius*
- b. Scape surpassing occipital margin by at least ⅓ its length, usually much longer; erect body hairs coarse, long and usually brown or black ..... 8
- 8a. Thorax strongly constricted and subcylindric at mesothorax, swollen in front of and behind constriction; scape and tibiae without erect hairs; most or all of eye above middle of side of head ..... *Prenolepis*
- b. Thorax only slightly constricted at mesothorax; scape and tibiae with erect hairs; most or all of eye below middle of side of head ..... *Paratrechina*

#### Genus *Brachymyrmex* Mayr

Creighton (1950:357) referred to *Brachymyrmex* as “this miserable little genus” with some justification. The species of this largely tropical genus are small to minute, drab colored and the integument is so thin that it is apt to collapse when a specimen dries. The result is not much to look at and makes for a taxonomically difficult group. Fortunately, only a single species is known in western North America.

#### *Brachymyrmex depilis* Emery

**WORKER.** Minute. Concolorous strong brown to reddish yellow. Head and thorax moderately shining, gaster dull.

**RANGE.** Nova Scotia to British Columbia and southward to central Mexico.

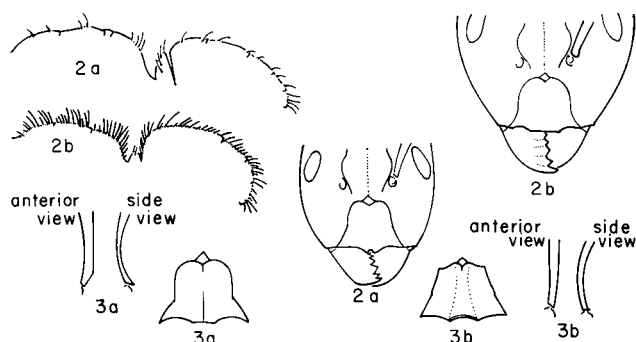
**LITERATURE NOTES.** The ants of this species form small colonies in the soil under stones or in rotting wood in a wide variety of habitats: open forest, dense moist forest, grasslands, and dry fields. The workers lead almost wholly subterranean lives and feed chiefly on honeydew secreted by aphids and mealybugs on the roots of plants. The very small size of the workers, their pale color and their slow gait make them very hard to find.

**NEVADA NOTES AND LOCALITY.** Map 38. We have only 1 record from Nevada: *Washoe Co.*: Lemmon Valley 9 mi. N Reno 4,900 ft., in Cool Desert.

#### Genus *Camponotus* Mayr

This is the largest genus of ants, comprising some 600 species, which are grouped in 40 subgenera: in the Nearctic fauna there are 43 species in 7 subgenera; Nevada is well represented by 10 species in 3 subgenera. The genus includes the largest ants in the state: the major workers may attain a length of 13 mm, while the queens may reach 17 mm.

The workers are highly polymorphic and all sizes become aggressive immediately when a nest is disturbed. The huge majors have powerful jaws, which can easily draw blood from the tough skin of human finger tips.



SUBGENERA OF GENUS *CAMPONOTUS*

#### KEY TO THE SUBGENERA OF *CAMPONOTUS*

- 1a. Small, length of major at most 8 mm ..... 2
- b. Larger, length of major more than 8 mm ..... 3
- 2a. Ventral border of clypeus with a narrow median notch, above which is a short triangular impression; hairs on gaster few, golden or dark ..... *Myrmentoma*
- b. Ventral border of clypeus without distinct notch and impression at middle; hairs on body (especially gaster) abundant, long, white, erect or suberect ..... *\*Myrmobrachys*
- 3a. Clypeus distinctly carinate (or if feebly carinate, scape flattened at base). [To detect flattening compare diameter in full face and side views.] ..... *Tanaemyrmex*
- b. Clypeus not carinate or feebly carinate; scape never flattened at base ..... *Camponotus*

#### Subgenus *Camponotus* Mayr

Most of the species excavate their nests in dead wood; hence the common name "carpenter ants." Some are rated serious pests and indeed their populous colonies are quite capable of reducing large timbers to feeble shells. They do not, however, eat the wood as do termites; they bite off small bits, which they carry to an exit and drop onto the ground where it piles up. The presence of such piles of "sawdust" suggests that the wood above is infested with carpenter ants. It is not conclusive evidence, however, because certain other insects exhibit similar behavior.

The damage by carpenter ants resembles that done by termites in the following respects: (1) the wood is extensively tunneled; (2) the tunnels vary in size (13–19 mm in diameter) and shape. The two kinds of pests may be distinguished as follows:

##### Termites

1. Feed on the wood through which they bore; do not expel "sawdust" from the tunnels.
2. Tunnels contain masses of soil.
3. Walls of tunnels stained with small spots.

##### Carpenter ants

1. Do not feed on the wood through which they bore; expel "sawdust" from tunnels.
2. Tunnels contain neither soil nor "sawdust."
3. Walls of tunnels clean and smooth.

#### KEY TO THE SPECIES OF SUBGENUS *CAMPONOTUS*

- 1a. Scape with a number of short scattered erect hairs; entire insect black and very shining; often with strong bluish reflections ..... *laevigatus*
- b. Scape without erect hairs except for a few at extreme tip ..... 2
- 2a. Color black ..... 3
- b. Thorax at least partly red ..... 4
- 3a. Moderately shining; clypeus and lower portion of cheek with large, coarse, scattered foveolae bearing erect or suberect hairs ..... *\*quercicola*
- b. Extremely dull; clypeus and lower portion of cheek with small foveolae bearing small appressed hairs ... *modoc*
- 4a. Thorax black anteriorly, red posteriorly; gaster dull ... *herculeanus*
- b. Thorax red throughout; gaster shining ..... *\*noveboracensis*

#### *Camponotus herculeanus* (Linnaeus)

**WORKERS.** Large to very large. **MAJOR WORKER.** Head and gaster black, thorax black anteriorly and red posteriorly. Head and thorax moderately shining, gaster dull. **MINOR WORKER.** Thorax dark reddish brown anteriorly and red posteriorly, head and gaster black.

**RANGE.** From Alaska across Canada and the states bordering Canada; also Arizona, Colorado, Nevada, New Mexico, Oregon, South Dakota, Utah, and Wyoming; Eurasia.

**NEVADA NOTES AND LOCALITY.** Map 39. We have 1 record of this species: Winnemucca (Humboldt Co.), in a house. It is quite possible it was brought in from some out-of-state locality in firewood or lumber.

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

**WORKER.** Large to very large. Entirely black and very shining, often with bluish reflections.

**RANGE.** Pacific Coast states and British Columbia eastward to the Rocky Mountains; Mexico.

**NEVADA NOTES.** We have 11 records from 11 localities, which are widely scattered throughout the state, except none in the northwest; 4,600–8,600 ft. Five records were from the Coniferous Forest Biome and 1 from Pinyon-Juniper. Two were reported nesting in prostrate coniferous trunks and 1 was in the wood of an abandoned mine building.

**NEVADA LOCALITIES.** Map 38. *Clark Co.:* Charleston Park in Spring Mts. 8,000 ft. *Douglas Co.:* E side Lake Tahoe 2 mi. S Glenbrook 6,400 ft. *Elko Co.:* Pilot Peak in Pilot Ra. 7,700 ft.; Jarbidge Mts. (-46N-58) 6,500 ft. *Lyon Co.:* Smith



4,800 ft. *Nye Co.*: Scofield Canyon E side Grant Ra. *Washoe Co.*: California boundary (31-17N-18) 8,600 ft.; Reno 4,600 ft., 4,700 ft.; 7 mi. W Reno. *White Pine Co.*: Lund.

### *Camponotus modoc* W.M. Wheeler

**WORKER.** Medium-sized to very large. Black, with golden yellow hairs and pubescence on gaster. Head feebly shining to dull, thorax and gaster dull.

**RANGE.** South Dakota and Colorado westward to British Columbia, Oregon, and California.

**LITERATURE NOTES.** Huge colonies are found in decaying logs and stumps. Nests in wood of buildings, especially log cabins in forests; may infest human food.

**NEVADA NOTES.** Eighty-eight records from 68 localities; widely scattered throughout the state; 6,400–12,000 ft.; lower records (Elko and Reno) represent colonies transported in lumber or firewood. *C. modoc* is strictly a montane ant: 59 records were from the Coniferous Forest Biome, 7 were from the ecotone above, and 3 were from the Alpine. We have nest data for only 18 colonies: all were nesting in rotten wood. Medias and minors were found tending aphids on small pine branches. Steller's jays (*Cyanocitta stelleri*) and robins (*Turdus migratorius*) fed on sexual forms during a mating flight on 18 July in the Coniferous Forest Biome.

The myrmecophile *Xenodusa reflexa* (Walker) (Coleoptera: Staphylinidae; det. L.M. Chilson) was taken in a nest on North Schell Peak, White Pine Co. at 9,700 ft.

**NEVADA LOCALITIES.** Map 38.

### Subgenus *Myrmentoma* Forel

The nesting habits of these ants are similar to those of the subgenus *Camponotus*. Colonies are small, consisting of a few dozen to several hundred individuals. The workers are timid. Food consists of honeydew and the flesh of other arthropods.

The taxonomy of this subgenus is in a muddle. Consequently we have not given ranges. R.R. Snelling has kindly prepared for us a key to the Nevada species.

#### KEY TO THE SPECIES OF SUBGENUS MYRMENTOMA

- 1a. Mandible finely rugulose or striate between coarse close-set punctures; clypeus convex, dull to slightly shining, integument microsculptured; thoracic dorsum usually not depressed at meso-epinotal suture; basal face of epinotum flat or weakly concave ..... 2
- b. Mandible shining between fine punctures, not striate except near cutting margin and along ventral margin; clypeus flat to weakly convex, moderately to strongly shining between fine sharp punctures; thorax broadly and shallowly impressed at meso-epinotal suture; basal face of epinotum usually weakly convex but may be flat ..... *hyatti*
- 2a. Pronotum with 6 or more erect hairs on dorsum; head of major, excluding mandibles, slightly broader than long;

head dark reddish brown, thorax reddish brown, gaster black varying to concolorous black; epinotum, in profile, often slightly depressed immediately in front of declivity ..... *essigi*

- b. Pronotum with 0–4 erect hairs on dorsum; head of major, excluding mandibles, slightly longer than broad; head red, thorax strong brown, gaster black varying to head and thorax dark reddish brown, gaster black; epinotum, in profile, straight ..... *sayi*

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

According to R.R. Snelling (personal communication) *C. nevadensis* Gregg is a synonym of *C. essigi*. NEW SYNONYMY.

**WORKER.** Medium-sized to large. Concolorous black varying to head and thorax reddish brown, gaster black. Smooth and shining.

**NEVADA NOTES.** We have 7 records from 6 localities: 6,000–7,800 ft. The 4 reported habitats were in the Coniferous Forest Biome. One nest was in a decaying pine stump; 1 was in firewood; 1 was in a house. The records are widely scattered except for a concentration near Lake Tahoe.

**NEVADA LOCALITIES.** Map 37. *Douglas Co.*: E side Lake Tahoe 2 mi. S Glenbrook 6,600 ft. *Elko Co.*: Jiggs. *Washoe Co.*: Reno; Little Valley 6,600 ft.; Fuller Lake 3 mi. S Verdi 6,000 ft. (Gregg, 1973 as *C. nevadensis*); between Little Valley and Lake Tahoe 7,800 ft.

### *Camponotus hyatti* Emery

**WORKER.** Small to large. Head very dusky red, thorax red, gaster black. Smooth and shining.

**NEVADA NOTES.** We have 25 records from 24 localities widely scattered throughout the state: 3,800–8,000 ft. Fifteen records are from the Cool Desert (5 from *Sarcobatus Subclimax*), 2 are from the Pinyon-Juniper Biome, and 1 from the Coniferous Forest. Five nests were recorded from rotten wood.

**NEVADA LOCALITIES.** Map 39. *Churchill Co.*: Fallon. *Clark Co.*: Virgin Mts. *Douglas Co.*: 4 mi. WSW Wellington 5,500 ft. *Elko Co.*: 2 mi. N Montello 4,900 ft. *Eureka Co.*: 3 mi. NNE Beowawe 4,600 ft. *Humboldt Co.*: Onion Reservoirs in Pine Forest Ra. 8,000 ft.; Sulphur 4,100 ft. *Lander Co.*: 10 mi. NNW Austin 5,800 ft.; 14 mi. SW Battle Mountain (20-30N-40) 5,200 ft. *Lincoln Co.*: Ash Springs 3,800 ft. *Lyon Co.*: 19-20N-26 4,000 ft.; 3 mi. SW Santa Margarita Ranch 5,500 ft. *Nye Co.*: Test Site (Cole, 1966:19). *Pershing Co.*: 41 mi. E Lovelock 3,800 ft.; Unionville 5,200 ft. *Storey Co.*: Six Mile Canyon 2 mi. ESE Virginia City 5,200 ft. *Washoe Co.*: Lemmon Valley 9 mi. N Reno 4,900 ft., 5,400 ft.; 9 mi. NW Gerlach 4,000 ft.; Reno 4,800 ft., 5,000 ft.; nr Sun Valley 4,800 ft.; 13-21N-18 5,000 ft.; 8 mi. NE Sparks.

### *Camponotus sayi* Emery

**MAJOR WORKER.** Large. Head red, thorax strong brown, gaster reddish black varying to head and thorax dark reddish brown, gaster black. Head and thorax moderately to strongly

shining, gaster strongly shining. **MINOR WORKER.** Small. Color as in major worker varying to concolorous reddish black. Head and gaster strongly shining, thorax moderately shining.

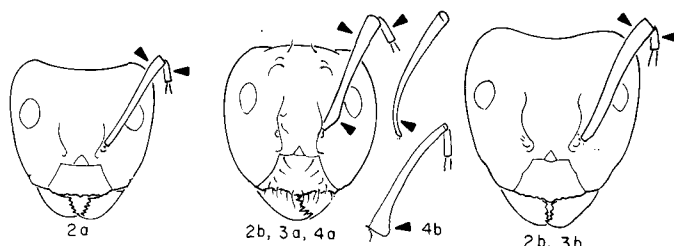
**NEVADA NOTES.** We have 26 scattered Nevada records from 10 localities. Three records are from the Pinyon-Juniper Biome (but 2 of those are from riparian cottonwood groves). For the remainder no data were given, except that 5 were from houses and 1 under elm bark in Las Vegas and 5 were in houses in Reno. No nests were found.

**NEVADA LOCALITIES.** Map 39. *Clark Co.*: Las Vegas 2,000 ft.; Boulder City 2,500 ft. *Douglas Co.*: 7 mi. N Minden. *Lyon Co.*: Dayton 4,300 ft. *Mineral Co.*: Shurz 4,900 ft. *Nye Co.*: Longstreet Spring 2,200 ft. *Washoe Co.*: Little Valley 6,400 ft.; 28 mi. N Gerlach 4,900 ft.; Reno 4,500 ft. *White Pine Co.*: 15 mi. N Atlanta 6,100 ft.

### Subgenus *Tanaemyrmex* Ashmead

Most of these species nest in gravelly soil, usually under stones but at times in exposed areas with excavated soil around the entrance.

In his 1968 list LaRivers includes (p. 7) *Camponotus festinatus* from "Clark Co. Colorado River, Ft. Mojave Indian Reservation. 1953 April 2-3." In a letter to Dr. LaRivers dated 28 May 1953 Dr. M.R. Smith identified a long list of ants including *C. festinatus* and adds "I am retaining all specimens but returning your cards as directed." We have accepted other such records by Smith as valid, but we reject this one because: (1) We have found no specimens in the material from LaRivers. (2) Smith did not add Nevada to the range in the Catalog Supplements (M.R. Smith, 1958, 1967). (3) Dr. D.R. Smith, the present curator at the National Museum, informed us by letter (31 December 1979), "I looked through our *Camponotus festinatus* collection and could not find any Nevada records." We therefore consider the presence of *C. festinatus* in Nevada to be unproven.



SUBGENUS *TANAEMYRMEX*

### KEY TO THE SPECIES OF SUBGENUS *TANAEMYRMEX*

- 1a. Scape of major with numerous fine short erect hairs . . . . . *\*festinatus*
- b. Scape of major without erect hairs except a cluster at the tip . . . . . 2
- 2a. Scape of major not surpassing occipital corner or surpassing it by an amount less than length of first funicular segment . . . . . *sansabeanus*

- b. Scape of major surpassing occipital corner by an amount equal to or greater than length of first funicular segment . . . . . 3
- 3a. Scape of major distinctly flattened at base, with flattened portion forming a lateral lobule . . . . . 4
- b. Scape of major flattened at base but without lateral lobule . . . . . 5
- 4a. Lateral lobule small and variable; surface of clypeus finely reticulorugose and slightly shining, its coarse erect hairs concentrated along basal and lateral borders . . . . . *semitestaceus*
- b. Lateral lobule prominent, strongly flattened and usually somewhat angulate on lower margin; surface of clypeus distinctly roughened, its coarse erect hairs scattered over entire surface . . . . . *\*dumetorum*
- 5a. Genae strongly shining, with very small inconspicuous punctures; head black, thorax and gaster light brownish yellow (often infuscated with brown), tibiae and tarsi black to brown . . . . . *ocreatus*
- b. Genae feebly shining or dull, punctures coarse and conspicuous. [Two forms: (1) usually head black, thorax wholly or partly red (rarely all black), gaster black, legs reddish brown; (2) thorax and gaster yellowish, with blackened head.] . . . . . *vicinus*

### *Camponotus ocreatus* Emery

**WORKERS.** Large to very large. **MAJOR WORKER.** Head reddish black, thorax weak red, gaster yellowish red. Head strongly shining, thorax dull, gaster feebly shining. **MINOR WORKER.** Head light brown infuscated with reddish brown, thorax very pale brown infuscated with reddish brown, gaster yellow. Shining throughout.

**RANGE.** New Mexico, Arizona, southern Nevada, and southern California; Mexico.

**NEVADA NOTES.** We have 6 records from 6 localities in the southern part of the state; 4,200-7,000 ft. One record was from the Hot Desert and 3 from the Pinyon-Juniper Biome. One nest was under a stone; 4 were exposed with the entrance surrounded by excavated earth, which in some cases formed a crater.

**NEVADA LOCALITIES.** Map 40. *Clark Co.*: Spring Mts. (36-17S-55) 6,200 ft.; Virgin Mts. (19-15S-71) 6,000 ft. *Nye Co.*: nr Daylight Pass, Death Valley Nat. Mon. 4,200 ft.; 15 mi. NW Manhattan 7,000 ft.; 17 mi. NW Manhattan 6,600 ft.; Test Site (Cole, 1966:20).

### *Camponotus sansabeanus* (Buckley)

**WORKERS.** Medium-sized to large. Head and thorax feebly shining, gaster strongly shining. **MAJOR WORKER.** Head black except clypeus and lower genae very dusky red; thorax, gaster, coxae, and femora reddish yellow; remainder of legs dark reddish brown. **MINOR WORKER.** Yellow.

**RANGE.** Arkansas and Louisiana westward to southern California.

**NEVADA NOTES.** We have 18 records from 18 localities scattered south of the 40th Parallel; 4,700-7,500 ft. All lo-

calities are in the Pinyon-Juniper Biome. Six nests were under stones; 7 were exposed with the entrance surrounded by excavated soil in various shapes.

**NEVADA LOCALITIES.** Map 40. *Clark Co.*: Mountain Spring Summit 5,400 ft.; Potosi Mt. 5,400 ft.; Virgin Mts. 5,200 ft. *Esmeralda Co.*: Lida Summit 7,400 ft. *Eureka Co.*: 8 mi. SSE Eureka 6,800 ft.; Allison Creek 7,100 ft. *Lincoln Co.*: Modena Summit 4,700 ft.; Beaver Dam State Park 5,000 ft.; Panaca Summit 6,700 ft.; 4 mi. W Caliente 5,600 ft.; Oak Springs Summit 6,200 ft.; 10 mi. SW Crystal Spring 5,500 ft. *Lyon Co.*: 12 mi. SE Wellington 6,200 ft. *Mineral Co.*: Montgomery Pass 7,100 ft. *Nye Co.*: 2 mi. SW Moores Sta. in Hot Creek Valley 7,000 ft. *Washoe Co.*: 12 mi. SSE Reno 5,200 ft. *White Pine Co.*: 10 mi. SW Ely 7,500 ft.

### *Camponotus semitestaceus* Emery

**WORKERS.** Large to very large. Feebly shining to shining throughout. Head red infuscated with dark reddish brown, thorax and anterior portion of gaster pale yellow, remainder of gaster brown varying in **MAJOR WORKER** to head black, thorax and gaster brownish yellow, posterior portion of gaster infuscated with dark reddish brown; in **MINOR WORKER** varying to head strong brown, thorax and gaster pale brown, the latter infuscated with brown.

**RANGE.** Oklahoma and Texas westward to the Pacific.

**NEVADA NOTES.** We have 90 records from 67 localities, all but 1 of which are south of the 40th Parallel; 3,000–7,700 ft. Seventeen records were in the Cool Desert (1 in a *Sarcobatus* Subclimax, 1 in a cottonwood grove, 2 in buildings, 1 in a fence post, 1 among roots of a plant); 41 were in the Pinyon-Juniper Biome. Eighteen nests were under stones, 8 in exposed soil with craters 5–20 cm in diameter, 12 exposed and surmounted by irregular piles of soil, 2 in rotten wood. Entrances were large (10 mm in diameter).

Larvae of *Pseudomorpha* sp. (Coleoptera: Carabidae; det. T.L. Erwin) were in nests in Douglas Co.: 8 mi. SE Minden 5,200 ft.; 16 mi. SE Minden 5,700 ft.; 12 mi. ESE Minden 6,500 ft.; Washoe Co.: California boundary (31-24N-18) 4,700 ft. All were in the Pinyon-Juniper Biome. These larvae are plump posteriorly; the anterior end forms a long extensible neck, which bears 2 apical hooks. We made numerous unsuccessful attempts to rear them in the laboratory.

A pupa of *Coniontis* sp. was found in a nest of this ant 12 mi. ESE Minden 6,500 ft. (Douglas Co.) and *Araeoschizus armatus* Horn (both Coleoptera: Tenebrionidae; det. T.J. Spilman) was in a nest 4 mi. S Mason 4,300 ft. (Lyon Co.).

**NEVADA LOCALITIES.** Map 40.

### *Camponotus vicinus* Mayr

This is one of the commonest and most widely distributed of all Nevada ants. There are two main color phases: one is pale and in the field cannot be distinguished from *C. semitestaceus*; it occurs in arid and semiarid habitats. The dark phase is described here.

**WORKERS.** Large to very large. **MAJOR WORKER.** Head black to reddish black, thorax red to dusky red with



Figure 33. *Camponotus vicinus*. Photograph by Kenneth Middleham.

black markings, gaster black. Dull or head and thorax dull, gaster moderately shining (Fig. 33). **MINOR WORKER.** Head black to reddish black, thorax dark red, gaster black. Dull varying to head and thorax dull, gaster moderately shining. In some colonies all workers appear entirely black in the field.

**RANGE.** British Columbia, Alberta, Manitoba, and southwestern North Dakota southward into the central highlands of Mexico; Lower California.

**NEVADA NOTES.** We have 197 records in Nevada from 141 localities; 3,900–9,700 ft. Twenty-eight records are from the Cool Desert (including 1 from a *Sarcobatus* Subclimax, 1 from a cottonwood grove, and 2 riparian), 74 are from the Pinyon-Juniper Biome, and 37 from the Coniferous Forest. The majority (65) of nests were under stones; 9 were under rotten logs lying on the ground; 12 were exposed with excavated soil around the entrance (which sometimes could be called a crater). Entrances ranged from 5 to 30 mm in diameter.

*Xenodusa angusta* Fall (Coleoptera: Staphylinidae; det. R.R. Snelling) was a guest in a nest 16 mi. NE Pahrump in the Spring Mts. (Clark Co.) 8,000 ft. *C. vicinus* workers were tending waxy scales, *Orthezia nigrocincta* Cockerell (Homoptera: Ortheziidae; det. D.R. Miller), on the roots of *Sarcobatus vermiculatus* in the Carson Sink 31 mi. N Fallon (8-24N-29) in Churchill Co. 3,900 ft.

**NEVADA LOCALITIES.** Map 41.

### Genus *Paratrechina* Motschulsky

“Workers of most species are mild-mannered, nonaggressive, rather active ants, capable of foraging both day and night. . . . [They] form small colonies of only a few hundred individuals in diverse dry-to-moist habitats; they occur in beaches, fields, meadows, and woods. . . . The ants may nest in the exposed soil, or under the cover of objects, in rotten wood, under the bark of logs and stumps, in twigs, or in plant cavities. . . . Workers tend plant lice, mealybugs, and scale

insects for honeydew, and also feed on both live and dead insects and the juices of fruits. They feed on a wide variety of household foods. . . . They are especially fond of sweets. . . . They may invade houses and stores from outdoors, but also nest within the structures of buildings. They are not capable of causing any appreciable damage to woodwork or masonry, . . . but they can be very annoying to housekeepers and store owners" (Smith, 1965:77).

The United States species of *Paratrechina* were revised by J.C. Trager (1984).

#### KEY TO THE SPECIES OF *PARATRECHINA*

- 1a. Erect hairs on scape sparse and almost entirely confined to a single row on front of scape . . . . . undescribed species?
- b. Erect hairs on scape abundant, occurring on sides as well as front of scape, absent only from rear surface . . . . . 2
- 2a. Yellow . . . . . *hystrix*
- b. Reddish black . . . . . *vividula*

#### *Paratrechina vividula* (Nylander)

**WORKER.** Small. Head brown, thorax dark yellowish brown, gaster dark brown. Strongly shining.

**RANGE.** Introduced into Florida, Mississippi, and southern Nevada, and in greenhouses in other states.

**NEVADA NOTES AND LOCALITIES.** Map 42. We have 16 collections from two localities; these collections were all taken in association with man-made structures. Sexual forms were taken as early as 22 April and as late as 15 September. *Clark Co.*: Las Vegas, 2,000 ft. (15 collections); *Overton*, 1,400 ft.

#### *Paratrechina hystrix* Trager

**WORKER.** Small. Concolorous yellow. Strongly shining.

**RANGE.** Deserts of southern California and southern Nevada.

**NEVADA NOTES AND LOCALITIES.** Map 42. We have 2 records, each based on a single stray specimen. *Lincoln Co.*: 2 mi. S Caliente, Kershaw Canyon, 5,000 ft. *Washoe Co.*: 21N-19E-33.

#### *Paratrechina* undescribed species?

**WORKER.** Small. Head and gaster reddish brown, thorax brownish yellow varying to concolorous reddish brown. Strongly shining.

**RANGE.** Southern Nevada and western Arizona.

**NEVADA NOTES AND LOCALITY.** Map 42. We have 1 record from a single locality. *Clark Co.*: 4 mi. S Mesquite, Virgin Mts. 4,000 ft.

#### Genus *Prenolepis* Mayr

"The habits of *imparis* are interesting if not very spectacular. The colonies are small . . . and the nests are obscure. They are often . . . in damp soil and in shady positions . . . . The

workers of *imparis* feed upon various sorts of sugary liquids derived directly from plant sources or from aphids [and upon] . . . the juices of dead earthworms . . . . Their most interesting characteristic is a surprising tolerance for low temperatures. Workers of *imparis* have been observed feeding outside the nest when the temperature was only a few degrees above freezing" (Creighton, 1950:412-413).

The one North American species of *Prenolepis* occurs sporadically in southern Canada, south to Georgia and west to Oregon and California; central Mexico.

#### *Prenolepis imparis* (Say)

W.M. Wheeler (1930:23) reported this ant (as "var. *californica*") from Ormsby County (no locality given). It has never been taken in Nevada since then. Not mapped.

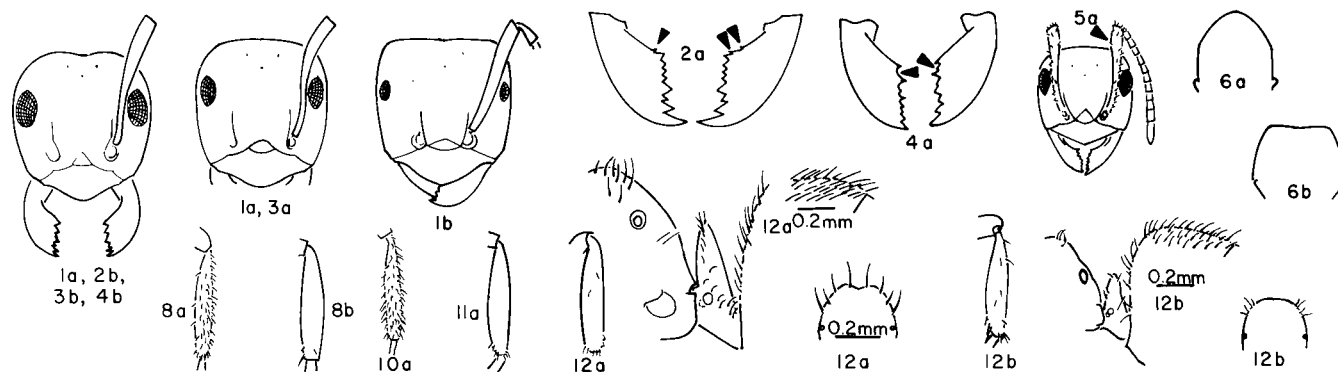
#### Genus *Lasius* Fabricius

In North America north of latitude 35°N the members of this genus are among the commonest ants. But, the genus is also one of the most monotonous: the colors are drab, there is nothing remarkable about the nests, and the habits are undistinguished.

#### KEY TO THE SPECIES OF *LASIUS*

(Adapted from Wilson, 1955)

- 1a. Eye large, its length 0.2 times head width or more . . 2
- b. Eye small, its length less than 0.2 times head width . . . . . 6
- 2a. With 1 or more offset teeth at basal angle of masticatory border of mandible (in most colony members) . . . . . *pallitarsis*
- b. Basal tooth aligned with other teeth on masticatory border of mandible . . . . . 3
- 3a. Eye length usually less (never more) than 0.25 times head width; scape without erect hairs; usually brownish yellow . . . . . *sitiens*
- b. Eye length more than 0.25 times head width; sometimes yellowish brown, but then the scape with erect hairs . . . . . 4
- 4a. In one or both mandibles of majority of nest series either penultimate basal tooth is markedly smaller than its flanking teeth, or there is a gap between ultimate and penultimate teeth that is wider than ultimate tooth . . . . . 5
- b. Ultimate and penultimate teeth subequal, gap between them about equal to ultimate tooth . . . . . *alienus*
- 5a. Scape and tibiae with standing hairs . . . . . *neoniger*
- b. Scape and tibiae lacking standing hairs . . . . . *crypticus*
- 6a. Crest of petiole strongly convex (when viewed from front) and not emarginate . . . . . *humilis*
- b. Crest of petiole at most feebly convex and often distinctly emarginate . . . . . 7
- 7a. Eye with fewer than 35 facets . . . . . 8
- b. Eye with 36 or more facets . . . . . 9
- 8a. Outer surface of each tibia with numerous standing hairs . . . . . *\*fallax*



## GENUS *LASIUS*

- b. Outer surface of each tibia with at most 1 or 2 standing hairs ..... *flavus*
- 9a. Body slender; appendages long; occipital border emarginate; surface strongly shining; pubescence sparse ..... *atopus*
- b. Body robust; appendages short; surface moderately shining; occipital border not strongly emarginate; pubescence usually dense ..... 10
- 10a. Hairs on lateral surface of tibiae numerous ..... *nevadensis*
- b. Hairs on lateral surface of tibiae few or none .... 11
- 11a. No erect hairs on lateral tibial surfaces ... *umbratus*
- b. Lateral surfaces of tibiae with a few erect hairs ... 12
- 12a. Dorsal outline of petiole emarginate in anterior view; hairs on dorsal surface of first gastric tergite subdecumbent and about 0.1 mm long ..... *subumbratus*
- b. Dorsal margin of petiole in anterior view entire; hairs on dorsal surface of first gastric tergite suberect and 0.12 mm or more in length ..... *vestitus*

### Subgenus *Lasius* Fabricius

Features of the mandibles are diagnostic for species in this subgenus and some specimens should be mounted with the mandibles open. To open the mandibles, we press the front of the head firmly, but gently, against a solid substrate. This will elevate the mouthparts and expose the mandibles; then with a fine needle we push each mandible sideways as far as it will go without breaking off.

### *Lasius alienus* (Foerster)

Our concept of this species includes the ant that Wilson (1955) believed to be *L. niger*, a Eurasian species. Our North Dakota collections are too variable to support the separation of eastern and western populations as separate species, and we think that true *L. niger* does not occur in North America.

**WORKER.** Small. Concolorous dark reddish brown OR head and gaster black, thorax dark reddish brown. Dull.

**RANGE.** Southern Canada and the lower 48 United States; Mexico; Eurasia.

**LITERATURE NOTES.** This ant shows a strong preference for shady woodland. Nests are in rotting logs and in soil

under stones. Food includes living and dead insects and honeydew. This species may invade houses in search of sweets and meats.

**NEVADA NOTES.** We have 40 records from 27 localities widely scattered throughout the state; 3,900–9,700 ft. Twenty-eight records are from Coniferous Forest Biome and 3 from the ecotone above it; 2 are from the Pinyon-Juniper Biome and 7 from the Cool Desert (2 from cottonwood groves and 1 from cottonwood riparian). Twenty-four nests were under stones, 2 were under dead wood lying on the ground, and 2 were in rotten wood.

Three nests had Homoptera which were identified as follows: *Cryptoripersia arizonensis* (Ehrhorn) (Pseudococcidae; det. D.R. Miller) in 2 nests from Lamoille Canyon, 1-13N-58, Elko Co., 8,800 ft.; *Aphis lugentis* Wms. (Homoptera: Aphididae; det. M.B. Stoetzel), from a nest at Onion Reservoirs, 10-43N-28, Humboldt Co. 8,000 ft.

**NEVADA LOCALITIES.** Map 43. *Churchill Co.*: 2 mi. N Fallon 3,900 ft. *Clark Co.*: Charleston Park 8,000 ft., 8,100 ft.; Spring Mts. 16 mi. NE Pahrump 8,000 ft.; Camp Bonanza in Spring Mts. 7,500 ft.; 3 mi. ENE Charleston Park; Charleston Peak 8,300 ft. *Elko Co.*: Lamoille Canyon road 8,200 ft., 8,800 ft.; Lamoille Canyon (1-31N-58) 8,800 ft., (-32N-58) 7,600 ft., 7,700 ft.; Lamoille Lake (-31N-58) 9,700 ft.; Lamoille Creek (-31N-58) 8,900 ft.; Thomas Canyon off Lamoille Canyon 7,600 ft., 7,700 ft.; Jarbidge 6,100 ft.; 8 mi. SW Wells 8,400 ft.; Grays Peak in East Humboldt Ra. 8,900 ft., 9,600 ft. *Humboldt Co.*: Onion Reservoirs in Pine Forest Ra. 8,000 ft. *Lander Co.*: Bunker Hill 8,900 ft. *Lyon Co.*: 4-16N-23 nr Carson River 4,300 ft. *Nye Co.*: South Twin River (-11N-42) in Toiyabe Ra. 8,800 ft. *Washoe Co.*: Little Valley 6,400 ft.; Whites Canyon (-18N-19) on Mt. Rose 6,800 ft. *White Pine Co.*: Ellison Ranger Sta. in White Pine Ra. 7,000 ft.

### *Lasius crypticus* Wilson

**WORKER.** Small. Concolorous dark reddish brown. Dull.

**RANGE.** Alberta and North Dakota to New Mexico and westward to the Pacific.

**LITERATURE NOTES.** Most abundant in the grasslands. Nests usually under stones. Timid. Many nests contain aphids and/or coccids.



**NEVADA NOTES.** We have 24 records from 21 localities; 3,900–8,100 ft.; widely scattered north of the 38th Parallel. One record is from the Coniferous Forest Biome, 5 from the Pinyon-Juniper Biome, and 14 from the Cool Desert (1 from a *Sarcobatus* Subclimax, 2 from cottonwood groves, 1 from a sand dune, 1 from riparian, 1 from a disturbed area). Six nests were under stones, 1 was under wood lying on the ground, 1 was in rotten wood, 6 were in exposed soil with a crater (2½–10 cm in diameter) around the entrance.

The mealybug *Cryptoripersia arizonensis* (Ehrhorn) (Homoptera: Pseudococcidae; det. D.R. Miller) was on the roots of *Distichlis stricta*, in a nest near Sulphur, Humboldt Co. 4,100 ft. *Blapstinus longulus* LeC. (Coleoptera: Tenebrionidae; det. T.J. Spilman), was in a nest near the Carson River (33-17N-34), Lyon Co. 4,300 ft.

**NEVADA LOCALITIES.** Map 44. *Elko Co.*: 5 mi. N North Fork 6,500 ft.; 4 mi. SSE Elko 6,400 ft.; Ruby Valley 34 mi. SW Wells 6,000 ft. *Humboldt Co.*: 34 mi. NE Vya 6,300 ft.; nr Sulphur 4,100 ft. *Lander Co.*: 9 mi. WSW Austin 5,700 ft. *Lyon Co.*: 33-17N-34 nr Carson River 4,300 ft. *Mineral Co.*: Mud Spring 6,500 ft. *Nye Co.*: 6-14N-44 in Big Smoky Valley 5,700 ft.; 3 mi. NE Ione 6,800 ft.; Mt. Jefferson (S side) 8,100 ft.; Test Site (Cole, 1966:20). *Pershing Co.*: 6 mi. NE Gerlach 3,900 ft. *Storey Co.*: 16 mi. SE Reno (33-18N-21) 5,800 ft. *Washoe Co.*: 28 mi. W Gerlach 4,900 ft.; 1 mi. SE Vya 5,500 ft.; Verdi; Whites Canyon on Mt. Rose 6,800 ft. *White Pine Co.*: Connors Pass 7,700 ft.; Ellison Ranger Sta. in White Pine Ra. 6,900 ft.; -12N-59 7,000 ft.

### *Lasius neoniger* Emery

**WORKER.** Small. Dark reddish brown. Moderately shining.

**RANGE.** Southern Maine across southern Canada to Idaho; from this northern boundary southward to California and New Mexico and a line joining the northern border of the Oklahoma Panhandle to the Florida Panhandle.

**LITERATURE NOTES.** Feeds on living and dead insects, plant secretions, and honeydew. Timid. Colonies are rather populous and numerous. Frequently invades houses, especially often after a rain. Their innumerable craters may become a nuisance on golf courses and lawns.

**NEVADA NOTES.** We have 16 records from 11 localities, which are widely scattered throughout the state; 1,500–9,000 ft. Two of the records are in the Hot Desert (both riparian), 3 are from the Cool Desert (1 from a lawn and 1 from a building), and 4 are from the Coniferous Forest Biome. We have data on 2 nests: one was under a stone and one was exposed and surmounted by a messy crater of sand.

**NEVADA LOCALITIES.** Map 44. *Clark Co.*: Riverside 1,600 ft.; 4 mi. SW Riverside 1,500 ft.; Charleston Peak 8,300 ft. *Elko Co.*: Thomas Canyon off Lamoille Canyon 7,600 ft. *Lyon Co.*: Smith. *Nye Co.*: South Twin River (-11N-42) in Toiyabe Ra. 9,000 ft. *Storey Co.*: Lockwood 4,300 ft. *Washoe Co.*: Reno 4,500 ft.; 4,800 ft.; Incline Village 6,300 ft.; Verdi.

### *Lasius pallitarsis* (Provancher)

This is the species which Wilson (1955) called *L. sitkaensis* Pergande. Provancher described his ant as questionably a

species of *Formica*. We deplore changing to a name not originally assigned to the proper genus, and long in synonymy; this is certainly not conducive to nomenclatural stability.

**WORKER.** Small to medium-sized. Head and gaster dark reddish brown, thorax reddish brown varying to head and thorax yellowish red, gaster reddish brown. Head shining, thorax and gaster moderately shining.

**RANGE.** From Nova Scotia and Quebec to Massachusetts, thence westward through the Dakotas and southern Alberta, southward through New Mexico, westward to the Pacific and northward through British Columbia to Alaska; Siberia.

**LITERATURE NOTES.** Primarily a forest dweller but sometimes abundant in grasslands. Nests in rotting logs and stumps and under stones. Feeds on living and dead insects and honeydew. Tends aphids and coccids on the leaves and roots of plants.

**NEVADA NOTES.** In Nevada *pallitarsis* is widely scattered throughout the state. We have 34 records from 28 localities, all of which are from the Coniferous Forest Biome; 5,000–9,700 ft. Seven nests were in rotten wood, 11 were under stones, and 2 were in exposed soil surmounted by a small crater around the entrance.

**NEVADA LOCALITIES.** Map 45. *Clark Co.*: Charleston Park 8,100 ft.; Mt. Ewe (2 mi. N Sheep Peak) 9,000 ft. *Douglas Co.*: Kingsbury Grade (6 mi. WNW Minden) 6,000 ft.; E side Lake Tahoe 2 mi. S Glenbrook 6,400 ft.; Glenbrook. *Elko Co.*: 2 mi. W Harrison Pass 6,300 ft.; 13 mi. W Jarbidge 5,200 ft.; Jarbidge 7,500 ft.; Carlin 5,000 ft.; Mt. Matterhorn in Jarbidge Mts. 8,500 ft.; Lamoille Canyon (-32N-58) 7,600 ft.; 7,700 ft. *Humboldt Co.*: Onion Reservoirs in Pine Forest Ra. 8,000 ft.; Santa Rosa Mts.; 20 mi. N Paradise Valley; Summit Lake. *Nye Co.*: Kawich Ra. *Washoe Co.*: Little Valley 6,200 ft.; 6,400 ft.; 6,600 ft.; 7,000 ft.; Fuller Lake 3 mi. S Verdi 6,000 ft.; 31-17N-18 on California boundary 8,600 ft.; Incline Village; Reno. *White Pine Co.*: nr Murry Summit in Egan Ra. 9,100 ft.; South Schell Peak 8,800 ft.; Wheeler Peak 9,700 ft.

### *Lasius sitiens* Wilson

**WORKER.** Small. Concolorous light brown to dark reddish brown. Dull.

**RANGE.** Colorado, New Mexico, Arizona, and Nevada; Mexico.

**NEVADA NOTES.** We have 25 records from 24 localities which are widely scattered throughout the state; 5,400–8,100 ft. Three records were in the Cool Desert and 18 in the Pinyon-Juniper Biome. Fourteen nests were under stones; 1 was in exposed soil surmounted by a 5-cm crater.

**NEVADA RECORDS.** Map 43. *Clark Co.*: Wheeler Pass in Spring Mts. 7,700 ft.; 6 mi. N Charleston Park in Spring Mts. 7,700 ft.; Spring Mts. 14 mi. NE Pahump 7,300 ft. *Elko Co.*: -43N-52. *Esmeralda Co.*: Lida Summit 7,400 ft.; Boundary Peak 7,900 ft. *Lander Co.*: 10 mi. SSE Eastgate 7,000 ft.; 7,100 ft.; 9 mi. WSW Austin 7,000 ft. *Lincoln Co.*: Panaca Summit 6,700 ft.; Oak Spring Summit 6,200 ft. *Lyon Co.*: Nye Canyon (-8N-25) 6,200 ft. *Nye Co.*: 8 mi. NE Gabbs 6,700 ft.; Manhattan 7,300 ft.; Peavine Peak Campground

in Toiyabe Ra. 6,400 ft.; Mt. Jefferson 8,100 ft.; Test Site (Cole, 1966:20). *Storey Co.*: 4 mi. S Lockwood 5,400 ft. *Washoe Co.*: 9 mi. E Vya 5,700 ft.; McClellan Peak (-16N-20) 7,300 ft.; S end Warm Springs Valley; Verdi. *White Pine Co.*: 1 mi. E McGill 7,000 ft.; Lehman Caves Nat. Mon. 6,700 ft.

### Subgenus *Cautolasius* Wilson

#### *Lasius flavus* (Fabricius)

**WORKER.** Small. Head strong brown, thorax and gaster reddish yellow. Moderately shining.

**RANGE.** From Nova Scotia to North Carolina and Alabama and westward to the Pacific; Eurasia.

**LITERATURE NOTES.** Inhabits open woodlands, where it usually nests under stones. Tends aphids on roots of grasses.

**NEVADA NOTES.** We have 26 records of this species from 15 localities, which are concentrated in the Sierra Nevada; only 5 are widely scattered in the central, eastern, and northeastern parts; 6,200–10,400 ft. All records are from the Coniferous Forest Biome and all nests were under stones.

**NEVADA LOCALITIES.** Map 46. *Douglas Co.*: Walleys Hot Spring nr Genoa; Glenbrook 6,200 ft. *Elko Co.*: Snowslide Gulch (-46N-58) in Jarbidge Mts. 9,000 ft. *Nye Co.*: South Twin River (-11N-42) in Toiyabe Ra. 9,100 ft. *Washoe Co.*: Little Valley 6,400 ft.; Hwy. 27 nr Mt. Rose 8,800 ft.; Mt. Rose 10,000 ft., 10,300 ft., 10,400 ft.; Lower Price Lake 7,000 ft.; Upper Price Lake 7,200 ft.; E side Lake Tahoe at Ormsby Co. Line 6,600 ft. *White Pine Co.*: below Mt. Moriah 10,000 ft.; Egan Ra. nr Murry Summit 9,200 ft.; “Lehman Caves, Mt. Wheeler” (Wilson, 1955:126).

### Subgenus *Chthonolasius* Ruzsky

The ants of this subgenus are subterranean. The nests are in the soil without cover or under stones or logs or in rotten wood; some species build messy earthen mounds, which have no obvious entrances. Food is said to be largely honeydew from root aphids and root coccids. When workers are crushed they may give off a faint odor of citronella.

It is generally thought that the species of this subgenus act as temporary social parasites on the species of the subgenus *Lasius* in their nest-founding.

#### *Lasius humilis* W.M. Wheeler

**WORKER.** Small. Yellow varying to head brownish yellow, thorax yellow, gaster yellowish brown. Dull.

**RANGE.** Colorado, Nevada, and New Mexico.

**NEVADA NOTES.** Our 6 records are from 6 localities widely scattered across the middle of the state between the 37th and 40th parallels; 3,800–8,000 ft.; 4 were in the Pinyon-Juniper Biome and 2 were in the Cool Desert. Four nests were under stones.

**NEVADA LOCALITIES.** Map 45. *Esmeralda Co.*: Lida Summit 6,300 ft. *Lincoln Co.*: Panaca Summit 6,700 ft. *Mineral Co.*: Lucky Boy Pass 8,000 ft. *Nye Co.*: 3 mi. NW Ione

7,500 ft. *Washoe Co.*: Pyramid Lake 3,800 ft. (W.M. Wheeler, 1917:529); 23 mi. N Reno 5,000 ft.

#### *Lasius nevadensis* Cole

**WORKER.** Small. Head and posterior portion of gaster yellowish brown, thorax and anterior portion of gaster yellow. Dull.

**NEVADA NOTES AND LOCALITY.** Map 45. This species has been reported once: 6 populous colonies in Kyle Canyon, Spring Mts., Clark Co., 7,700 ft. in an open coniferous forest. “Two of the nests were beneath large stones; the others were marked only by entrance holes surrounded by a scattering of soil particles” (Cole, 1956b:27).

#### *Lasius subumbratus* Viereck

**WORKER.** Small. Concolorous reddish yellow. Head and gaster shining, thorax moderately shining.

**RANGE.** Coast to coast in southern Canada and the northern states; southward in the mountains to New Mexico, Arizona, and eastern Nevada.

**LITERATURE NOTES.** In New Mexico nests were under stones in coniferous forests. *L. subumbratus* queens start their colonies by gaining admission to established nests of *L. pallidus* (Wilson, 1955:179).

**NEVADA NOTES AND LOCALITIES.** Map 44. We have 2 records of this species, both from White Pine County: “Lehman Caves, Mt. Wheeler” (Wilson, 1955:178); South Schell Peak 8,600 ft.

#### *Lasius umbratus* (Nylander)

**WORKER.** Small. Head and gaster yellowish red, thorax reddish yellow. Head and gaster shining, thorax dull.

**RANGE.** From Nova Scotia southward to Florida and westward to Idaho, Nevada, and Arizona; Eurasia.

**NEVADA NOTE AND LOCALITY.** Map 43. The only Nevada record of this species is in USNM, det. M.R. Smith: Nye County, Charnock Springs, E side Big Smoky Valley (NE of Darrough Hot Springs). Under log.

#### *Lasius vestitus* W.M. Wheeler

**WORKER.** Small. Head and gaster yellowish brown, thorax yellow varying to head and gaster strong brown, thorax yellow. Strongly shining.

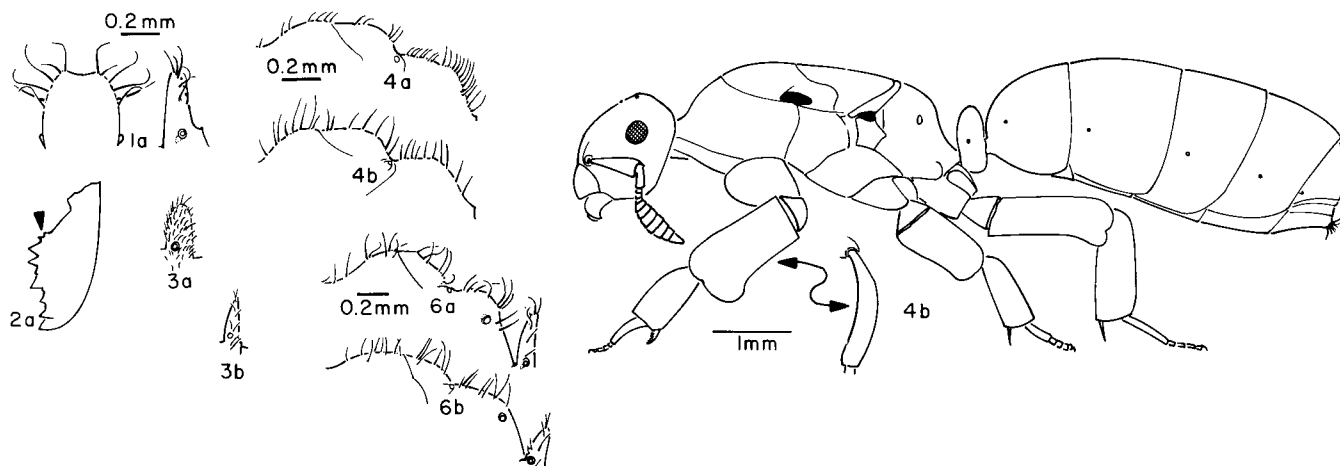
**RANGE.** Nevada and California to British Columbia.

**NEVADA NOTES.** We have 5 records from 3 localities; 7,600–8,100 ft.; all are in the Coniferous Forest Biome. Four nests were under stones and 1 was under a log.

**NEVADA LOCALITIES.** Map 46. *Clark Co.*: Charleston Peak in Spring Mts. 7,700 ft., 8,100 ft. *Elko Co.*: Lamoille Canyon 7,600 ft.

### Genus *Acanthomyops* Mayr

This genus has been regarded as a subgenus of *Lasius*; it certainly resembles the subgenus *Chthonolasius* in color, shape and habits; furthermore some species of *Chthonolasius* have



## GENUS ACANTHOMYOPS

a faint odor of oil of citronella, which is so pronounced in *Acanthomyops*.

The workers are small and yellow to yellowish brown with the surface strongly shining. They are subterranean and rarely seen on the surface. Nests are usually in the soil under stones or logs, or in rotten wood; when without cover they are usually under a constructed pile of excavated soil without entrances. The food is largely, if not entirely, honeydew from root aphids and root coccids. When the nest is disturbed or a worker crushed, a strong odor of oil of citronella is produced.

In his revision of this Nearctic genus, Wing (1968) recognized 15 species; 3 of these have been found in Nevada. Several species of *Acanthomyops* can apparently hybridize quite readily. Therefore one is likely to encounter forms that will not key out; they should be labelled "*Acanthomyops* sp."

### KEY TO THE SPECIES OF ACANTHOMYOPS

- 1a. Standing hairs on gastric dorsum 0.23 mm long or longer; crest of petiole sharp to moderately sharp and usually emarginate ..... 2
- b. Standing hairs on gastric dorsum 0.22 mm long or shorter; crest of petiole varied ..... 3
- 2a. Standing hairs on gastric tergites confined to posterior edges, except first, which has basal hairs; pubescence on head dense to moderate; mandible with 1 or more denticles on basal margin ..... *\*interjectus*
- b. Standing hairs on gastric tergites, except 1st, less regularly distributed but still concentrated posteriorly; pubescence on head dilute to very dilute; mandible rarely with a denticle on basal margin ..... *\*colei*
- 3a. Crest of petiole blunt in side view ..... 4
- b. Crest of petiole sharp in side view ..... 5
- 4a. Standing hairs short (0.1 mm or less), twice as numerous on epinotum as elsewhere on thorax (female with hairs mostly appressed and matted to surface) ... *\*murphyi*
- b. Standing hairs longer (0.12 mm or more), evenly distributed over thoracic dorsum (female unusually hairy; femora and tibiae resembling flat plates; tarsi slender; scape strongly incrassate distally) ..... *latipes*

- 5a. Pubescence on sides of second gastric tergite dense to very dense; most of body and appendages densely pubescent ..... *\*occidentalis*
- b. Pubescence on sides of second gastric tergite dilute to moderate; remainder of body and appendages never more than moderately pubescent ..... 6
- 6a. Some hairs on thorax and crest of petiole flexed ..... *californicus*
- b. Hairs on thorax and crest of petiole slightly curved but not flexed ..... *coloradensis*

### *Acanthomyops californicus* (W.M. Wheeler)

**WORKER.** Small. Head and gaster yellowish brown, thorax yellow. Strongly shining.

**RANGE.** Los Angeles Co., California, and northwestern Nevada.

**NEVADA NOTES AND LOCALITY.** Map 47. We have one record of this species: Washoe Co.: 21 mi. ENE Vya, 6,000 ft., in the Cool Desert. Nest under a stone.

Immature mealybugs *Puto* sp. (Homoptera: Pseudococcidae; det. D.R. Miller) were found in the above nest.

### *Acanthomyops coloradensis* (W.M. Wheeler)

**WORKER.** Small. Head and gaster brownish yellow, thorax yellow. Strongly shining.

**RANGE.** New Mexico to Manitoba and westward to Alberta, Oregon, and Nevada.

**NEVADA NOTES.** We have 3 records from 2 localities, both near the southern tip of the state. Two were in the Pinyon-Juniper Biome and 1 in the Coniferous Forest. All 3 nests were under stones.

**NEVADA LOCALITIES.** Map 47. *Clark Co.*: 4 mi. NNE Charleston Park 7,700 ft.; Spring Mts. 16 mi. NE Pahrump 8,000 ft.

### *Acanthomyops latipes* (Walsh)

**WORKER.** Small. Head strong brown, thorax brownish yellow, gaster strong brown to brownish yellow. Shining.

**FEMALE.** Length about 8 mm; thorax about as long as gaster. Head and gaster strong brown, thorax dark brown. Head and thorax strongly shining, gaster dull. Unusually hairy. Femora and tibiae resembling flattened plates. Scape strongly incrassate distally.

**RANGE.** Coast to coast in southern Canada and the northern states, but absent from many eastern and central states and all Gulf States.

**LITERATURE NOTES.** Wheeler and McClendon (1903: 150-151) gave a poetic description of the mating flight of this species: "This flight, . . . presents a beautiful spectacle. At the moment when the great swarming impulse seizes the colony, the shining amber-yellow workers, together with the host of sable males and large tawny-red females, break in a flood from the main openings of the nest. The winged forms hasten up the slender grass-blades on which they rock for a few moments, while filling their tracheae with the pure air of the upper world, then one by one spread their glittering wings and soar into the air like sparks rising from a fire."

**NEVADA NOTES.** We have 9 records from 9 localities; 4,800-6,400 ft. Five were in the Pinyon-Juniper Biome and 2 in the Cool Desert. Three nests were reported under stones.

The ants were found tending the mealybugs *Cryptoripersia tubulata* McKenzie (Homoptera: Pseudococcidae; det. D.R. Miller), in a nest on the clearing around a *Pogonomyrmex occidentalis* mound, Freds Mt., 18 mi. N Reno (4-22N-19), Washoe Co., 6,000 ft.

**NEVADA LOCALITIES.** Map 47. *Douglas Co.*: 10 mi. SE Minden 5,600 ft.; 11 mi. SE Minden 5,800 ft. *Humboldt Co.*: Tenmile Spring NE Summit Lake (Wing, 1968, map 101; locality given by Wing in litt.). *Nye Co.*: Test Site (Cole, 1966:20); Peavine Creek Campground in Toiyabe Ra. 6,400 ft. *Storey Co.*: 20 mi. E Reno 4,800 ft. *Washoe Co.*: Freds Mt. (18 mi. N Reno) 6,000 ft.; 24 mi. NNW Reno 5,300 ft.; Leadville 5,800 ft.

## Genus *Myrmecocystus* Wesmael

Some of the most interesting Nevada ants belong to the genus *Myrmecocystus*, commonly called honey ants. Plant secretions and other liquids are stored in the swollen gaster of certain workers called repletes. Strictly speaking, however, "honey ant" is a misnomer, because the liquids stored are not like true bee honey. To produce the latter the bee workers collect nectar and other sweet plant fluids and place them in cells in the nest; here the substance undergoes ripening involving both chemical changes and evaporation. By contrast the sweet liquids stored by the honey ants consist of unaltered nectar from flowers, exudates from galls and honeydew.

*Myrmecocystus* is found only in the southwestern part of the Nearctic Realm. It ranges from longitude 97°W on the Texas coast to latitude 19°N in central Mexico and thence northwestward to the southeastern edge of Washington State at latitude 46°N. It reaches the Pacific Coast only in southern California and Lower California, Mexico.

Snelling (1976, 1982) has recognized 28 species of *Myrmecocystus*, 19 of which occur in Nevada.

*Myrmecocystus* is primarily a genus of arid and semiarid

habitats, to which it is especially adapted by its ability to store liquids. In its range it constitutes a conspicuous feature of the ant fauna and rivals in abundance the seed-harvesting genera, such as *Pheidole* and *Pogonomyrmex*.

"The species of *Myrmecocystus* are, for the most part, generalized predator-scavengers, but they have been able to utilize a resource only cursorily tapped by other ants in this habitat: the carbohydrate-rich secretions of plants. They gather nectar from floral and extrafloral nectaries, fruit juices, and honeydew from aphids and pseudococcids. This food is available only as a liquid and is stored against future need within the crops of workers which remain in the nest. The fully engorged crops greatly distend the gasters, resulting in the essentially immobile 'replete' caste (Fig. 37). Although repletes are known to be produced by ants of other genera, the phenomenon is most frequently associated with *Myrmecocystus*. Hundreds of repletes may be present within a single colony. Their existence was known to the Amerindians who excavated nests to gather them for food." Coyotes have also been accused of raiding the nests (Snelling, 1976:1).

The stored food is regurgitated by the repletes to soliciting workers. Apparently the larvae are not fed by regurgitation (trophallaxis). They are fed largely, if not exclusively, on dead insects; the workers place this food in the vicinity of the larvae, which feed upon it unaided.

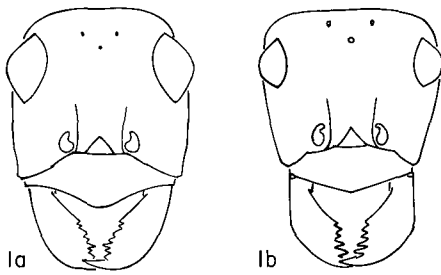
Some species nest in fine loose sand, others in coarse compact sand and still others in stoney, well-drained soil. The nest usually has a single large entrance surrounded by a neat crater, typically composed of coarse gravel (if the soil contains any) mixed with soil. Its texture is often quite firm suggesting that salivary secretion may be used as a binder.

"Nest tunnel and chamber construction seem to reflect the all important concept of moisture conservation. Few chambers are constructed at those levels which remain almost perpetually dry. The bulk of the excavation is carried on in the depths of permanent moisture. Those tunnels providing access to replete chambers are usually constricted at the entrance to the gallery. These certainly would impede the outward flow of humid air. The main gallery into the nest is usually surprisingly large, considering the size of the ants, and it is seldom closed even in the hottest part of the day. It is, however, frequently constricted at some point between the surface and the first level of galleries. This is a common condition in the nests of those species inhabiting areas normally characterized by a long dry season, such as southern California and western Arizona" (Snelling, 1976:8).

All keys are adapted from Snelling (1976).

## KEY TO THE SUBGENERA OF *MYRMECOCYSTUS*

- 1a. Integument yellow or brownish yellow; mandible with 8-10 teeth; eye large; ocelli reduced or absent; nocturnal . . . . . *Myrmecocystus*
- b. Integument darker, either (a) bicolored, head and thorax yellowish red, gaster dark brown to black OR (b) concolorous black or dark brown or orange; mandible with 6-7 teeth; eye small; ocelli present; diurnal, matinal or crepuscular . . . . . 2



#### SUBGENERA OF GENUS MYRMECOCYSTUS

- 2a. Smaller; uniformly blackish or dark brown ..... *Eremnocystus*  
 b. Larger; either bicolored or orange ..... *Endiodioctes*

#### Subgenus *Endiodioctes* Snelling

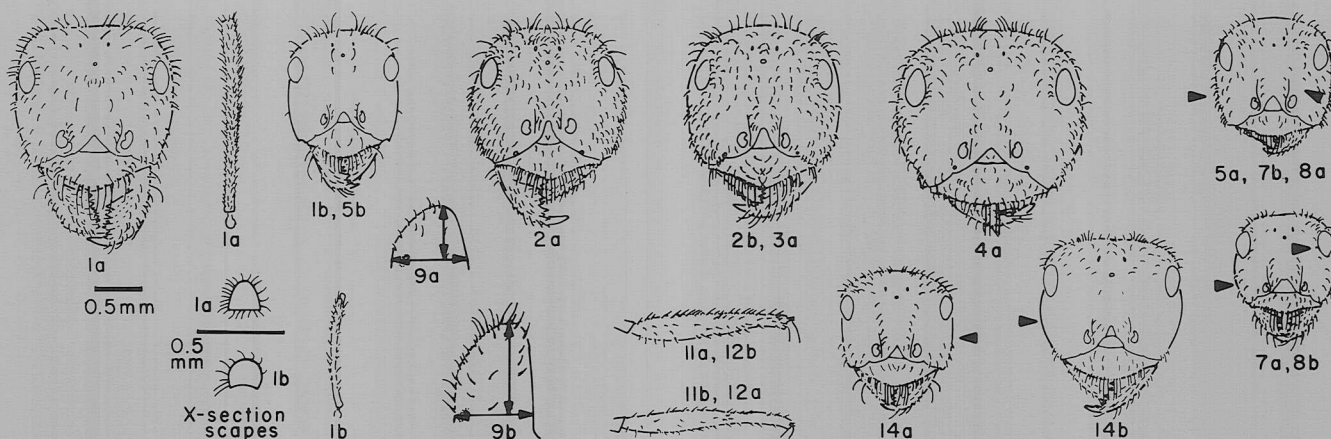
These ants are diurnal foragers, often highly predaceous on small arthropods.

#### KEY TO THE SPECIES OF SUBGENUS *ENDIODIOCTES*

- 1a. Abundantly hairy; scape, femora, and tibiae with numerous suberect to erect hairs on all surfaces; first 3 or 4 tergites with dense pubescence; head width of major usually more than 1.7 mm ..... 2  
 b. Less hairy; scape and femora often sparsely hairy, usually with at least 1 face lacking standing hairs; tergite 3 often sparsely pubescent; head width of major less than 1.7 mm ..... 5  
 2a. Longest hairs of tergite 2 (exclusive of posterior row), occiput, and pronotum more than eye length; head of major not orbiculate ..... *\*melliger*  
 b. Longest hairs on tergite 2 (exclusive of posterior row), occiput, and pronotum less than eye length; head of major often orbiculate ..... 3  
 3a. Longest hairs on tergite 2 (exclusive of posterior row) and pronotum 0.6 or more times minimum eye diameter ..... *mendax*  
 b. Longest hairs of tergite 2 (exclusive of posterior row) and pronotum no more than 1/2 times minimum eye diameter, usually less ..... 4  
 4a. Head of major strongly orbiculate; frontal lobe dull, weakly and irregularly punctate, punctures often elongate; frons weakly (if at all) punctate, punctures (when present) not exceeding diameter of their hairs ..... *\*placodops*  
 b. Head of major not strongly orbiculate; frontal lobes shiny, distinctly punctate, punctures round or weakly ovoid; frons usually with distinct coarse punctures greater in diameter than hairs arising from them ..... *semirufus*

- 5a. Gena, in frontal view, with 10 or more erect hairs evenly distributed between eye and base of mandible ..... 6  
 b. Gena, in frontal view, with not more than 10 erect hairs, most near mandibular insertion ..... 10  
 6a. Tergite 3 uniformly and densely pubescent; clypeus moderately shining or polished; frontal lobes shining ..... 7  
 b. Tergite 3 without pubescence or at least less pubescent than tergites 1 and 2 ..... *\*intonsus*  
 7a. Tergite 4 with pubescence (when present) very widely scattered; erect hairs present only adjacent to inner eye margin; punctures on frontal lobe and frons uniformly minute and evenly distributed ..... 8  
 b. Tergite 4 conspicuously pubescent (in specimens with pronotal width more than 1.0 mm); erect hairs present over 1/2 of distance between inner eye margin and antennal socket; punctures on frontal lobe and frons variable in size and irregularly distributed ..... 9  
 8a. Longest pronotal hairs more than 1/2 minimum eye diameter; gena usually with 12–16 erect hairs ..... *romainei*  
 b. Longest pronotal hairs less than 1/2 minimum eye diameter; gena usually with fewer than 12 erect hairs ..... *flaviceps*  
 9a. Longest occipital hairs more than 3/4 minimum eye diameter; longest pronotal hairs at least 1/2 minimum eye diameter; petiole, in profile, thickly cuneate, length at lower margin of spiracle exceeding height from spiracle to summit ..... *koso*  
 b. Longest occipital hairs at most slightly more than 1/2 minimum eye diameter; longest pronotal hairs less than 1/2 minimum eye diameter; petiole higher than thick when measured as above ..... *semirufus*  
 10a. In majors, longest occipital hairs at least equal to minimum eye diameter ..... 11  
 b. In majors, longest occipital hairs usually about 1/2 minimum eye diameter ..... 13  
 11a. Longest pronotal hairs about equal to maximum eye diameter, always exceeding minimum eye diameter; hind femur with numerous suberect hairs on dorsal surface; head, thorax, and legs distinctly brown ..... *depilis*  
 b. Longest pronotal hairs about equal to maximum eye diameter; hind femur with only very short subappressed hairs on dorsal surface ..... 12  
 12a. Hairs on dorsal face of hind femur appressed to subappressed; frontal lobes and frons finely and uniformly punctate; mandible 7-toothed; gaster usually entirely orange ..... *\*wheeleri*  
 b. Hairs on dorsal face of hind femur suberect, conspicuous; frontal lobes finely and irregularly punctate, with large impunctate areas; mandible 8-toothed; gaster black, often with basal 2 or 3 tergites extensively yellowish ..... *\*kathjuli*  
 13a. Tergite 3 with dense appressed pubescence ..... *flaviceps*  
 b. Tergite 3 with little or no appressed pubescence ..... 14





#### SUBGENUS *ENDIODICTES*

- 14a. Head, thorax, and legs yellowish red (top of head slightly infuscated); pubescence abundant on face; sides of head straight in frontal view ..... *kennedyi*  
 b. Head, thorax, and legs brownish; pubescence very sparse on face; sides of head in large workers often convex ..... *mimicus*

#### *Myrmecocystus depilis* Forel

**WORKER.** Small to medium-sized. Head strong brown ventrally and yellowish brown dorsally, thorax dark brown and gaster dark reddish brown. Head strongly shining, thorax and gaster feebly shining.

**RANGE.** Western Texas to southern Nevada and southward to central Mexico.

**NEVADA NOTES.** We have 2 records from 2 localities, both in the Hot Desert near the southern tip of the state. One nest was in sandy soil surmounted by a low crater 10 cm in diameter; the entrance was large.

**NEVADA LOCALITIES.** Map 48. *Clark Co.*: Sandy 2,600 ft.; 10 mi. S Searchlight 2,600 ft.

#### *Myrmecocystus flaviceps* W.M. Wheeler

**WORKER.** Small to medium-sized. Head strong brown, thorax dark brown, gaster very dark brown. Head shining, thorax and gaster feebly shining.

**RANGE.** Southwestern Utah, southern Nevada and southeastern California to northern Sonora and northeastern Lower California.

**NEVADA NOTES.** We have 32 records from 29 localities; 600–6,500 ft. All but 3 records were in the southern tip of the state. Thirteen were in the Hot Desert, 10 in the Cool Desert (1 in *Atriplex Subclimax* and 3 in *Sarcobatus Subclimax*), and 1 was in the Pinyon-Juniper Biome. All nests were in exposed terrain and surmounted by a crater ranging from 4 to 30 cm in diameter (Fig. 34). The entrance was large (7–13 mm). Sandy soil was preferred.

**NEVADA LOCALITIES.** Map 49. *Clark Co.*: Davis Dam on Colorado River 600 ft.; Searchlight 3,400 ft.; 11 mi. W Searchlight 4,600 ft.; 8 mi. W Searchlight 4,100 ft.; Valley

of Fire State Park 2,000 ft.; Red Rock Canyon 3,900 ft.; Boulder City 2,500 ft.; 5 mi. W Boulder City (Snelling, 1976: 85); 3 mi. W Cottonwood Cove 1,200 ft.; 2 mi. NW Logandale. *Esmeralda Co.*: 7 mi. WNW Tonopah 5,200 ft.; 9 mi. SW Goldpoint 4,400 ft.; 11 mi. E Lida 5,000 ft.; Pigeon Spring 6,500 ft.; Dyer 5,100 ft. *Lincoln Co.*: 5 mi. NE Caliente 4,800 ft.; Cathedral Gorge State Park 5,000 ft.; Pahroc Summit (24 mi. W Caliente) 4,900 ft. *Nye Co.*: 15 mi. NNW Pahrump 3,400 ft.; California boundary 13 mi. SW Beatty 3,800 ft.; 7 mi. SSE Beatty 3,000 ft.; 3 mi. S Moores Sta. in Hot Creek Valley 5,800 ft.; 24 mi. N Tonopah 6,300 ft.; 27 mi. NNW Tonopah 5,400 ft.; Rock Valley 3,300 ft.; Test Site (Cole, 1966 as *melliger*). *Pershing Co.*: 41 mi. E Lovelock 3,800 ft. *Washoe Co.*: Lemmon Valley (9 mi. N Reno) 5,000 ft., 5,400 ft.

#### *Myrmecocystus kennedyi* Cole

**WORKER.** Small to medium-sized. Head, thorax, and petiole strong brown infuscated with dark reddish brown, gaster black. Head strongly shining, thorax and gaster moderately shining.

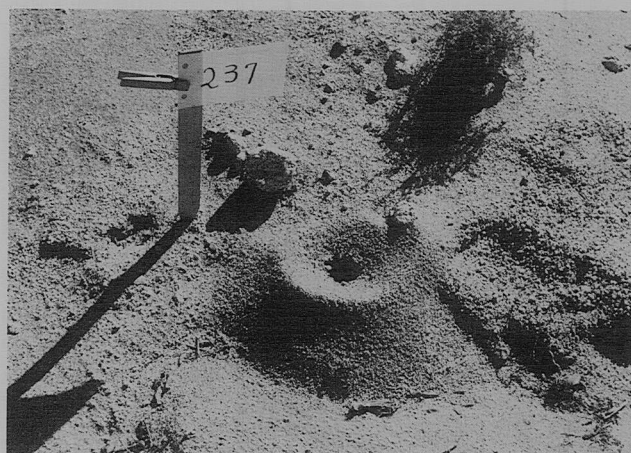
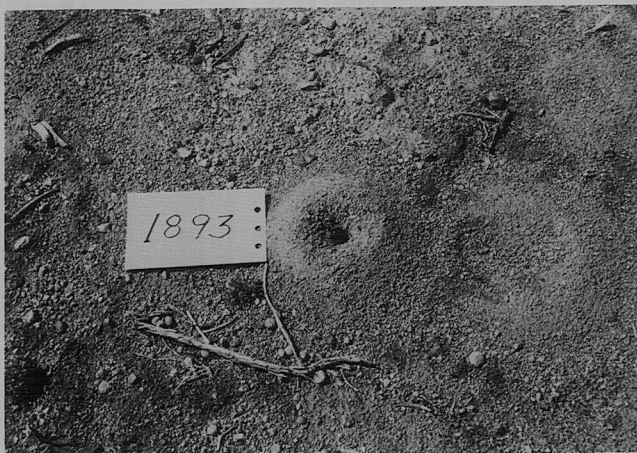


Figure 34. *Myrmecocystus flaviceps*. Crater.



**Figure 35.** *Myrmecocystus kennedyi*. Crater. Lyon County, 3 mi. east of Smith.

**RANGE.** Southern Oregon and Idaho southward to Sonora and northern Lower California.

**NEVADA NOTES.** In Nevada this species is concentrated in the midwestern part; there are no records from the east-central and northeast. We have 71 records from 59 localities; 1,500–6,700 ft. Two of the records were in the Hot Desert; 40 were in the Cool Desert (17 in *Sarcobatus* Subclimax, 3 in *Atriplex* Subclimax, 6 in disturbed habitats); 3 were in the Pinyon-Juniper Biome. The nests were always in exposed soil and generally surmounted by a neat hard-packed crater 8–15 cm in diameter (Fig. 35). The entrance was conspicuously large, its shape circular or slit-like, and its dimensions 6–20 mm. Refuse was stuffed into chambers near the surface. Workers were timid, fast, and elusive, but workers of flourishing colonies were apt to be aggressive and the bites were annoying.

*Araeoschizus armatus* Horn (Coleoptera: Tenebrionidae; det. T.J. Spilman) was found in a nest 6 mi. W Orovada (Humboldt Co.), 4,100 ft.

**NEVADA LOCALITIES.** Map 48.

### *Myrmecocystus koso* Snelling

**WORKER.** Small to medium-sized. Head strong brown ventrally and dark brown dorsally, thorax dark brown, gaster black varying to head reddish yellow, thorax yellowish red, gaster dark reddish brown. Head shining, thorax and gaster dull.

**RANGE.** Southern Nevada and the Mojave Desert in southeastern California.

**NEVADA NOTES.** Most Nevada records are from the southern part of the state; only 5 are from farther north; there is none from Washoe, Humboldt, Elko or White Pine counties. We have 53 records from 39 localities; 800–7,000 ft. Twenty-three were in the Hot Desert, 14 in the Cool Desert (2 in *Atriplex* Subclimax, 3 in *Sarcobatus* Subclimax, and 1 on a revegetating playa), and 6 were in the Pinyon-Juniper Biome. The nests were always in exposed soil, but the su-



**Figure 36.** *Myrmecocystus koso*. Crater. Lincoln County, 4 mi. west of Caliente.

perstructure was highly variable: diameter 5–15 cm, usually low; sometimes only a thin disc of excavated soil; often irregular and messy; rarely a neat compact crater (Fig. 36). The entrance was large, 6–10 mm in diameter. The workers were timid, fast, and elusive; the bite was annoying.

We collected *Araeoschizus* sp. (Coleoptera: Tenebrionidae; det. T.J. Spilman), in the nest of *koso* 29 mi. NW Lovelock (8-30N-29), 4,400 ft., Pershing Co.

**NEVADA LOCALITIES.** Map 50.

### *Myrmecocystus mendax* W.M. Wheeler

**WORKER.** Small to large. Head and thorax dark reddish brown, gaster black varying to head yellowish red, thorax reddish brown, gaster dark reddish brown. Head shining, thorax and gaster dull.

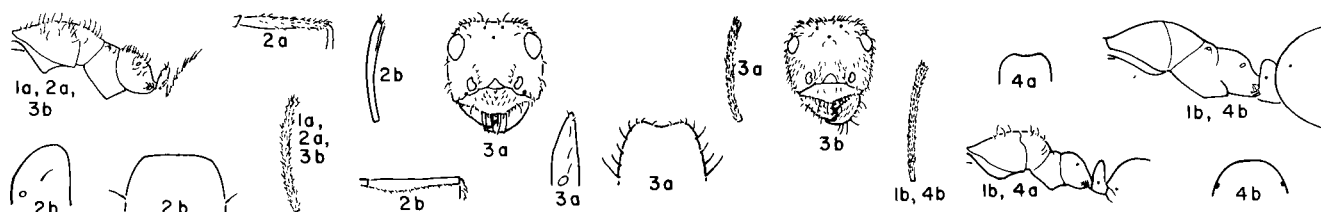
**RANGE.** Colorado to central Texas, westward to southern Nevada and southeastern California; adjacent northern Mexico.

**NEVADA NOTES.** We have 10 records from 12 localities, all in the southern part of the state; 3,900–6,500 ft. Four records were reported in the Hot Desert and 1 in the Pinyon-Juniper Biome. An exposed nest was surmounted by a crater about 8 cm in diameter; the entrance was large (2 cm). One nest was under a stone. The workers moved very rapidly.

**NEVADA LOCALITIES.** Map 48. *Clark Co.*: 1 mi. NW Granite Springs; 3 mi. NE Nelson 2,200 ft. *Esmeralda Co.*: Lida 6,500 ft.; Dyer 5,000 ft. *Lincoln Co.*: 40 mi. N Pioche; Delmar Flat 4,400 ft.; 2 mi. S Caliente 5,000 ft. *Nye Co.*: 6 mi. SE Beatty 4,000 ft.; 4 mi. SSE Beatty 4,200 ft.; 5 mi. ESE Beatty 4,500 ft.; 6 mi. SSE Beatty 3,900 ft.; Mercury (Snelling, 1976:39).

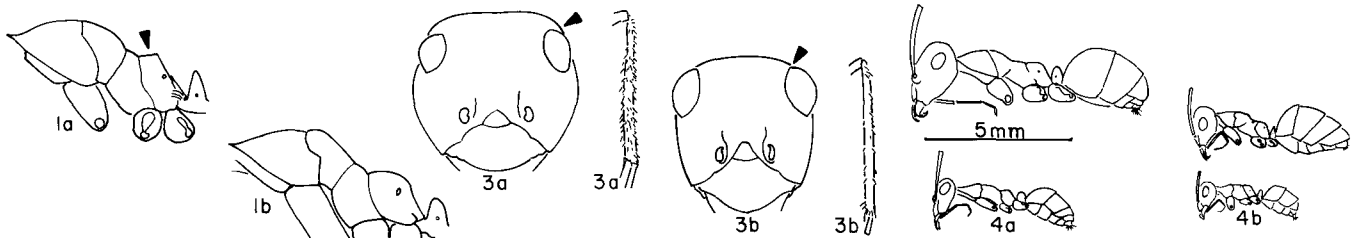
### *Myrmecocystus mimicus* W.M. Wheeler

**WORKER.** Small to medium-sized. Head yellowish red infuscated with dark reddish brown, thorax dark reddish



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#### SUBGENUS MYRMECOCYSTUS

compressed, crest concave or flat (in posterior view), but not conspicuously notched ..... *creightoni*

#### *Myrmecocystus arenarius* Snelling

**WORKER.** Small. Concolorous very dusky red to black. Strongly shining.

**RANGE.** West-central Nevada.

**NEVADA NOTES.** This is a Cool Desert species. The nests were in loose dune sand and were surmounted by half-craters about 5 cm in diameter; the entrances were small, only about 4 mm in diameter.

**NEVADA LOCALITIES.** Map 52. *Churchill Co.*: Sand Mt. 4,000 ft.; Blow Sand Mts. 4,600 ft. *Washoe Co.*: 6 mi. N Nixon 4,200 ft.; 2.8 mi. N Wadsworth. These records are also in Snelling (1982).

#### *Myrmecocystus creightoni* Snelling

**WORKER.** Small. Head dark reddish brown to reddish black, thorax and gaster dusky red. Moderately shining to shining.

**RANGE.** Southern Nevada and southern California.

**NEVADA NOTES AND LOCALITY.** Map 51. Our one record of this species is from Kyle Canyon in the Spring Mts. (5,200 ft.) in Clark Co. This is in the Hot Desert.

#### *Myrmecocystus hammettensis* Cole

**WORKER.** Small. Concolorous reddish black. Head shining, thorax and gaster dull.

**RANGE.** Southwestern Idaho to central Nevada and east-central California.

**NEVADA NOTES.** We have 14 records for this species from 14 localities, all in the Cool Desert (1 in *Sarcobatus* Subclimax, 3 in *Atriplex* Subclimax, 2 in disturbed habitats, and 1 on a sand dune) and all in the northern half of the state; 3,900–7,000 ft. Nests were in exposed soil and surmounted by a low crater 5–10 cm in diameter; the entrance was 2–5 mm in diameter; the soil of some craters was firmly packed.

**NEVADA LOCALITIES.** Map 51. *Churchill Co.*: 14 mi. ESE Frenchman 4,700 ft. *Elko Co.*: Halleck. *Eureka Co.*: 17 mi. S Eureka 6,000 ft. *Humboldt Co.*: 12 mi. SW Denio 4,400 ft.; 10 mi. NNE Winnemucca 4,400 ft. *Lyon Co.*: 5 mi. E Smith 4,900 ft.; Santa Margarita Ranch 4,800 ft.; Churchill Butte 6,000 ft. *Nye Co.*: 11-12N-46 in Monitor Valley 7,000 ft.; 17-10N-43 in Big Smoky Valley 5,900 ft. *Washoe Co.*: 24 mi. S Gerlach 3,900 ft.; 31 mi. NW Gerlach 4,800 ft.

*White Pine Co.*: 19 mi. SW Ely 6,000 ft.; 2 mi. N McGill 6,000 ft.

#### *Myrmecocystus lugubris* W.M. Wheeler

**WORKER.** Small. Concolorous reddish black. Head and thorax moderately shining, gaster dull.

**RANGE.** Mojave Desert of California and Nevada.

**NEVADA NOTES.** We have 6 records from 3 localities, all in the extreme south and all in the Hot Desert. Two nests were under stones.

**NEVADA LOCALITIES.** Map 51. *Clark Co.*: Tule Springs 2,800 ft. *Nye Co.*: Test Site (Cole, 1966:21); Rock Valley 3,300 ft.

#### *Myrmecocystus yuma* W.M. Wheeler

**WORKER.** Small. Head dark reddish brown ventrally, dorsal portion of head and entire thorax dusky red, gaster very dusky red varying to head and thorax very dusky red, gaster reddish black. Head and thorax strongly shining, gaster moderately shining.

**RANGE.** Mojave and Colorado deserts of southern Nevada, southern California, southwestern Arizona, and north-eastern Lower California.

**NEVADA NOTES.** We have 7 records from 5 localities, all in the Hot Desert near the southern tip of the state; 800–3,200 ft. We have nest data for 3 records: no crater, only an irregular pile of excavated sand; the entrance was small.

**NEVADA LOCALITIES.** Map 53. *Clark Co.*: Valley of Fire State Park 2,000 ft.; 14 mi. SE Indian Springs 3,200 ft.; Cottonwood Cove on Lake Mohave 800 ft.; Boulder City 2,500 ft. *Nye Co.*: 2 mi. N Pahrump 2,700 ft.

#### Subgenus *Myrmecocystus* Wesmael

Species of this subgenus are light yellow to brownish yellow with large black eyes; nocturnal. "Refuse chambers are rare in the nest. Debris from the nest is usually carried to the surface and dropped at random some distance from the entrance" (Snelling, 1976:115). Craters are regular and made of the coarsest available gravel. The particles are probably agglutinated, since the craters are little affected by rain.

#### KEY TO THE SPECIES OF SUBGENUS MYRMECOCYSTUS

- 1a. Posterior  $\frac{2}{3}$  of dorsal surface of epinotum strongly and angularly projecting upward; erect hairs very sparse, with few or none on outer surface of hind tibia ..... 2

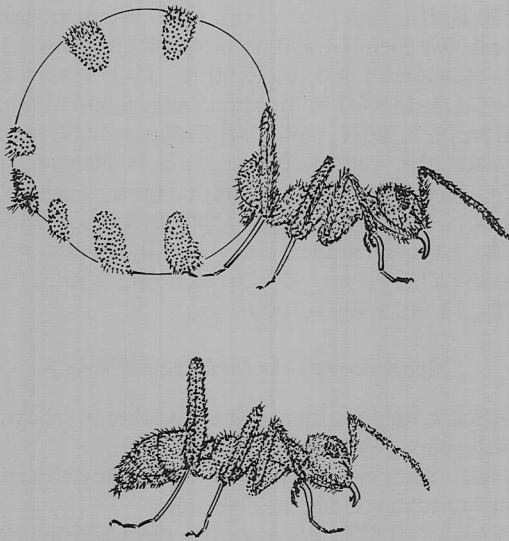


Figure 37. *Myrmecocystus mexicanus*. Replete and worker.

- b. Dorsal surface of epinotum either flat or evenly convex; often abundantly hairy . . . . . 3
- 2a. With at least 2 erect pronotal hairs as long as apical width of scape; tergum I with a few erect hairs on disc; hind tibia with a few erect hairs on outer face beyond basal  $\frac{1}{3}$  . . . . . *ewarti*
- b. Erect pronotal hairs, when present, shorter than apical width of scape; tergum I without discal hairs; hind tibia without erect hairs on outer face beyond basal  $\frac{1}{3}$  . . . . . *pyramicus*
- 3a. Head, epinotum, and gaster with abundant appressed pubescence; middle and hind tibiae usually with numerous erect hairs along apical  $\frac{1}{2}$  of outer face; upper eye margin often distinctly below occipital corner; if meso-epinotal suture impressed, head length of major exceeds 1.3 mm . . . . . 4
- b. Head, epinotum, and gaster shining, with little or no appressed pubescence; middle and hind tibiae with no more than 3 or 4 erect hairs beyond basal  $\frac{1}{3}$  of outer face, usually none; upper eye margin coincident with occipital corner; meso-epinotal suture deeply impressed and dorsal face of epinotum convex . . . . . *navajo*
- 4a. Larger; highly polymorphic; head length of major more than 1 mm; meso-epinotal suture usually impressed; epinotum as long as high or longer, juncture of dorsal and posterior faces broadly rounded . . . . . *mexicanus*
- b. Smaller; moderately polymorphic; head length of major up to 1.4 mm; meso-epinotal suture not impressed; epinotum higher than long, juncture of dorsal and posterior faces abruptly rounded, often subangulate . . . *testaceus*

### *Myrmecocystus ewarti* Snelling

**WORKER.** Small to medium-sized. Concolorous yellow, eyes black. Moderately shining to shining.

**RANGE.** Mojave and Colorado deserts of southern Nevada and southern California.



Figure 38. *Myrmecocystus mexicanus*. Crater. Nye County, Hot Creek Valley.

**NEVADA NOTES AND LOCALITIES.** Map 52. We have 2 records, both from the Hot Desert in the southern part of the state. *Clark Co.*: 6 mi. E Searchlight 2,400 ft.; 2 mi. W Cottonwood Cove 1,200 ft. Each nest was in exposed soil and surmounted by a crater 10 cm in diameter; the entrance was 5 mm in diameter.

### *Myrmecocystus mexicanus* Wesmael

**WORKER.** Medium-sized to-large. Head and thorax brownish yellow, gaster yellowish brown, eyes black. Head and gaster shining, thorax moderately shining (Fig. 37).

**RANGE.** Central Mexico northward to Colorado and westward to California and Lower California.

**NEVADA NOTES.** We have 47 records from 47 localities; 1,500–7,600 ft. Nine records are from the Cool Desert (3 in *Sarcobatus* Subclimax), 25 in Hot Desert. Typically the craters (Fig. 38) were large (4–30 cm in diameter, average 18 cm), high (3–5 cm), with a sharp ridge and with a large entrance (average 18 mm). The typical crater was constructed of firmly compacted coarse gravel.

*Conibiosoma elongatum* (Horn) (Coleoptera: Tenebrionidae; det. T.J. Spilman), was taken in a nest at Mud Springs in Dixie Valley, Churchill County, 4,000 ft. *Papusus* n. sp. (Coleoptera: Scydmaenidae; det. W.R. Suter) was in a nest 8 mi. SW Beatty, Nye County, 3,500 ft. Three *Tetrastichus* sp. (Hymenoptera: Eulophidae; det. G. Gordh) were in a nest 7 mi. NE Pahrump in Spring Mts., Clark County, 4,700 ft.

**NEVADA LOCALITIES.** Map 53.

### *Myrmecocystus navajo* W.M. Wheeler

**WORKERS.** Small to medium-sized. Concolorous yellow to yellowish brown, eyes black. Head and gaster shining, thorax moderately shining.

**RANGE.** Southeastern Colorado to western Texas, westward to Utah, southern Nevada, southeastern California, and northern Sonora.

**NEVADA NOTES.** We have 20 records from 18 localities,





**Figure 39.** *Myrmecocystus navajo*. Crater. Lincoln County, 5 mi. northeast of Caliente.

all in the southern part of the state; 2,200–6,500 ft. Three records were in the Hot Desert, 3 in the Cool Desert, and 8 in the Pinyon-Juniper Biome. The nests were in exposed soil and surmounted by a crater. The craters (Fig. 39) were large (10–30 cm in diameter, average 18 cm), high (one measured 3 cm), with a large entrance (average 11 mm). A typical crater was constructed of firmly compacted coarse gravel.

**NEVADA LOCALITIES.** Map 52. *Clark Co.*: Kyle Canyon in Spring Mts. (7-19S-59) 4,000 ft.; 23-19S-58 4,700 ft.; 36-17S-55 in Spring Mts. 6,200 ft. *Esmeralda Co.*: Lida 6,500 ft. *Lincoln Co.*: 5 mi. NE Caliente 4,800 ft.; 8 mi. ENE Caliente 5,500 ft.; 6 mi. E Panaca 5,800 ft.; 14 mi. W Caliente 5,000 ft.; 8 mi. SW Crystal Spring; 10 mi. SW Crystal Spring 5,500 ft.; 1 mi. SE Coyote Summit 5,100 ft.; Timpahute Ra. 6,400 ft.; Oak Springs Summit 6,200 ft.; Pahroc Summit 4,900 ft. *Nye Co.*: 3 mi. SSW Moores Sta. in Hot Creek Valley 6,200 ft.; 24 mi. N Tonopah 6,300 ft.; 17-10N-43 in Big Smoky Valley 5,900 ft.; Fairbanks Spring 2,200 ft.

### *Myrmecocystus pyramicus* M.R. Smith

**WORKER.** Small to medium-sized. Concolorous yellow varying to bicolored: head and gaster light olive brown, thorax yellow. Strongly shining.

**RANGE.** Southeastern Oregon, southern Idaho, and northern Nevada.

**NEVADA NOTES.** This species has been reported only north of the 38th Parallel. We have 27 records from 20 localities: 4,000–6,800 ft.; all in the Cool Desert (4 in Atriplex Subclimax and 4 in Sarcobatus Subclimax). The nests were in exposed soil and were surmounted by a crater 5–14 cm (average 9 cm) in diameter. The crater was made of fine soil and sand; sometimes it was firmly packed. The entrance was large—6–12 mm in diameter.

*Araeoschizus armatus* Horn (Coleoptera: Tenebrionidae; det. T.J. Spilman) was taken in a nest of *M. pyramicus* 6 mi. W Orovalda, Humboldt County, 4,100 ft.

**NEVADA LOCALITIES.** Map 53. *Churchill Co.*: 9-48N-

37 5,200 ft. *Humboldt Co.*: 7 mi. NNE Winnemucca 4,400 ft.; 12 mi. SW Denio 4,400 ft.; 6 mi. W Orovalda 4,100 ft.; Soldier Meadows 4,400 ft., 4,600 ft.; 35-37N-41; 4,000 ft. *Lander Co.*: 9-15N-47 in Monitor Valley 6,800 ft. *Lyon Co.*: 3 mi. E Smith 4,700 ft.; 6 mi. ESE Wabuska 4,300 ft. *Mineral Co.*: Deadhorse Wells 4,100 ft.; 2 mi. N Fletcher Springs. *Nye Co.*: Ione Valley (23-11N-38) 6,000 ft.; Potts 6,700 ft. *Washoe Co.*: 9 mi. NW Gerlach 4,000 ft.; 31 mi. NW Gerlach 4,800 ft.; 5 mi. W Mullen Gap 4,300 ft. (Smith, 1951:93). *White Pine Co.*: 19 mi. SW Ely 6,000 ft.; 2 mi. N McGill 6,000 ft.; 33 mi. E Ely 6,100 ft.

### *Myrmecocystus testaceus* Emery

**WORKER.** Medium-sized. Head and thorax yellow, gaster brownish yellow, eyes black. Shining.

**RANGE.** Southern Washington to Lower California and eastward to Idaho, Utah, and Nevada.

**NEVADA NOTES.** We have 106 records from 78 localities which are scattered throughout the state; 4,300–8,000 ft. Thirty-six records are from the Cool Desert; 40 from the Pinyon-Juniper Biome. Two nests were under stones, but the vast majority were in exposed terrain and usually surmounted by excavated soil around the entrance. The only general resemblance to the nest of most other species of *Myrmecocystus* lay in the large entrance 6–25 mm in diameter. Craters were common, 5–20 cm in diameter but were usually low and irregular; many nests were surmounted by thin discs of excavated soil, while many had only messy mounds. The material ranged from sand to coarse gravel. According to our notes only 2 nests had compacted craters.

Larvae of *Pseudomorpha* sp. (Coleoptera: Carabidae; det. T.L. Erwin) were found in 2 nests of this ant in Douglas Co., 8 mi. SE Minden, 5,200 ft., in the Pinyon-Juniper Biome.

**NEVADA LOCALITIES.** Map 54.

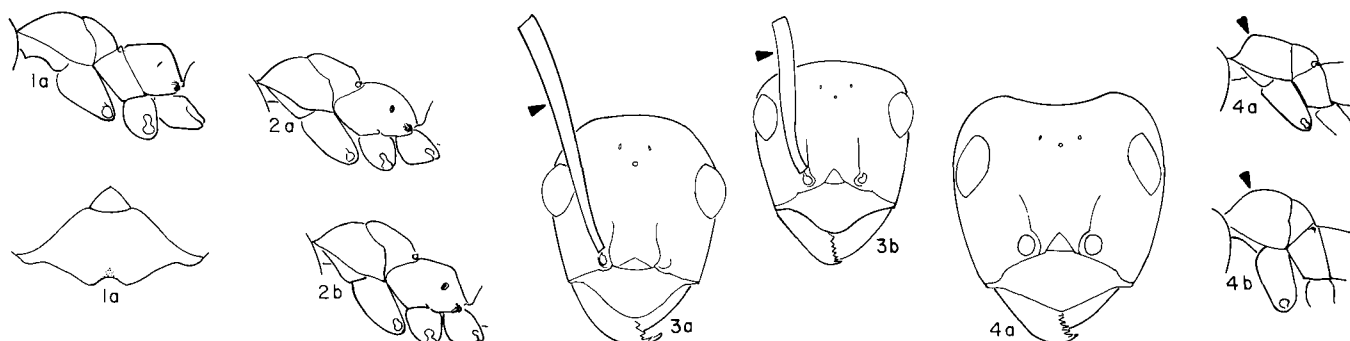
### Genus *Formica* Linnaeus

*Formica* is by far the largest genus in the Nearctic ant fauna, consisting of 78 species, which is 15% of the total. Anatomically the genus is not very specialized. Its behavior is relatively plastic and does include some rather interesting specialties, such as slave-making, temporary social parasitism, colony founding by budding, and several unique methods of nest construction.

In revising the subdivisions of *Formica* we generally follow D.R. Smith (1979), except that we retain *obtusopilosa* in the *sanguinea* group and merge the *microgyna* group into the *rufa* group (*vide infra*).

### KEY TO THE SPECIES GROUPS OF *FORMICA*

- 1a. Ventral border of clypeus notched in middle; integument dull to feebly shining; pubescence dense, at least on gaster; bicolored (except concolorous reddish yellow in *curiosa*), head and thorax reddish brown or reddish yellow, gaster brown or black; epinotum short and usually angulate in profile; facultative slave-makers; colony-founding parasitic ..... *sanguinea* group



SPECIES GROUPS OF GENUS *FORMICA*

- b. Ventral border of clypeus not notched or, if so, pubescence is very sparse and body shining; other characters various ..... 2
- 2a. Slender; surface shining; epinotum rounded in profile (i.e., base and declivity not differentiated) ..... 3
- b. Generally robust; surface usually dull; epinotum usually angulate in profile (i.e., base and declivity clearly differentiated) ..... 4
- 3a. Scape slender, long ( $1\frac{1}{4}$ – $1\frac{1}{2}$  length of head), scarcely curved at base; median segments of funiculus more than  $1\frac{1}{2}$  times as long as broad; posterior face of petiolar scale convex; frontal carina long and sigmoid; larger ants (4–7 mm long) ..... *\*pallidefulva* group
- b. Scape shorter (less than  $1\frac{1}{4}$  head length); frontal carinae subparallel, not diverging dorsally; smaller ants ( $2\frac{1}{2}$ –6 mm long) ..... *neogagates* group
- 4a. Larger workers with occipital border distinctly concave; pronotum (in profile) with basal and declivous faces meeting at an angle ..... *\*exsecta* group
- b. Larger workers with occipital border at most slightly concave, usually flat or slightly convex; pronotum (in profile) evenly convex, not angulate ..... 5
- 5a. Bicolored: head and thorax reddish or yellowish red and notably lighter than gaster or, if infuscated, infuscation not completely masking reddish ground color in larger workers; gaster brown or black; surface mostly dull; polymorphic ..... *rufa* group
- b. Concolorous black or brown or bicolored; if bicolored, thorax lighter than gaster and upper portion of head ..... *fusca* group

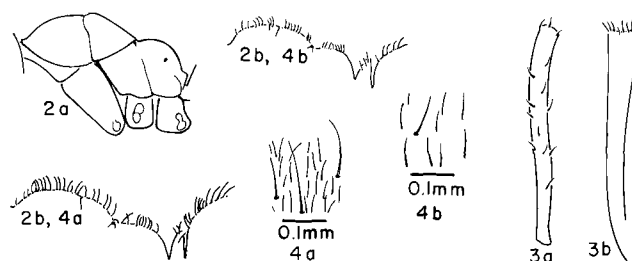
### The *Neogagates* Group

Four of the species included here (*bradleyi*, *manni*, *oregonensis*, and *perpilosa*) were originally included by Creighton (1950) in the subgenus *Raptiformica*. We are in agreement with Wilson and Brown (1955) and Buren (1968a) that these species are more closely related to those of the *neogagates* group than to those of the erstwhile subgenus *Raptiformica*, now the *sanguinea* group.

These ants form small colonies of a few hundred individuals which nest in the soil under stones or in exposed soil with a crater around the entrance. Although they are the

smallest species in the genus *Formica*, ants in large colonies can be quite pugnacious; nevertheless, as a whole, species in this group are considered to be timid, and are often enslaved by species in the *sanguinea* group of *Formica* and by *Polyergus*.

The workers of all species are small to medium-sized and all have a shining surface.



NEOGAGATES GROUP OF GENUS *FORMICA*

### KEY TO THE SPECIES OF THE *NEOGAGATES* GROUP

- 1a. Concolorous yellowish red ..... *\*bradleyi*
- b. Colored otherwise ..... 2
- 2a. Pronotum without erect hairs (rarely 2 or 3) ... *limata*
- b. Pronotum with 10 or more erect hairs ..... 3
- 3a. Scape bearing a number of short delicate erect whitish hairs ..... *lasioides*
- b. Scape without erect hairs ..... 4
- 4a. Pilosity abundant; pronotum with numerous (15–28) erect hairs; pronotal and gastric hairs long, flexuous, and narrowly pointed; gastric pubescence long and with tips overlapping, closely spaced ..... *perpilosa*
- b. Pilosity moderately abundant; pronotum with 10–23 erect hairs, which are shorter; gastric pubescence sparse, short, and tips not overlapping ..... 5
- 5a. Gaster black, remainder yellowish red in a majority of the nest series (some of the red may be replaced by brown on a few); largest worker  $4\frac{1}{2}$  mm long ..... *manni*
- b. Gaster black (or deep brown), remainder distinctly brownish; species distinguishable with great difficulty ..... 6

- 6a. Largest workers 5½ mm long ..... *neogagates*  
 b. Largest workers 6 mm long ..... \**oregonensis*

### *Formica lasioides* Emery

**WORKER.** Small to medium-sized. Head and gaster reddish black, thorax very dusky red varying to head dark reddish brown, thorax yellowish red, gaster very dusky red to dark reddish brown. Shining to strongly shining.

**RANGE.** Coast to coast in southern Canada and the northern states with southward extensions into the mountains of California and Nevada and in the Rocky Mountains to New Mexico.

**NEVADA NOTES.** In Nevada *lasioides* is well scattered throughout the state, although most (87%) of the records are above 6,000 ft. We have 79 records for this species from 56 localities; 3,800–10,900 ft. Of these records 4 were in the Alpine Biome, 40 in the Coniferous Forest Biome, 8 in the Pinyon-Juniper, and 16 in the Cool Desert (3 in sand dunes and 1 in a disturbed area). Of the nests for which we have descriptions, the majority were under stones; those exposed were surmounted by a low irregular messy pile of soil, which in some cases resembled a crater; such structures ranged from 4 to 30 cm in diameter. This is a rapid-moving and timid species, but residents of populous colonies are sometimes aggressive and their bites are annoying.

**NEVADA LOCALITIES.** Map 56.

### *Formica limata* W.M. Wheeler

**WORKER.** Small to medium-sized. Head and gaster black or reddish black, thorax dark reddish brown to yellowish red. Strongly shining.

**RANGE.** Minnesota, North Dakota, Colorado, New Mexico, Utah, and Nevada.

**NEVADA LOCALITY.** Map 55. *Nye Co.*: Test Site (Cole, 1966:24).

### *Formica manni* W.M. Wheeler

**WORKER.** Small to medium-sized. Head and thorax reddish yellow, gaster reddish black varying to head and thorax dark reddish brown, gaster black. Shining.

**RANGE.** Washington and Idaho to Utah, Nevada, and northern California.

**NEVADA NOTES.** This species is abundant and widely distributed throughout the state north of latitude 38°N; 3,800–8,000 ft., mostly between 4,000 ft. and 7,000 ft. We have 120 records from 104 localities. Of these records 29 are from the Pinyon-Juniper Biome and 78 from the Cool Desert (18 from *Sarcobatus* Subclimax, 2 on the edge of a marsh, 1 on a revegetating playa, and 3 from disturbed habitats). We have no records from the Hot Desert, Coniferous Forest or Alpine Biomes. We have notes on 50 nests: 24 were under stones; 14 of the exposed nests were surmounted by a crater 5–17 cm in diameter (Fig. 40); the remainder had a messy mass



**Figure 40.** *Formica manni*. Craters. Nye County, Hot Creek Valley.

of excavated earth varying in shape. We have often noted that *F. manni* is fast and timid, but that some of the populous colonies may be aggressive. We found it once as a slave of *Polyergus breviceps*.

**NEVADA LOCALITIES.** Map 55.

### *Formica neogagates* Emery

**WORKER.** Small to medium-sized. Head and gaster very dusky red, thorax dark reddish brown varying to head dark red dorsally and strong brown ventrally, thorax reddish yellow with strong brown markings, gaster dark reddish brown. Strongly shining.

**RANGE.** Coast to coast in southern Canada and the northern states, with an extension in the Appalachians to North Carolina; in the west spreading northward to southern Alaska and southward to Nevada, Arizona, and New Mexico.

**NEVADA NOTES.** The species has been reported widely distributed throughout the state except for the northeastern corner. We have 74 records from 59 localities; 3,900–10,000 ft., but mostly between 4,000 ft. and 8,000 ft. Twenty-nine of the localities were in the Cool Desert (8 in *Sarcobatus* Subclimax, 2 in cottonwood groves, 2 riparian, 1 in moist soil encrusted with salt, 1 in turf at the edge of a marsh, and 1 in a disturbed area), 10 were in the Pinyon-Juniper Biome, 2 in Coniferous Forest Biome, and 5 in the Alpine Biome. Of the nests described 11 were under stones; of the exposed nests 7 were surmounted by a crater 3–12 cm in diameter; 12 had irregular piles of excavated soil. Entrances were small (2–3 mm).

We have usually found *F. neogagates* fast and timid, but populous colonies sometimes produce aggressive workers that bite promptly.

Workers from a colony 2 mi. N McGill (White Pine Co., 6,000 ft.) were tending mealybugs, *Chorizococcus* sp. (Homoptera: Pseudococcidae; det. D.R. Miller), at the base of winter fat (*Ceratoides lanata*). Workers from a colony 5 mi. NE Gerlach (Pershing Co.) 3,800 ft. were tending coccids,



*Orthezia sarcobati* Morrison (Homoptera: Ortheziidae; det. D.R. Miller), on *Sarcobatus vermiculatus*.

NEVADA LOCALITIES. Map 57.

### *Formica perpilosa* W.M. Wheeler

**WORKER.** Small to medium-sized. Head and thorax reddish yellow, gaster dark reddish brown, varying to head and thorax reddish yellow with dark reddish brown infuscation, gaster reddish black. Shining.

**RANGE.** Central Texas, Oklahoma, and Kansas westward to California and Lower California.

**LITERATURE NOTES.** "It is preëminently a species peculiar to irrigated lands and river bottoms in the deserts of the southwest. There it nests in rather populous colonies about the roots of bushes or trees, often forming obscure craters or low mound nests . . . I have never found it nesting under stones. It is a very active and aggressive ant" (W.M. Wheeler, 1913:423).

**NEVADA NOTES.** *F. perpilosa* presents a seeming paradox in Nevada: it has been found only within the boundaries of the Hot Desert, but it cannot be classed as a Hot Desert ant, because it occurs only near streams and other well-watered places. It is our only truly riparian species.

Our 16 records are from 8 localities, all in the southern part of the state. We ourselves have found it only once: in Beatty, in a gravel sidewalk beside a hedge which bordered a tree-filled lawn. The low messy crater was 40 cm in diameter, with numerous entrances 6–12 mm in diameter. The workers moved swiftly.

*Elasmosoma vigilans* Ckll. (Hymenoptera: Braconidae; det. P.M. Marsh) was collected at Las Vegas by D.F. Zoller, who noted that the wasps were darting at the ants. This braconid is known to be an ant parasitoid.

**NEVADA LOCALITIES.** Map 55. *Clark Co.*: Las Vegas 2,000 ft.; Overton 1,500 ft.; Lee Canyon. *Lincoln Co.*: Caliente. *Nye Co.*: Beatty 3,800 ft.; Fairbanks Spring; Ash Meadows; Test Site.

### The *Rufa* Group

Some species of this group are temporary social parasites and the females are never larger than the largest workers; they are incapable of founding a colony alone. In some way the parasitic female manages to secure adoption by the workers of the host species. The host queen is eliminated in an unknown manner. The host workers remain in the nest for a considerable time, but they eventually die off and are never present in a mature colony.

W.M. Wheeler (1913) and Creighton (1950) recognized two closely related species groups: the *rufa* group and the *microgyna* group. Creighton (1950:456) separated them thus:

"Females feebly shining or subopaque, never more than 5.5 mm. in length and never larger than the largest workers, often smaller than the largest workers; erect hairs on the pronotum of the worker, when present, often clavate or spatulate" . . . . . *microgyna* group  
 "Females usually 8 mm. or more in length and notably

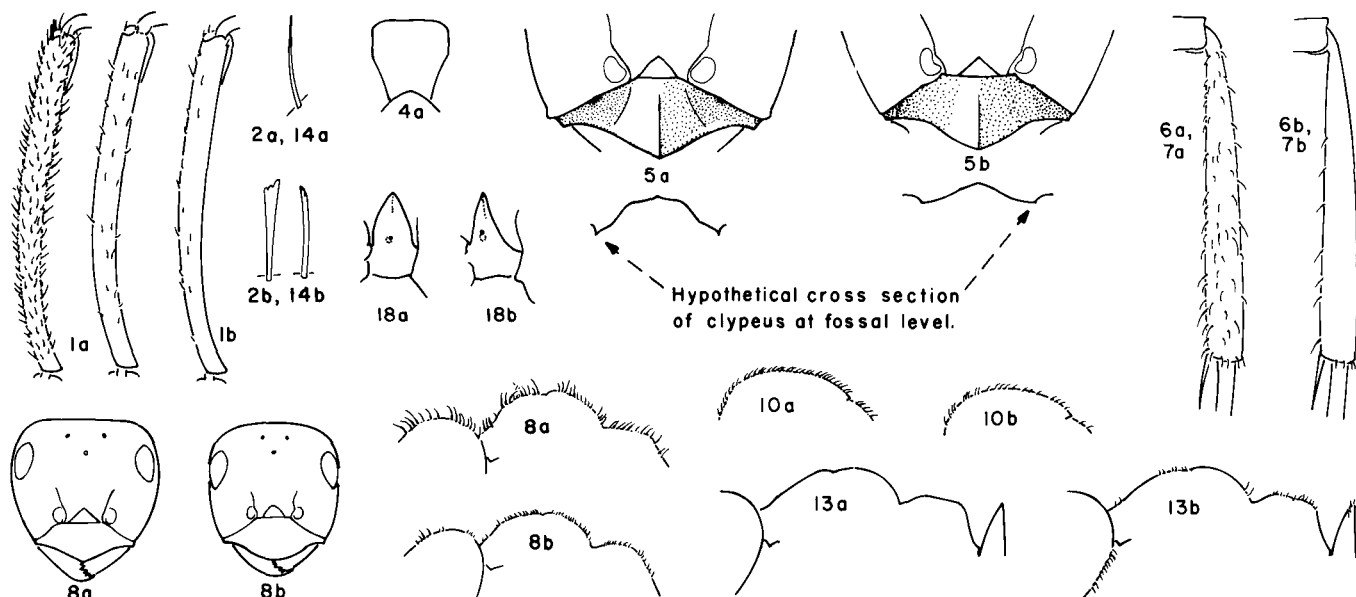
larger than the largest workers, but if they are less than 8 mm. in length and no larger than the largest workers, they are very smooth and shining; erect hairs on the pronotum of the worker, when present, not notably clavate or spatulate" . . . . . *rufa* group

From this couplet it is easy to understand that it was often difficult or impossible to separate groups. Small queens occur in both; without queens, workers can be separated only by pronotal hairs (when present)—a very unreliable character. Otherwise the workers of the two groups are quite similar.

We have therefore combined the two groups into a single *rufa* group. To be sure this makes a long key, but we find that better than two keys without knowing which to use.

### KEY TO THE SPECIES OF THE *RUFA* GROUP

- 1a. Scares with erect or suberect hairs on all surfaces . . . . . 2
- b. Scares with very few or no erect hairs . . . . . 4
- 2a. All hairs tapering to sharp points; thoracic hairs slender and unequal in length . . . . . *oreas*
- b. Some hairs spatulate; thoracic hairs all short and subequal in length (female no larger than largest worker) . . . . . 3
- 3a. Gastric pubescence very dense, nearly hiding integumentary sculpture . . . . . *microgyna*
- b. Gastric pubescence less dense, not dense enough to conceal integument . . . . . *nevadensis*
- 4a. Petiolar scale (seen from behind) with a flat or broadly concave crest; sides of upper half of scale parallel, tapering inward only in lower half (female sometimes no larger than largest worker, strongly shining, color dull brown with some yellow markings) . . . . . *dakotensis*
- b. Petiolar scale (seen from behind) with crest convex or angularly produced upward in middle; sides of scale tapering inward from crest to base . . . . . 5
- 5a. Clypeal fossa deep and pit-like; edge of clypeus ventral to pit sweeping upward to median lobe; median lobe box-like (i.e., sides descending abruptly to fossae and making angles with its anterior face) . . . . . 6
- b. Clypeal fossa shallow and scarcely pit-like; edge of clypeus ventral to pit broadly united to base of lobe and not forming a distinct curve with it; median lobe not box-like (i.e., sides descending to fossae through even curves which begin at carina) . . . . . 7
- 6a. Middle and hind tibiae with numerous erect hairs on all surfaces . . . . . *obscuriventris*
- b. Middle and hind tibiae without erect hairs except for double row on flexor surfaces . . . . . *laeviceps*
- 7a. Erect hairs on middle and hind tibiae usually abundant on all surfaces, but at least there are more than 2 erect hairs in addition to those on flexor surfaces . . . . . 8
- b. Erect hairs on middle and hind tibiae, when present, confined to double row on flexor surface, rarely 1 or 2 erect hairs elsewhere . . . . . 10
- 8a. Head of largest worker as broad as or broader than long; erect hairs on thorax unequal in length; head hairs



#### RUFA GROUP OF GENUS *FORMICA*

- only a little less abundant and not much longer than those on thorax ..... *obscuripes*
- b. Head of largest worker longer than broad; erect hairs on thorax short and of about equal length; head hairs notably longer and sparser than those on thorax ... 9
- 9a. Smaller workers extensively infuscated, medias more or less infuscated; legs in all sizes of workers brownish black ..... *planipilis*
- b. Head and thorax of all workers (except an occasional mimim) clear red; legs scarcely or not at all darker than thorax ..... *coloradensis*
- 10a. Gaster densely clothed with short erect hairs which (in profile) are so close together that they give appearance of a loose plush-like vestiture ..... 11
- b. Erect hairs on gaster much more widely spaced and not forming an even vestiture ..... 12
- 11a. Erect gastric hairs very short, averaging 0.06 mm long (female yellow, hairs very long, yellow, with tips curled) ..... *ciliata*
- b. Erect gastric hairs averaging 0.12 mm long (female dirty brown, mostly dull, without erect hairs on dorsum, densely pubescent) ..... *\*mucescens*
- 12a. Clypeus, gula, and gena strongly shining ... *subnitens*
- b. Clypeus, gula, and gena dull ..... 13
- 13a. Gula, crest of petiole, and thoracic dorsum usually without erect hairs, rarely 1 or 2 inconspicuous hairs ..... *haemorrhoidalis*
- b. Pronotum, epinotum, and crest of petiole with numerous erect hairs in at least a considerable part of nest series ..... 14
- 14a. Erect hairs slender and pointed at tip ..... 15
- b. Erect hairs blunt or spatulate (female no larger than largest worker) ..... 16
- 15a. Erect hairs on occipital angles in most of nest series ..... *integroides*
- b. Occipital angles without erect hairs ..... *propinqua*
- 16a. Occipital margin evenly convex in all sizes of workers; erect hairs on thorax about 0.06 mm long and spatulate ..... *querquetulana*
- b. Occipital margin flat or slightly concave for at least 1/2 width of head in largest workers and often in smaller workers as well; thoracic hairs various ..... 17
- 17a. Erect hairs always present on crest of petiole; pubescence on gastric dorsum dense and wholly concealing the surface; sides of gaster feebly shining ..... 18
- b. Erect hairs never present on crest of petiole; pubescence of gastric dorsum rather dilute and not wholly concealing surface at rear edge of somites; sides of gaster strongly shining ..... *whymperi*
- 18a. Crest of petiole broadly rounded in side view; body hairs broadly spatulate at tips ..... *densiventris*
- b. Crest of petiole sharp in side view; body hairs narrowly spatulate at tip ..... *\*calviceps*

#### *Formica ciliata* Mayr

**WORKERS.** Small to large. **LARGEST WORKER.** Head yellowish red, thorax strong brown, gaster dark brown. Dull. **SMALL WORKER.** Head black dorsally and reddish yellow ventrally, thorax dark brown, gaster black. Dull.

**RANGE.** Nevada, Utah, and Colorado northward to Montana and eastward to Minnesota.

**NEVADA NOTES AND LOCALITY.** Map 58. Our Nevada material is represented by a single collection: Kingston Ranger Sta. in Toiyabe Ra., Lander Co., 7,100 ft.; in the Cool Desert. The thatch consisted mostly of chips of bark; it was 1 m in diameter and located at the base of a dead sagebrush.



### *Formica coloradensis* W.M. Wheeler

**WORKERS.** Medium-sized. **LARGEST WORKER.** Head yellowish red, thorax strong brown, gaster very dusky red. Dull. **SMALL WORKER.** Head and thorax yellowish red with small patches of dark reddish brown infuscation, gaster dark reddish brown with black infuscation. Dull.

**RANGE.** New Mexico through Colorado, Utah, and Nevada into Idaho.

**LITERATURE NOTES.** In Colorado, Gregg (1963) found this species nesting under stones and wood, in decaying logs and in thatch mounds.

**NEVADA NOTES AND LOCALITIES.** Map 59. We have 2 records: Hwy. 27 nr Mt. Rose, Washoe Co., 9,100 ft., in fallen coniferous trunk, which was slightly decayed; it was in the Coniferous Forest Biome. The second is from the Test Site in Nye Co.

### *Formica dakotensis* Emery

**WORKERS.** Medium-sized. **LARGEST WORKER.** Head dark red, thorax yellowish red, gaster with each somite dark reddish brown anteriorly and black posteriorly. Feebly shining. **SMALL WORKER.** Head dark reddish brown dorsally and dark red ventrally, thorax dark reddish brown, gaster as in large worker. Feebly shining.

**RANGE.** Southern Canada, Alaska, and the northern states with southward extensions to Nevada and New Mexico.

**LITERATURE NOTES.** Temporary hosts for *F. dakotensis* are *F. fusca*, *F. lepida*, *F. montana*, and *F. pallidefulva*.

**NEVADA NOTES.** Our 8 records are from 7 localities, which are widely scattered north of the Hot Desert. Two are in the Coniferous Forest Biome, 1 in the ectotone above, and 1 in the Alpine Biome. Five nests were under stones and 1 was under a dead sagebrush trunk.

**NEVADA LOCALITIES.** Map 60. *Elko Co.*: Snowslide Gulch in Jarbidge Mts. 8,600 ft. *Nye Co.*: South Twin River in Toiyabe Ra. 8,400 ft.; Table Mt. (E side) 10,800 ft. *Washoe Co.*: Mt. Rose 10,500 ft. *White Pine Co.*: Wheeler Peak 10,000 ft., 10,500 ft.; North Schell Peak 9,700 ft.; Snake Creek in Snake Ra.

### *Formica densiventris* Viereck

**WORKERS.** Small to medium-sized. **LARGEST WORKER.** Head and thorax dark reddish brown with dusky red infuscation, gaster black. Dull. **SMALL WORKER.** Head and thorax strong brown, gaster black. Dull.

**RANGE.** New Mexico, Colorado, Utah, Nevada, California, and Washington.

**NEVADA NOTES.** Our 24 records are from 16 localities, which are widely scattered throughout the state north of the Hot Desert; 5,500–10,000 ft. Five records are from the Pinon-Juniper Biome, 6 from the Coniferous Forest Biome, and 1 is from the ecotone above it. Four nests were in and under rotten wood, 1 was under a stone, 1 was under a stone surmounted by thatch, and 1 was under a prostrate sagebrush trunk. When a populous nest was disturbed the workers moved



**Figure 41.** *Formica haemorrhoidalis*. Thatch mound. Elko County, 7 mi. northeast of Oasis.

rapidly and attacked promptly; the bite was annoying. As hosts we found *F. argentea*, *F. fusca*, *F. neorufibarbis*, and *F. subpolita*.

**NEVADA LOCALITIES.** Map 58. *Elko Co.*: 13 mi. SW Mountain City; Ruby Dome 7,200 ft.; Lamoille Canyon 6,300 ft. (Cole, 1956c:257). *Esmeralda Co.*: Boundary Peak 8,900 ft. *Humboldt Co.*: Onion Reservoirs in Pine Forest Ra. 8,000 ft. *Lincoln Co.*: Panaca Summit 6,700 ft. *Nye Co.*: Ophir ruins 7,600 ft.; 4 mi. S McIntyre Summit; ridge S Mt. Jefferson 10,000 ft. *Ormsby Co.*: nr Lake Tahoe (Cole, 1956c:257). *Washoe Co.*: Hwy. 27 nr Mt. Rose 8,800 ft.; between Little Valley and Lake Tahoe 7,800 ft. *White Pine Co.*: 10 mi. SW Ely 7,500 ft.; Ely 5,500 ft.; Wheeler Peak 9,100 ft.; Lehman Caves Nat. Mon. (-12N-59) 7,000 ft.

### *Formica haemorrhoidalis* Emery

**WORKERS.** Medium-sized to large. **LARGEST WORKER.** Head yellowish red, thorax reddish yellow, gaster dark reddish brown. Dull. **SMALL WORKER.** Head and thorax yellow with dusky red infuscation, gaster dark reddish brown. Dull.

**RANGE.** California to Washington, thence eastward to Colorado and the Dakotas.

**LITERATURE NOTES.** In Colorado, Gregg (1963) found this species in mixed and deciduous forests, pinyon-juniper woodland, grassland, and sagebrush desert. In North Dakota we (Wheeler and Wheeler, 1977:10) reported it as a grassland species which preferred shrubby areas, mostly sagebrush. The nest is usually started under a stone or around the base of some small plant (frequently sagebrush). In some nests very little thatch is used, but dome-like thatch mounds are common, averaging 20 cm in height and 60 cm in diameter. The large thatch domes have numerous entrances over all parts of the surface.

**NEVADA NOTES.** Our 40 records are from 26 localities, which are widely scattered north of the Hot Desert except none in the northwest; 4,300–8,800 ft. Six records were from

the Cool Desert (1 from a cottonwood grove), 11 were from the Pinyon-Juniper Biome, and 1 from the Coniferous Forest.

The nest structure (Fig. 41) is so varied that we give all our recorded descriptions; no two were alike: under horizontal buried sagebrush trunk; thatch mound around rotten log 1 m long; under slightly buried stone with excavated soil at one end of stone; under several contiguous partly buried stones with excavated soil at edge of largest stone; under a slightly buried stone; thatch 15 cm deep on horizontal dead sagebrush trunk and nearby thatch 38 cm in diameter around erect dead sagebrush trunk; a polycalic cluster of 7 thatch mounds  $1\frac{1}{2}$ – $7\frac{1}{2}$  m apart, each thatch mound on top of a large deeply buried stone except 1 around a dead *Purshia* trunk, thatch mostly pine needles; asymmetrical thatch mound  $94 \times 102$  cm, of pine needles; asymmetrical thatch mound against a juniper stump, thatch of juniper needles; under old lumber and piece of tin roofing, debris piled around timber; under a log 60 cm long and 30 cm in diameter.

Our notes on the behavior of one colony can serve as a sample for the species: fast, aggressive, bite annoying; workers patrolling pine trunks and numerous on the ground; certainly the dominant animal in that habitat.

**NEVADA LOCALITIES.** Map 60. *Douglas Co.*: 16 mi. SE Minden 5,700 ft.; Nevada Beach (Cole, 1956d:260). *Elko Co.*: 1 mi. W Harrison Pass 6,600 ft.; 7 mi. NE Oasis 6,000 ft.; 15 mi. SW Elko 5,000 ft.; Pole Canyon in East Humboldt Ra.; Pine Creek in Jarbidge Mts. 6,500 ft. *Lander Co.*: Bob Scott Summit 7,300 ft. *Lyon Co.*: Nye Canyon 6,200 ft.; -7N-26 6,100 ft.; 4 mi SE Wabuska 4,300 ft.; Smith. *Mineral Co.*: Montgomery Pass 7,100 ft.; Lucky Boy Pass 8,000 ft. *Nye Co.*: Troy Peak in Grant Ra. 7,400 ft. *Ormsby Co.*: Kings Canyon; nr Lake Tahoe (Cole, 1956d:259 as *tahoensis*). *Storey Co.*: 4 mi. N Virginia City 6,200 ft.; 16 mi. SE Reno (-18N-21) 5,800 ft. *Washoe Co.*: Lower Price Lake 7,100 ft.; Geiger Grade; S end Warm Springs Valley; Reno; Verdi. *White Pine Co.*: 10 mi. SW Ely 7,500 ft.; nr Murry Summit in Egan Ra. 8,800 ft.

### *Formica integroides* Emery

**WORKERS.** Small to large. **LARGEST WORKER.** Head and thorax reddish yellow to yellowish red, thorax with dark reddish brown infuscation, gaster dark reddish brown. Dull. **SMALL WORKER.** Head and thorax dark brown with small patches of reddish yellow, gaster dark reddish brown. Dull.

**RANGE.** Mountains of California and western Nevada northward to Washington.

**LITERATURE NOTES.** Nest in open woods. Extensive use of thatch, often in the shape of a dome.

**NEVADA NOTES.** All our 6 records are from the Sierra, i.e., near Lake Tahoe. They represent 4 localities in the Coniferous Forest Biome. Nests were in decaying stumps covered, or surrounded by, thatch. All colonies were populous, active, and aggressive; the bite was annoying.

**NEVADA LOCALITIES.** Map 61. *Washoe Co.*: 10 mi. W Reno 6,500 ft., 7,000 ft.; 6 mi. SW Reno 6,400 ft.; 4 mi. N Verdi 6,300 ft.

### *Formica laeviceps* Creighton

**WORKERS.** Small to large. **LARGEST WORKER.** Head red, thorax yellowish red with dark brown markings, gaster dark reddish brown anteriorly and black posteriorly. Dull. **SMALL WORKER.** Head and thorax dark reddish brown, gaster black. Head feebly shining, thorax and gaster dull.

**RANGE.** Nevada, Utah, Colorado, and the Dakotas.

**NEVADA NOTES.** We have 8 records from 7 localities; 4,200–7,100 ft. One was in the Coniferous Forest Biome and 1 in the Cool Desert. Only 1 nest was described: in an asymmetrical thatch mound  $86 \times 107$  cm in diameter and 56 cm in height.

Workers from the Battle Mt. nest were tending *Zyaxaphis filifolia* Gill. & Palmer (Homoptera: Aphididae; det. D. Hille Ris Lambers) on *Artemisia tridentata*.

**NEVADA LOCALITIES.** Map 62. *Douglas Co.*: Spooner Summit 7,100 ft. *Lander Co.*: Battle Mt. 8 mi. SW town of Battle Mountain 5,400 ft. *Storey Co.*: Mustang, 4,200 ft.; 8 mi. NE Virginia City. *Washoe Co.*: Clear Creek (-34N-22); Verdi, 4,800 ft.; S end Warm Springs Valley.

### *Formica microgyna* W.M. Wheeler

**WORKERS.** Small to medium-sized. **LARGEST WORKER.** Head and thorax yellowish red, gaster dark reddish brown. Dull to feebly shining. **SMALL WORKER.** Head strong brown with reddish black infuscation, thorax reddish yellow with small dorsal patches of dark brown infuscation, gaster dark reddish brown. Dull to feebly shining.

**RANGE.** Wyoming, Nevada, Utah, Colorado, and New Mexico.

**LITERATURE NOTES.** In Colorado, Gregg (1963) found this species in coniferous forests, mixed forests, and foothill meadows; nests were under stones or wood, in rotten wood or in thatch. Hosts for *F. microgyna*: *F. argentea*, *F. lasioides*, and *F. neogagates*.

**NEVADA NOTES.** We have 6 records from 5 localities. One was in *Sarcobatus Subclimax* in the Cool Desert and one was in the Alpine Biome. Both of these were nesting under half-buried stones.

**NEVADA LOCALITIES.** Map 60. *Elko Co.*: Lamoille Canyon in Ruby Mts. 6,300 ft. (Cole, 1956c:257). *Esmeralda Co.*: Boundary Peak, 9,000 ft.; SE face of mt. next to Boundary Peak 11,200 ft. *Lander Co.*: 20 mi. SW Crescent Valley (-27N-46) 5,000 ft. *Nye Co.*: Test Site (Cole, 1966:24).

### *Formica nevadensis* W.M. Wheeler

**WORKER.** Medium-sized. Head and thorax strong brown, gaster very dusky red. Feebly shining.

**RANGE.** Nevada.

**NEVADA NOTES.** We have 7 records from 5 localities; 6,800–10,400 ft. All were from the Coniferous Forest Biome. We have description of one nest: a crescent of thatch beside a stone. The workers were foraging on a young bristlecone pine.

**NEVADA LOCALITIES.** Map 59. *Esmeralda Co.*: Boundary Peak 9,000 ft. *Ormsby Co.*: "Ormsby County"



**Figure 42.** *Formica obscuripes*. Thatch dome of *Juncus* stems. Washoe County, Little Valley.



**Figure 43.** *Formica obscuripes*. Thatch dome. Washoe County, 9 mi. east-northeast of Vya.

(W.M. Wheeler, 1904b:373). *Washoe Co.*: Whites Canyon on Mt. Rose, 6,800 ft.; nr Lake Tahoe 6,900 ft. (Cole, 1956c: 256). *White Pine Co.*: North Schell Peak 10,400 ft.

### *Formica obscuripes* Forel

**WORKERS.** Medium-sized to large. **LARGEST WORKER.** Head dark brown dorsally and strong brown ventrally, thorax dark reddish brown, gaster black varying to head and thorax yellowish red, gaster black. Dull. **SMALL WORKER.** Head and thorax very dusky red, gaster with each somite very dusky red anteriorly and black posteriorly varying to head dark reddish brown dorsally and yellow ventrally, thorax and gaster dark reddish brown. Dull.

**RANGE.** Southern Canada and the northern states from Indiana and Michigan westward to British Columbia and southward to California, Nevada, Utah, Colorado, and New Mexico.

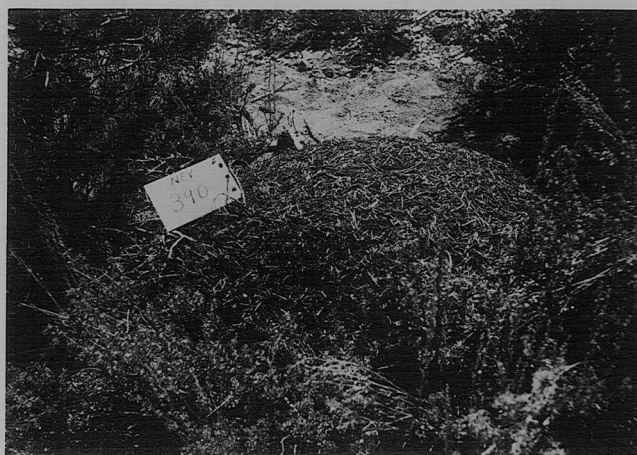
**LITERATURE NOTES.** Nests are usually in open areas devoid of cover but sometimes in open woods. They are begun at the base of small plants (frequently sagebrush). Extensive use is made of thatching. The mature nest consists of a large mound of collected detritus. An important feature is a large brood chamber in the center of the thatch in which all the brood is kept. Sather (1972) provides a comprehensive account of the growth and maturity of mound structure.

**NEVADA NOTES.** *Formica obscuripes* is scattered throughout the state north of the Hot Desert (i.e., north of latitude 38°N). We have 60 records from 44 localities; 4,300–10,480 ft. (80% between 5,000 and 9,000 ft.). Twenty of the records were from the Cool Desert (1 from a *Sarcobatus* Subclimax and 1 from a disturbed area), 5 were from the Pinyon-Juniper Biome, 6 were from the Coniferous Forest Biome, and 1 was from the Alpine Biome.

The nest is typically a dome-shaped thatch mound (Figs. 42, 43) which was usually circular in basal outline but often elliptical. The thatch was mounted on an earthen base 5–8 cm high and was greater in diameter (43–150 cm, average

88 cm) than the thatch. The thatch itself was piled in the center of this base and measured 30–138 cm (average 66 cm) in diameter and 13–43 cm (average 30 cm) in height. The composition of the thatch was opportunistically determined, i.e., it depended upon the available plant material. Apparently when a favorite material was sufficiently abundant, the thatch was homogeneous; this was true especially of pine needles and juniper sprays. There are numerous entrances throughout the thatch; we counted at least 50 in one mound. The foregoing might be called typical, but many variants occurred; e.g., 2 nests were under stones and 1 was under a log lying on the ground. A common variant was a long pile of messy thatch along a prostrate sagebrush trunk.

Colonies were populous and the workers were very aggressive. When a colony was disturbed the surface of the mound was soon covered with workers. Many assumed the defensive position: head up and mandibles widely spread; gaster turned forward under the thorax and ready to spray



**Figure 44.** *Formica obscuriventris*. Thatch dome of pine and juniper needles. White Pine County, Lehman Caves National Monument.





**Figure 45.** *Formica obscuriventris*. Thatch dome. Elko County, Pilot Peak. Photograph by Gary Nigro.

formic acid into any wound made by the mandibles. Many workers started spraying at the beginning of the disturbance and soon there was an invisible cloud of formic acid vapor above the nest that was irritating to human eyes and noses. The bites of the workers were also annoying.

Under normal conditions workers would not expose themselves to direct sunlight during the hot hours of the day, but they worked diligently in any shaded areas no matter how small. Just what they were doing was hard to determine. Seemingly they were removing sticks from the thatch and putting them back at a slightly different angle.

This species was tending *Aphis incognita* (Hottes and Frison) at Bunker Hill (-16N-43), Lander Co., 8,100 ft. and *Brevicorne symphoricarpi* (Thomas) (both Homoptera: Aphididae; det. W.B. Stoetzel) on *Symphoricarpos vaccinioides*, nr Murry Summit, White Pine Co., 8,200 ft.

NEVADA LOCALITIES. Map 61.

### *Formica obscuriventris* Mayr

**WORKERS.** Small to large. **LARGEST WORKER.** Head red with dark reddish brown infuscation, thorax dark reddish brown, gaster with each somite dark reddish brown anteriorly and black posteriorly varying to head yellowish red with dark red infuscation, thorax red, gaster with each somite dark reddish brown anteriorly and black posteriorly. Head and thorax dull, gaster feebly shining. **SMALL WORKER.** Head dark reddish brown to yellowish red with reddish brown infuscation, thorax strong brown with dark brown infuscation to strong brown with yellowish red infuscation, gaster with each somite dark reddish brown anteriorly and black posteriorly. Dull.

**RANGE.** Southern Canada and New England southward to Virginia and thence westward to the Pacific.

**NEVADA NOTES.** Our 48 records are widely scattered in that part of the state north of the Hot Desert boundary (with 1 exception); they represent 39 localities; 5,600–10,000 ft. Nine of these records were from the Cool Desert, 8 from the Pinyon-Juniper Biome, 6 from the Coniferous Forest, and 1 from the Alpine Biome. Our remarks about the nest



**Figure 46.** *Formica oreas*. Thatch mound, the tallest (60 cm) we have ever found. Washoe County, Hobart Creek Reservoir.

of *F. obscuripes* apply to *F. obscuriventris* (Figs. 44, 45) but the latter seemed to produce more variants. The same applied to behavior, except that *F. obscuriventris* was more prone to send out foraging columns.

*Formica obscuriventris* was found tending the aphid, *Aphis filifoliae* G. & P. (Homoptera: Aphididae; det. L.M. Russell), on *Pinus monophylla* at Lehman Caves Nat. Mon., White Pine Co., 6,800 ft.

NEVADA LOCALITIES. Map 62.

### *Formica oreas* W.M. Wheeler

**WORKERS.** Small to large. **LARGEST WORKER.** Head clear yellowish red or mostly infuscated with dark reddish brown, thorax yellowish red to dark reddish brown, gaster with each somite very dusky red to dark reddish brown anteriorly and black posteriorly. Head moderately shining, thorax and gaster dull. **SMALL WORKER.** Head very dusky red to strong brown, thorax strong brown to dark reddish brown, gaster dark reddish brown to dark brown. Dull to feebly shining.

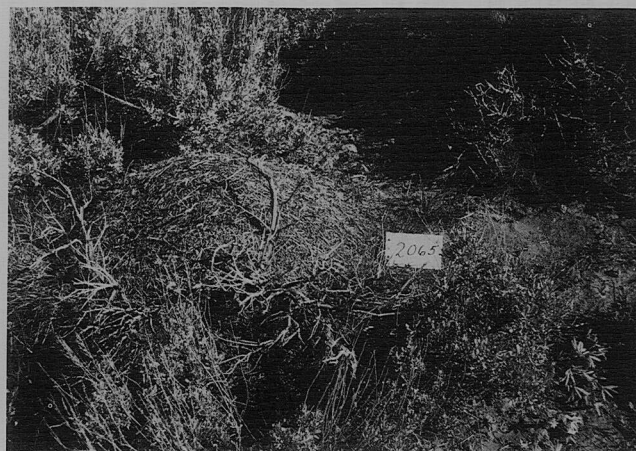
**RANGE.** Saskatchewan and North Dakota to New Mexico, northwestward to Washington and southern Alberta.

**LITERATURE NOTES.** In North Dakota, Sather (1972: 107) found that most colonies formed an integrated cluster of nests, i.e., were polycalic. Workers visited freely between nests and often transferred brood.

**NEVADA NOTES.** Our 16 records represent 12 localities and are widely scattered north of the Hot Desert; 6,200–9,000 ft. Five records were from the Cool Desert and 4 were from the Coniferous Forest Biome. Extensive use was made of thatch in the nest but more eccentrically (both literally and figuratively) than by either *F. obscuripes* or *F. obscuriventris*. We have described 5 nests (Fig. 46) as “typical thatch,” i.e., either circular or elliptical domes. Two of the nests were polycalic (i.e., had small accessory thatch mounds in the vicinity). One typical dome had decaying wood buried in the thatch. Three nests were under stones, with a small amount of thatch on or beside the stone. One colony had its thatch scattered along a prostrate living trunk of sagebrush.



**Figure 47.** *Formica planipilis*. Thatch dome. Elko County, 7 mi. north-northwest of Jarbidge.



**Figure 48.** *Formica planipilis*. Thatch mound. Washoe County, 24 mi. southeast of Vya.

The behavior was similar to that of *F. obscuripes*. The workers of one colony of *F. oreas* were tending *Obtusicauda artemisicola* (Williams) (Homoptera: Aphididae; det. D. Hille Ris Lambers) on sagebrush (*Artemisia tridentata*) 8 mi. NW Jarbidge (Elko Co.) 6,200 ft. Workers were also tending *Cinara* sp. (Homoptera: Aphididae) on lodgepole pine (*Pinus murrayana*) in Little Valley (Washoe Co.) 6,400 ft.

**NEVADA LOCALITIES.** Map 58. *Elko Co.*: end of Lamoille Canyon road 8,800 ft.; 8 mi. NW Jarbidge 6,200 ft.; 10 mi. N Contact. *Esmeralda Co.*: Boundary Peak 9,000 ft. *Eureka Co.*: Eureka 6,200 ft. *Ormsby Co.*: McClellan Peak (22-16N-20) 7,000 ft.; Lake Tahoe. *Washoe Co.*: Little Valley 6,400 ft.; Hobart Creek Reservoir 7,200 ft.; McClellan Peak (15-16N-29) 7,300 ft.; 34-23N-19. *White Pine Co.*: Ellison Ranger Sta. in White Pine Mts. 7,200 ft.

### *Formica planipilis* Creighton

**WORKERS.** Small to large. **LARGEST WORKER.** Head red with dusky red infuscation to strong brown ventrally and brown dorsally, thorax reddish yellow with dark reddish brown infuscation, gaster black or each somite dark reddish brown anteriorly and black posteriorly. Head moderately shining, thorax and gaster feebly shining. **SMALL WORKER.** Head and thorax dark reddish brown heavily infuscated with black, gaster dark reddish brown varying to entire insect yellowish red infuscated with dark reddish brown. Feebly shining to dull.

**RANGE.** North Dakota, Wyoming, Colorado, Utah, Nevada, Idaho, Oregon, Washington, and British Columbia.

**NEVADA NOTES.** Our 46 records are widely scattered throughout the state and represent 29 localities; 4,800–10,200 ft. (75% from 6,000–9,000 ft.). Five records were from the Cool Desert, 3 from the Pinyon-Juniper Biome, and 4 from the Coniferous Forest Biome. *F. planipilis* makes extensive use of thatch. Most of our nests (Figs. 47, 48) were typical domes averaging 53 cm in diameter and 28 cm in height; a soil base 76 cm in diameter was recorded in two instances. Nest material: grass culms in pieces 5 cm long, juniper sprays, pine needles. Atypical nests: 1 under log lying on ground, 1

in log, 1 with thatch spread along a log 60 cm in diameter and 1.8 m long, 1 with thatch surrounding a crack in a rock.

**NEVADA LOCALITIES.** Map 59. *Elko Co.*: 5 mi. N North Fork 6,500 ft.; end of Lamoille Canyon road, 8,800 ft.; 4 mi. ESE Elko 6,400 ft.; 7 mi. NNW Jarbidge 6,300 ft.; Lee Lake in Ruby Mts. 9,700 ft.; “Ruby Mts.” (Cole, 1956d: 259); Snowslide Gulch in Jarbidge Mts., 8,000 ft.; 4-47N-52 on Idaho border, 5,000 ft. *Esmeralda Co.*: Middle Creek 8,000 ft. *Lander Co.*: Bunker Hill, 7,600 ft.; Austin Summit, 7,600 ft.; Austin (Cole, 1956d:259). *Nye Co.*: Peavine Creek 6,800 ft.; Test Site (Cole, 1966:23). *Ormsby Co.*: nr Lake Tahoe (Cole, 1956d:259). *Pershing Co.*: 1 mi. ENE Star Peak in Humboldt Ra. 7,600 ft.; Humboldt Canyon 4,800 ft. *Washoe Co.*: Fuller Lake 3 mi. S Verdi 6,000 ft.; 24 mi. SE Vya 6,300 ft.; 5 mi. SW Reno 5,600 ft. *White Pine Co.*: 2 mi. E McGill 7,700 ft.; North Schell Peak 10,200 ft.; Mt. Washington 7,400 ft.; nr Murry Summit in Egan Ra. 8,900 ft.; South Schell Peak 8,800 ft.; Wheeler Peak 8,300 ft.; 12 mi. NW Ely; “Mt. Wheeler (Lehman Cave)” (Creighton, 1940: 9); Ely (Cole, 1956d:259).

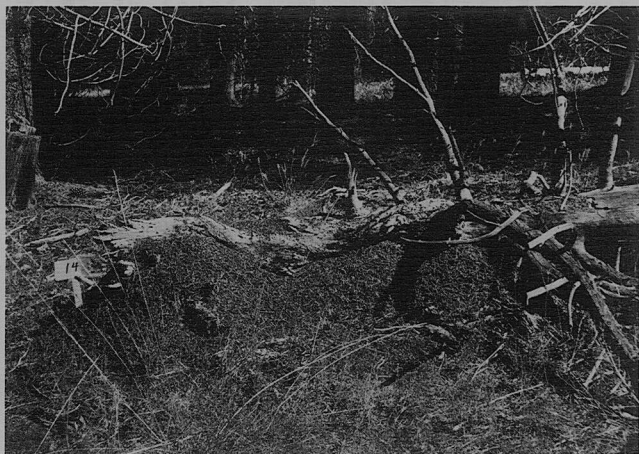
### *Formica propinqua* W.M. Wheeler

**WORKERS.** Small to large. **LARGEST WORKER.** Head yellowish red, thorax strong brown, gaster dusky red with black infuscation or entirely black. Dull. **SMALL WORKER.** Similar to large worker varying to reddish black with reddish yellow patches on venter of head and in spots on thorax. Dull.

**RANGE.** Colorado, Utah, Nevada, California, Idaho, Oregon, and Washington.

**NEVADA NOTES.** Our 21 records are mostly concentrated near Lake Tahoe, but 5 are widely scattered elsewhere. The records represent 19 localities 3,900–7,800 ft. Three records were in the Cool Desert (1 in a disturbed area), 2 in Pinyon-Juniper Biome, and 9 in the Coniferous Forest Biome. The nest (Figs. 49, 50) of this species was typically a messy pile of thatch on, in, under or against a dead stump or prostrate trunk, the latter on or several feet above the ground. Polycaly was common. The workers were numerous, active,





**Figure 49.** *Formica propinqua*. Thatch under prostrate trunk. Washoe County, Little Valley.

and aggressive. Their bite was annoying and they were quick to becloud the atmosphere with formic acid.

We found *Myrmecophila* (probably *oregonensis*) (Orthoptera: Gryllidae; det. A.B. Gurney) in a nest at Hobart Creek Reservoir (Washoe Co.), 7,200 ft.

**NEVADA LOCALITIES.** Map 63. *Churchill Co.*: 5 mi. SW Fallon 3,900 ft.; Fallon 3,900 ft. *Elko Co.*: Secret Pass 6,400 ft. *Humboldt Co.*: Soldier Meadows 4,400 ft. *Lincoln Co.*: Ursine 5,800 ft. *Ormsby Co.*: nr Lake Tahoe (Cole, 1956d:257). *Storey Co.*: 4 mi. N Virginia City 6,200 ft.; 3 mi. N Virginia City 6,400 ft. *Washoe Co.*: Little Valley 6,400 ft., 7,400 ft.; Lower Price Lake 7,000 ft.; between Little Valley and Lake Tahoe 7,600 ft., 7,800 ft.; Hobart Creek Reservoir 7,200 ft.; Lemmon Valley 9 mi. N Reno 4,900 ft.; 5 mi. SW Reno 5,600 ft.; Smoke Creek 4,100 ft.; Reno.

### *Formica querquetulana* Kennedy and Dennis

**WORKER.** Medium-sized. Head and thorax reddish yellow with very little to extensive infuscation of dark brown, gaster with each somite very dusky red anteriorly and black posteriorly. Dull.

**RANGE.** New England westward to Montana, Nevada, and California.

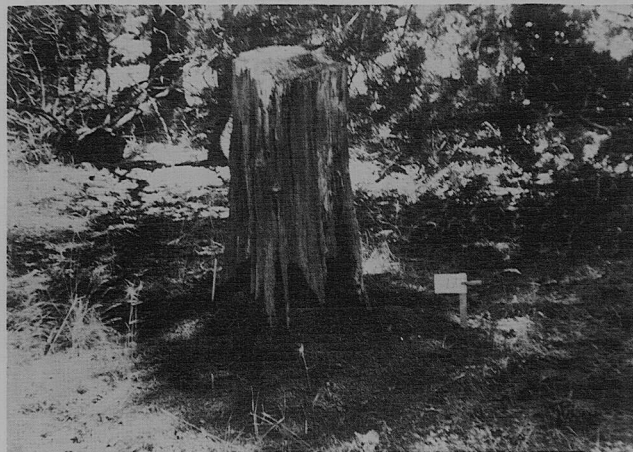
**LITERATURE NOTE.** *Formica fusca* has been reported as the host for *F. querquetulana*.

**NEVADA NOTES.** We have 3 records from 3 localities and only scant information about one, which is in the Alpine Biome at 11,200 ft.; only strays were found and they were mixed with strays of *F. microgyna*.

**NEVADA LOCALITIES.** Map 63. *Esmeralda Co.*: SE face of mt. next to Boundary Peak 11,200 ft.; Lida Summit 7,400 ft. *Ormsby Co.*: Kings Canyon.

### *Formica subnitens* Creighton

**WORKERS.** Small to large. **LARGEST WORKER.** Head and thorax yellowish red, thorax with dark reddish brown infuscation, gaster with each somite very dusky red anteriorly



**Figure 50.** *Formica propinqua*. Thatch in and around stump. Washoe County, Little Valley.

and black posteriorly varying to head yellowish red, thorax reddish yellow, gaster with each somite dark reddish brown anteriorly and black posteriorly. Head feebly shining (except clypeus, gula, and genae strongly shining), thorax dull, gaster feebly shining. **SMALL WORKER.** Head yellowish red with dark reddish brown infuscation, thorax dark brown, gaster with each somite dark brown anteriorly and black posteriorly.

**RANGE.** North Dakota, Wyoming, Colorado, Idaho, New Mexico, Nevada, California, Oregon, and British Columbia.

**LITERATURE NOTES.** This species seems to make little use of thatch. The mounds were usually of soil and detritus.

**NEVADA NOTES.** *F. subnitens* is widely scattered in the northern half of the state; 4,600–10,500 ft. We have 9 records from 9 localities, 2 of which were in the Cool Desert and 2 in the Coniferous Forest Biome. Three nests were described: (1) a dome 48 cm in diameter composed of soil and gravel with only a little plant debris; (2) under many stones; (3) messy pile of thatch 28 by 53 cm piled against a stone.

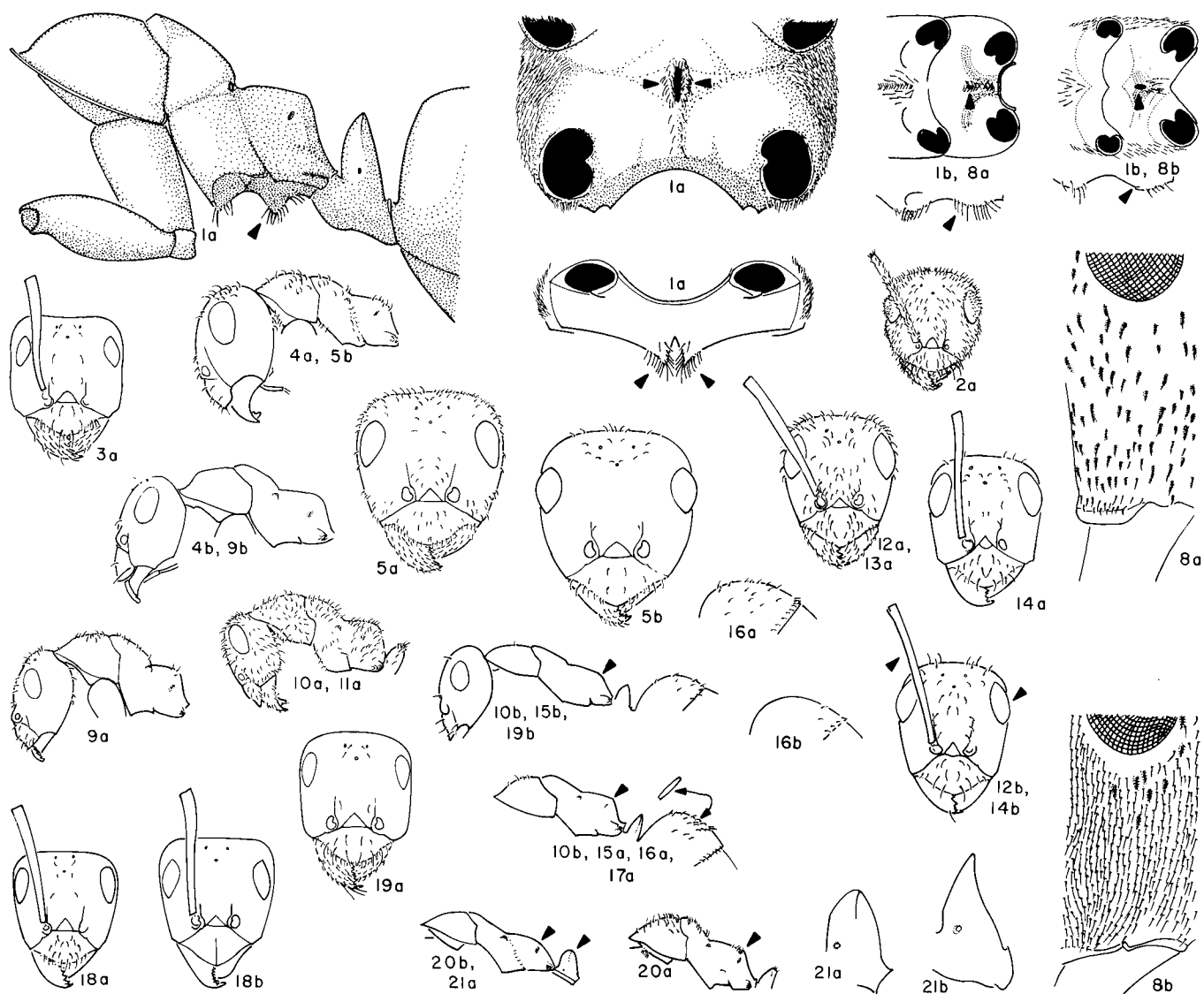
**NEVADA LOCALITIES.** Map 62. *Humboldt Co.*: 6 mi. S Paradise Valley 4,600 ft. *Lincoln Co.*: Panaca 4,800 ft. *Washoe Co.*: 26-21N-18 4,600 ft.; Red Rock Road (15-21N-18) 5,200 ft.; Duck Flat 4,800 ft.; Mt. Rose 10,400 ft., 10,500 ft.; McClellan Peak (15-21N-18) 7,300 ft. *White Pine Co.*: 30-18N-60 6,300 ft.

### *Formica whymperi* Forel

**WORKER.** Medium-sized. Head and thorax reddish yellow with dark brown infuscation varying to head dark reddish brown with dark brown infuscation, thorax dark brown, gaster dark reddish brown. Dull.

**RANGE.** Michigan to Minnesota; Montana to British Columbia, southward to California and thence eastward to Colorado; also New Mexico.

**LITERATURE NOTES.** Colonies are rather small. The nests are under stones and logs, which are banked with detritus. Hosts for *F. whymperi* have been *F. neoclara* and *F. neorufibarbis*.



#### FUSCA GROUP OF GENUS FORMICA

**NEVADA NOTE AND LOCALITY.** Map 63. We have 1 record for this species: *Elko Co.*: Lamoille.

#### The *Fusca* Group

In general this is a docile group, but members of populous colonies can become very aggressive. Many workers bite and spray formic acid into the wound. We found the bite annoying. Other workers just spray and help create the invisible cloud of formic acid vapor that is formed over the disturbed nest.

The *fusca* group of *Formica* was extensively revised by Francoeur in 1973. Whereas Creighton in 1950 had recognized 13 species in this group, Francoeur increased the number to 33, 14 of which were new. Although we do not accept all his changes, we do not find it necessary to make a complete revision. Our key is modified from Francoeur's.

The first couplet of the new key requires explanation, since it involves a new metasternal character discovered by Francoeur. It is a very useful character but difficult to see without some preparatory technique. Here are directions based upon our method: From the preserved sample of a colony belonging to the *fusca* group, pin 3 representative workers on 3 triangles on the same pin in the usual manner. Grasp a fourth worker by the thorax with forceps. Hold it firmly on its back. With fine forceps remove the meso- and metathoracic legs on one side, especially the entire coxae. Put a fourth triangle on the pin and glue the mutilated ant upside down on it. The character of the first couplet will then be in plain view.

If the colony is represented only by dried ants on a pin, i.e., no duplicates in alcohol, the technique is somewhat more difficult. Remove one of the triangles from the pin and soak

it and its ant in relaxing fluid (Wheeler and Wheeler, 1963: 42). Transfer to the appropriate solvent to loosen the relaxed ant from the triangle. Remove the legs and remount upside down, as described above.

In pinning all specimens in the *fusca* group, the posterior surface of the head (i.e., the gula) should be plainly visible.

# **KEY TO THE SPECIES OF THE *FUSCA* GROUP**

(Modified from Francoeur, 1973)

- 1a. Metasternum with a pair of distinctly hairy triangular lobes, arising 1 on either side of median sternal cavity; mesometasternal profile composed of a concavity followed by a hairy triangle ..... 2
- b. Metasternum without such lobes; mesometasternal profile composed of a concavity followed by a straight or convex line ..... 7
- 2a. Eye and scape with numerous small erect hairs ..... *\*pilicornis*
- b. Eye and scape without erect hairs ..... 3
- 3a. Strongly polymorphic; thorax opaque or subopaque; dorsal gastric hairs long and flexuous and tapering from base to apex; gastric pubescence dilute, surface strongly shining; eye small (OI less than 30) ..... *subpolita*
- b. Feebly polymorphic or monomorphic; dorsal gastric hairs short and bristle-like, nearly same diameter throughout, tip truncate or abruptly tapered; gastric pubescence normal or dense; surface dull or very dull; OI greater than 30 ..... 4
- 4a. Erect hairs present on occiput and epinotum ..... 5
- b. Erect hairs absent on gena, gula, and epinotum ... 6
- 5a. Gena and mesopleuron with erect hairs ... *\*montana*
- b. Gena and mesopleuron without erect hairs ..... *\*altipetens*
- 6a. Concolorous black or brownish black ..... *\*occulta*
- b. Brownish to yellowish; usually bicolored ... *neoclara*
- 7a. Concolorous black, blackish or yellowish brown or if bicolored, thorax lighter than head and gaster (thorax yellow and hairy or thorax reddish and upper half of head black; smallest workers and some largest may be so infuscated that light color is reduced to patches on genae and thorax) ..... 8
- b. Bicolored: head and thorax red, often infuscated with patches of reddish brown, especially on dorsum; gaster black or blackish brown ..... 20
- 8a. Gena between eye and mandible with widely spaced coarse elongate punctures; hairs abundant around spinasternal cavity ..... 9
- b. Gena between eye and mandible without coarse elongate punctures or, if present, they are near eye and mixed with small circular punctures; spinasternal hairs varied ..... 10
- 9a. Erect hairs abundant on occiput, thoracic dorsum and gastric dorsum; concolorous brownish black or black, sometimes thorax and petiole lighter than head and gaster ..... *hewitti*
- b. Erect hairs few or none on occiput, dorsum of thorax and dorsum of gaster; head and gaster dark reddish brown to brownish black, thorax yellowish brown with

reddish brown infuscation (smallest and some larger workers may be so infuscated that lighter color is reduced to patches on gena and thorax) ... *neurufibaris*

- 10a. Hairs abundant on gula, occiput, thorax, metafemora, and dorsal margin of petiole ..... 11
- b. Hairs reduced: absent from epinotum, dorsal margin of petiole, and 1-3 other structures mentioned above ..... 15
- 11a. Hairs abundant over entire body; erect and suberect hairs on all 4 faces of femora; petiole, in profile, thick and rounded at summit; yellowish, bicolored: gaster and dorsal portion of head brownish, thorax and ventral portion of head yellowish touched with red ..... *\*lepida*
- b. Body hairs not so abundant; erect and suberect hairs confined to ventral and lateral faces of femora; petiole, in profile, thinner and angulate at summit ..... 12
- 12a. Mesopleuron, occipital angle, and gena with erect hairs ..... 13
- b. Mesopleuron, occipital angle, and gena without erect hairs ..... 14
- 13a. Scape longer than head; CI 82-87; crest of petiole with median notch; concolorous yellowish brown or bicolored: thorax and venter of head lighter than gaster and dorsum of head ..... *\*transmontanis*
- b. Scape shorter than head; CI 87-91; crest of petiole entire; concolorous dark brown ..... *\*longipilosa*
- 14a. Head rounded and broader or trapezoidal, with convex sides; CI 85-96; crest of petiole entire; brownish yellow with brown infuscation; often bicolored with thorax and venter of head lighter than gaster and dorsum of head ..... *aerata*
- b. Head rectangular and narrow, with straight sides; CI 72-88; crest of petiole usually with median notch; yellowish; usually bicolored with thorax and ventral portion of head yellowish orange, gaster and dorsal portion of head dark brown ..... *\*pacifica*
- 15a. Epinotum high, with basal and declivous faces forming a well-marked angle; dorsum never densely punctate, shining on at least part of head; usually a few long punctures ventral and posterior to eye ..... 16
- b. Epinotum low, without a distinct angle, with basal and declivous faces forming a single even convexity; dorsum dull and punctate; elongate punctures lacking ventral and posterior to eye ..... 19
- 16a. Hairs abundant on first gastric tergite, rarely fewer than 10 (mean 20) exclusive of posterior row; hairs usually confined to posterior portion of spinasternal cavity ... 17
- b. Hairs reduced on first gastric tergite, rarely more than 10 (mean 4) exclusive of posterior row; hairs usually surrounding spinasternal cavity ..... 18
- 17a. Pubescence dense to very dense on tergites 1-4; big elongate punctures absent from gena; pronotum usually with long erect hairs; with 10-43 (mean 12) somewhat swollen erect hairs on dorsum of first tergite (exclusive of posterior row); brownish black, brown or yellowish brown ..... *argentea*

- b. Pubescence dilute to normal on tergite 4 and at least dorsal half of gena; a few elongate punctures ventral and posterior to eye; black to blackish brown ..... *subsericea*
- 18a. Eye small, OI 31–35; scape longer than head length; blackish brown to black ..... *microphthalma*
- b. Eye larger, OI 34–43; scape shorter than head length; black to brown ..... *fusca*
- 19a. Hairs present on gula; eye smaller, OI less than 36, not extending beyond outline of head; clypeus with ventral angle; blackish brown ..... *sibylla*
- b. Hairs absent from gula; eye larger, OI 36.7–39.5, interrupting outline of head; epinotum long, low, and without angle; blackish brown to black ..... *subelongata*
- 20a. Epinotum high, its angle distinct ..... *\*gnava*
- b. Epinotum long and low, its angle reduced to an even convexity ..... 21
- 21a. Scale of petiole low and, in profile, thick and broadly rounded at summit, both faces convex but anterior more so ..... *xerophila*
- b. Scale of petiole high and, in profile, thin and angulate at summit ..... *moki*

### *Formica aerata* Francoeur

**WORKERS.** Small. With silky luster due to pubescence.

**LARGEST WORKER.** Head and thorax strong brown with dark reddish brown infuscation, gaster dark brown. **SMALL WORKER.** Very dark brown with ventral portion of head and patches on thorax yellowish brown.

**RANGE.** California, western Nevada, and southern Oregon.

**NEVADA NOTES.** *F. aerata* is restricted to the mid-western part of the state. We have 61 records from 37 localities; 3,900–8,200 ft., but 75% are between 4,000 ft. and 4,900 ft. Thirty-five of these records are from the Cool Desert, but only 2 are from pure sagebrush habitat; the remainder are scattered thus: 2 from Sarcobatus Subclimax, 4 from cottonwood groves, 8 from disturbed cottonwood groves, 12 from cottonwood riparian, 4 from riparian, and 3 from disturbed habitat. Only 1 was from the Coniferous Forest Biome. Seven nests were under stones, 1 was under slightly buried wood. Four nests were surmounted by messy craters 50–150 mm in diameter and 3 by messy irregular mounds of soil. Workers were fast and timid. They were often seen ascending and descending cottonwood trunks. Workers tended *Macrosiphoniella zerothermum* (Knowlton and Russell) (Homoptera: Aphididae; det. L.M. Russell) on *Artemisia tridentata* at Sonoma Stage Sta. site (-7N-26), Lyon Co., 6,100 ft.

**NEVADA LOCALITIES.** Map 64.

### *Formica argentea* W.M. Wheeler

**WORKER.** Small to medium-sized. Head dark reddish brown, thorax and gaster yellowish red varying to head, thorax and gaster reddish black, appendages paler. With a silvery luster due to pubescence.

**RANGE.** A triangle with its apex in eastern Massachusetts

and its base on the Pacific Coast from British Columbia to southern California.

**NEVADA NOTES.** This species is very adaptable and is distributed throughout the state. We have 109 records representing 100 localities. Twenty-three records are from the Cool Desert (1 from Sarcobatus Subclimax, 1 from a cottonwood grove, 1 from riparian cottonwood grove, 2 from disturbed cottonwood groves, and 1 from a disturbed habitat), 26 are from the Pinyon-Juniper Biome, 30 from the Coniferous Forest Biome, 7 from the ecotone, and 4 from the Alpine Biome. *Formica argentea* is definitely a montane ant. While the elevational range is 4,400–11,500 ft., 95% of the records are above 6,000 ft. Most (43) nests were under stones, 5 were under wood lying on the ground, 13 were exposed (5 of these under earthen mounds and 8 with excavated soil in craters around the entrance).

In a nest of this species we found *Hetaerius tristriatus* Horn (Coleoptera: Histeridae; det. J.M. Kingsolver), nr summit Sugarloaf Mt. 3 mi. SSE Montgomery Pass, Mineral Co., 9,000 ft. *F. argentea* was tending *Aphis* sp. nr *penstemonicola* G. & F. (Homoptera: Aphididae; det. M.B. Stoetzel), on squaw currant (*Ribes cereum*), Lehman Caves Nat. Mon., White Pine Co., 6,800 ft.

**NEVADA LOCALITIES.** Map 66.

### *Formica fusca* Linnaeus

**WORKER.** Small to medium-sized. Head very dusky red, thorax and gaster dark reddish brown varying to concolorous black, appendages pale. Shining, especially head and gaster.

**RANGE.** In the east, southern Canada, and the northern states to Minnesota and Iowa and southward in the mountains to South Carolina; in the west, California to the Yukon and eastward to Manitoba and the Dakotas.

**NEVADA NOTES.** This common species is widely distributed throughout the state north of the Hot Desert. We have 101 records from 84 localities. Five records are from the Cool Desert (1 from a cottonwood grove, 1 from a Sarcobatus Subclimax), 4 from the Pinyon-Juniper Biome, 65 from the Coniferous Forest Biome, 20 from the ecotone above it, and 17 from the Alpine Biome. This is definitely one of Nevada's high-altitude ants. The elevational range is 4,100–11,500 ft.; but 90% are above 7,000 ft., 80% above 8,000 ft., 68% above 9,000 ft., 54% above 10,000 ft., and 14% above 11,000 ft.

The overwhelming majority (63) of nests were under stones; 9 were under wood lying on the ground; only 4 were in exposed soil with a superstructure of excavated soil (1 messy mound, 1 disc, and 2 craters). As usual with species of this group, the workers were fast and timid, but 1 colony was aggressive. Six colonies were slaves of *Polyergus breviceps*, 1 was enslaved by *Formica subnuda* and 1 was host of *F. dakotensis*.

**NEVADA LOCALITIES.** Map 67.

### *Formica hewitti* W.M. Wheeler

**WORKER.** Medium-sized. Dark brown to reddish black; some specimens with ventral portion of head and small tho-

racic areas reddish brown. Head and thorax feebly shining, gaster shining.

**RANGE.** A triangle with its apex in Quebec and its base on the Pacific Coast from California to British Columbia.

**NEVADA NOTES.** Our 10 records represent 10 localities, which are widely scattered north of the Hot Desert; 6,700–11,600 ft. One record was in the Cool Desert, 3 in the Coniferous Forest Biome, 2 in the ecotone above it, and 3 from the Alpine Biome. Four nests were under stones, 1 was among the roots of a phlox plant which was under a dead sagebrush trunk, and 1 was in a fallen trunk 8 m long.

**NEVADA LOCALITIES.** Map 68. *Elko Co.*: 9 mi. WNW Jarbidge 6,700 ft.; Lamoille. *Esmeraldo Co.*: N slope of mt. N of Boundary Peak 11,600 ft.; Boundary Peak 11,000 ft. *Mineral Co.*: Mt. Grant 11,000 ft. *Washoe Co.*: Mt. Rose 10,300 ft. *White Pine Co.*: North Schell Peak 9,500 ft.; Wheeler Peak 8,300 ft., 10,100 ft.; Pyramid Peak 9,800 ft.

### *Formica microphthalmia* Francoeur

**WORKER.** Small to medium-sized. Reddish black, with silky luster.

**RANGE.** California and western Nevada.

**NEVADA NOTES.** Our 7 records represent 3 localities near Lake Tahoe. All were in the Coniferous Forest Biome. One nest was under a stone; another was exposed and surmounted by a 23-cm crater around a 25-mm entrance.

**NEVADA LOCALITIES.** Map 64. *Douglas Co.*: 6 mi. NNW Minden 7,000 ft. *Washoe Co.*: between Little Valley and Lake Tahoe 7,600 ft.; Hwy. 27 nr Mt. Rose 8,800 ft.

### *Formica moki* W.M. Wheeler

This species has long been known as *F. occidua*. Francoeur (1973) used *F. occidua* even though *F. moki* is the older name, as was pointed out by D.R. Smith (1979).

**WORKERS.** Small to medium-sized. **LARGEST WORKER.** Ventral portions of head and thorax reddish yellow, head with large dorsal portion infuscated dark reddish brown, thorax lightly infuscated with small patches of brown, gaster dark reddish brown. Dull. **SMALL WORKER.** Ventral portions of head and thorax yellow, dorsal portion of head and entire gaster black, thoracic infuscation dark reddish brown. Dull.

**RANGE.** Northwestern corner of Arizona, southern Nevada, and the Transverse and Coast ranges of California.

**LITERATURE NOTES.** Usually nests under stones in open woods; sometimes under sidewalks or along the sides of buildings. May become a pest by foraging in houses or by tending aphids on cultivated plants. Fierce and aggressive.

**NEVADA NOTES.** Our 8 records from 5 localities are all from the southern part of the state and all in the Pinyon-Juniper Biome. One nest was in the ends of a rotten log (8 cm in diameter) lying on the ground, 3 were under stones, and 1 was in the slightly decayed buried portion of a log 15 cm in diameter. We noted that the workers were fast and aggressive, that the bite was annoying and that a populous colony produced an invisible cloud of formic acid over a disturbed nest.

**NEVADA LOCALITIES.** Map 64. *Clark Co.*: Potosi Mts. 5,400 ft.; Kyle Canyon 7,000 ft.; Virgin Mts. 6,000 ft.; 3 mi. ENE Charleston Park 7,000 ft. *Lincoln Co.*: Beaver Dam State Park 5,000 ft.

### *Formica neoclara* Emery

**WORKERS.** Small to medium-sized. **LARGEST WORKER.** Ventral portion of head yellowish red and dorsal portion reddish black, thorax reddish yellow with dark reddish brown infuscation, gaster black. Dull. **SMALL WORKER.** Head and thorax brownish yellow with dark reddish brown infuscation, gaster very dusky red. Dull.

**RANGE.** From Yukon Territory through the Dakotas and westward to the Pacific Coast States and British Columbia.

**LITERATURE NOTES.** Populous colonies common in grasslands, open woods, and especially in disturbed areas. The nest is usually exposed and surmounted by a low messy mass of excavated soil, which often covers a considerable area, e.g., 90–120 cm × 60–90 cm and always with many entrances. These ants have often been reported tending aphids. Abundant in some nests has been *Uhleriola floralis* (Uhler) (Hemiptera: Lygaeidae), a bug that resembles the ants (Wheeler and Wheeler, 1963:271).

**NEVADA NOTES.** Our 17 records are from 12 localities which are widely scattered throughout the state; 3,900–9,800 ft. Three records are from the Cool Desert (1 from a disturbed riparian habitat and 2 from a cottonwood grove in an irrigated farmyard) and 4 were from the Coniferous Forest Biome. One exposed nest was surmounted by a 75-mm crater, 1 by piles of excavated earth along exposed cottonwood roots; 1 was in soil at base of a cottonwood stump; 2 were under stones; 1 was in and under a rotten log; 1 was under buried wood. We noted fast moving processions of workers up and down cottonwood trunks.

**NEVADA LOCALITIES.** Map 68. *Churchill Co.*: 5 mi. SSW Fallon 3,900 ft. *Humboldt Co.*: Soldier Meadows 4,400 ft. *Lyon Co.*: Artesia Lake (35-13N-23) 4,500 ft.; Smith. *Nye Co.*: Kawich Ra. *Pershing Co.*: Cow Creek 5,200 ft. *Storey Co.*: 9 mi. S Lockwood 5,700 ft. *Washoe Co.*: Little Valley 6,500 ft.; Hwy. 27 nr Mt. Rose 8,800 ft.; Reno 4,500 ft. *White Pine Co.*: Lehman Caves Nat. Mon. 7,500 ft.; Pyramid Peak, 9,800 ft.

### *Formica neorufibarbis* Emery

This insignificant-appearing ant is a record-holder. It occupies a territory much greater than that of any other Nearctic species of the *fusca* group. It also holds the elevational record for the Nearctic ant fauna: 14,269 ft. on Mt. Evans in Colorado (Gregg, 1963:533). Similarly it holds the altitudinal record in Nevada: 12,160 ft. on Boundary Peak.

**WORKERS.** Small to medium-sized. **LARGEST WORKER.** Head dark reddish brown, thorax yellowish brown infuscated with dark reddish brown, gaster dark reddish brown. **SMALL WORKER.** Concolorous black varying to lower portion of gena and patches on mesothorax, epinotum and sides of petiole dark reddish brown, remainder of head and



body black. Darkness of color varies inversely with size: the smallest workers may be entirely black.

**RANGE.** An enormous triangle from western Alaska on the Bering Strait and the Mackenzie Delta (on the border of the Arctic Ocean) to an apex on Newfoundland; thence south-westward to New Mexico, Arizona, and California; its base extends northward along the Pacific Coast to southern and central Alaska.

**LITERATURE NOTES.** "This ant represents a characteristic element of the boreal coniferous forest . . . It is the *Formica* which endures the most severe climate in North America and one of the few ants that can breach the boundary of the tundra . . . This ant which is very timid feeds on honeydew and dead arthropods. It seems to gather little from flowers" (our translation from Francoeur, 1973:226–228).

Bernstein (1976:183–184) reported that 85% of the food collected is liquid from plants, mostly flowers. Regardless of abundance of food, all foraging ceases as soon as the brood is mature. The brood is reared quickly, an adaptation to a short summer. The smaller workers are nearly black; therefore they warm up earlier in the day. A larger body tends to heat up more slowly and a redder color probably reflects more solar radiation than would a blacker color. "Color and size differences . . . enable each colony to utilize a greater range of environmental conditions for foraging than if they were of a single size and color."

**NEVADA NOTES.** Our 104 records represent 51 localities scattered statewide. The elevational range is 5,000–12,160 ft.; 79% were above 8,000 ft. and 51% were above 10,000 ft. One record was from the Pinyon-Juniper Biome, 22 were in the Coniferous Forest Biome, 9 in the ecotone above it, and 42 from the Alpine Biome. Thirty-three colonies nested under stones; 27 were in and/or under rotten wood lying on the ground or partially buried and 1 was in the root system of a phlox-like plant. The workers were fast and aggressive and the bite was annoying. We found 1 colony enslaved by *Formica subnuda*.

**NEVADA LOCALITIES.** Map 65.

### *Formica sibylla* W.M. Wheeler

**WORKER.** Medium-sized. Dark brown to reddish black. Pubescence dense.

**RANGE.** Oregon, California, and the Sierra Nevada in midwestern Nevada.

**NEVADA NOTES.** This montane species is restricted to the Carson Range of the Sierra Nevada near Lake Tahoe. Our 30 records are from 16 localities; 6,000–9,000 ft. All are in the Coniferous Forest Biome. This species constructed craters (Figs. 51, 52) in openings in the coniferous forest, where the soil was sandy and bare of vegetation. The dusty craters measured 15–28 cm in diameter and the rim was 25–50 mm high: the entrance was large—19–38 mm. Frequently an enormous number of craters were clustered in a small area; we suspect that most were feeding stations, because we have never found brood upon excavation. We have found brood in only 2 nests both of which were under stones. The workers were very timid and fast.



**Figure 51.** *Formica sibylla*. Numerous craters in an opening in an coniferous forest. Washoe County, Little Valley.

**NEVADA LOCALITIES.** Map 69. *Douglas Co.*: 6 mi. WNW Minden 6,000 ft. *Ormsby Co.*: 5 mi. SW Carson City 7,100 ft.; 7 mi. WSW Carson City 7,000 ft.; Kings Canyon (Wheeler, 1913:531). *Washoe Co.*: Little Valley 6,400 ft., 6,800 ft., 6,900 ft., 7,000 ft., 7,500 ft.; nr Lower Price Lake 6,900 ft.; Marlette Lake 8,000 ft.; 6 mi. SW Reno 6,400 ft.; Sand Point on E side Lake Tahoe 6,400 ft.; Hwy. 27 nr Mt. Rose 6,900 ft., 9,000 ft.; Whites Canyon on Mt. Rose 6,800 ft.

### *Formica subelongata* Francoeur

**WORKER.** Medium-sized. Very dusky red to black with dense pubescence.

**RANGE.** California and Nevada.

**NEVADA NOTES.** We have 11 records from 11 localities, which are widely scattered north of the Hot Desert. Four are from the Cool Desert, 3 from the Pinyon-Juniper Biome, and 1 from the ecotone below the Alpine. Four nests were under



**Figure 52.** *Formica sibylla*. Cluster of craters. Washoe County, Little Valley.

stones and 1 was under a dead prostrate sagebrush trunk. The workers were timid and fast.

**NEVADA LOCALITIES.** Map 70. *Elko Co.*: 7 mi. NE Oasis 6,000 ft. *Esmeralda Co.*: Boundary Peak 8,100 ft., 9,000 ft. *Nye Co.*: Moores Sta. in Hot Creek Valley 6,000 ft.; 3 mi. NE Ione 7,500 ft. *Ormsby Co.*: Kings Canyon. *Washoe Co.*: Peavine Peak 6,900 ft.; 4 mi. NNE Vya 5,600 ft.; Mt. Rose 10,300 ft.; Clear Creek (-38N-22). *White Pine Co.*: Ely.

### *Formica subpolita* Mayr

**WORKER.** Small to medium-sized. Head yellowish red with dusky red infuscation, thorax strong brown, gaster dusky red. Head and gaster strongly shining, thorax feebly shining.

**RANGE.** California and Nevada northward to southern British Columbia.

**NEVADA NOTES.** This species is found in abundance throughout the state from 4,300 ft. to 10,800 ft. (43% of the records 6,000–7,000 ft., 65% 6,000–8,000 ft., 93% 5,000–9,000 ft.). We have 204 records from 108 localities. Of these 64 were in the Cool Desert (2 in the cottonwood riparian), 51 in the Pinyon-Juniper Biome, 19 in the Coniferous Forest Biome, 8 from the ecotone above, and 5 in the Alpine Biome.

We have descriptions of 122 nests: 61 were under stones and 9 were under other objects lying on the ground; of the exposed nests 44 were surmounted by craters (4–10 cm in diameter with entrances 4–8 mm in diameter) and 8 by messy mounds of excavated soil. Colonies may be locally very numerous. Workers were timid and fast.

We have collected mealybugs from 3 nests (Homoptera: Pseudococcidae; det. D.R. Miller): *Cryptoripersia tubulata* McKenzie from Lamoille Canyon (9-32N-58) 7,000 ft. (*Elko Co.*) and from Mt. Jefferson 8,700 ft. (*Nye Co.*); *Phenacoccus eschscholziae* McKenzie from Carroll Summit (9-16N-38) 7,500 ft. (*Lander Co.*).

**NEVADA LOCALITIES.** Map 71.

### *Formica subsericea* Say

We include Francoeur's *F. glacialis* and *F. podzolica* in this species. NEW SYNONYMY.

**WORKER.** Medium-sized to large. Head, thorax, and gaster reddish black to black. With a silky luster due to pubescence.

**RANGE.** Southern Canada and the lower 48 states (except perhaps Florida and Texas), with northwestward extensions to northern Alaska and southern Northwest Territory.

**NEVADA NOTES.** This species is sparsely scattered throughout the state at high elevations: 5,500–11,500 ft., but 88% are between 7,000 ft. and 11,000 ft. We have 37 records from 32 localities. Two records are from the Cool Desert, 18 from the Coniferous Forest Biome, 10 from the ecotone above it, and 1 from the Alpine Biome. Of the nests described 17 were under stones, 2 were under dead wood lying on the ground, 1 was in rotten wood, 3 were exposed and surmounted by messy mounds of excavated soil. A few colonies were populous; the ants were fast and aggressive.

**NEVADA LOCALITIES.** Map 70. *Clark Co.*: Charleston Peak 10,400 ft., 11,000 ft.; Hayford Peak 9,700 ft.; Mummy Mt. 11,500 ft. *Elko Co.*: end of Lamoille Canyon road 8,800 ft., 8,900 ft.; Lamoille Canyon 7,600 ft.; Thomas Canyon off Lamoille Canyon 7,700 ft.; 8 mi. SW Wells 8,400 ft.; Grays Peak in East Humboldt Ra. 9,000 ft. *Humboldt Co.*: Onion Reservoirs in Pine Forest Ra. 8,000 ft. *Lander Co.*: Bunker Hill 8,000 ft. *Nye Co.*: Troy Peak 8,800 ft., 9,000 ft., 10,700 ft.; Table Mt. 9,500 ft.; South Twin River in Toiyabe Ra. 7,100 ft., 8,500 ft., 8,800 ft. *Ormsby Co.*: 7 mi. WSW Carson City 7,000 ft. *Washoe Co.*: Hwy. 27 nr Mt. Rose 8,800 ft.; Mt. Rose 10,300 ft., 10,400 ft., 10,500 ft.; 6 mi. WSW Virginia City 5,500 ft. *White Pine Co.*: nr Lehman Caves Nat. Mon. 7,500 ft.; Ellison Ranger Sta. in White Pine Mts. 6,900 ft., 7,000 ft.; Mt. Washington 9,500 ft.; nr Mt. Moriah 7,000 ft.; nr Murry Summit in Egan Ra. 9,200 ft.; Wheeler Peak 8,000 ft.

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

**WORKER.** Medium-sized. Ventral portion of head reddish yellow with dark reddish brown to black infuscation dorsally, thorax entirely brown to reddish yellow with brown infuscation, gaster very dusky red to black. Dull to shining.

**RANGE.** Arizona, California, Utah, Nevada, and Washington.

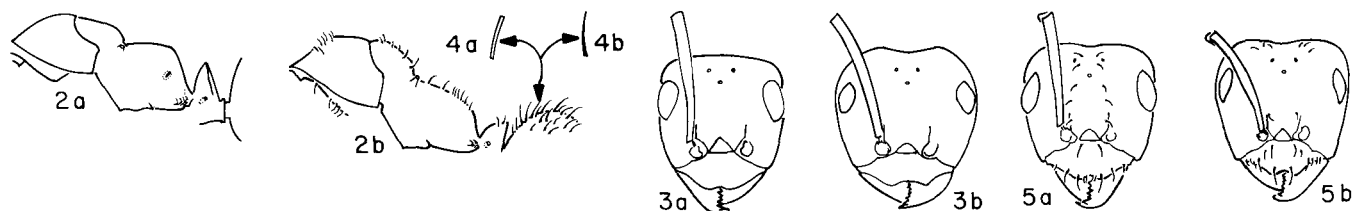
**NEVADA NOTES.** This species has been found only in the southern and western parts of the state. We have 29 records from 20 localities; 4,200 ft.–6,500 ft. One record is from a *Sarcobatus* Subclimax in the Hot Desert, 3 from the Cool Desert (2 from disturbed habitats), while the majority (19) are from the Pinyon-Juniper Biome. Five nests were under stones, 1 under dead wood; of the exposed nests 5 were surmounted by messy piles of excavated soil and 7 by craters 7–22 cm in diameter with entrances 15–20 mm in diameter.

**NEVADA LOCALITIES.** Map 69. *Clark Co.*: Potosi Mt. 6,300 ft. *Douglas Co.*: 8 mi. SE Minden 5,200 ft.; 9 mi. SE Minden 5,400 ft.; 11 mi. ESE Minden, 5,800 ft.; 12 mi. ESE Minden 6,400 ft. *Lincoln Co.*: 8 mi. ENE Caliente 5,500 ft.; 4 mi. W Caliente 5,600 ft.; Beaver Dam State Park 5,000 ft.; Oak Springs Summit 6,200 ft. *Lyon Co.*: 6 mi. SE Dayton 6,300 ft. *Nye Co.*: 4 mi. ESE Beatty 4,200 ft.; -9N-51 in Hot Creek Valley 6,500 ft.; Test Site (Cole, 1966:24 as *moki*); Peavine Creek Campground in Toiyabe Ra. 6,400 ft. *Pershing Co.*: Florida Canyon 8 mi. SW Imlay 5,000 ft. *Storey Co.*: 4 mi. E Virginia City 4,800 ft. *Washoe Co.*: 12 mi. SSE Reno 5,200 ft., 5,500 ft.; 4 mi. WSW Virginia City 6,300 ft.; 5 mi. SW Reno 5,600 ft.

### The *Sanguinea* Group

This group comprises eight species which were formerly placed in the subgenus *Raptiformica*. All species are facultative slave-makers, i.e., species which usually or often have slaves but can get along without them.

The colony-founding female forces her way into a small colony of another species of *Formica*, somehow gets rid of its queen and workers and appropriates its nest and brood.



SANGUINEA GROUP OF GENUS FORMICA

The workers emerging from this brood accept the intruding queen as their own. The enslaved species belong to the *neogagates*, *fusca*, and *pallidefulva* species groups.

When the workers of the slave-making species have become numerous enough, they start raiding for more slaves. "The raid begins with the formation of a loose column of raiders which approach and surround the nest to be raided. No attempt to enter the nest is made until a considerable number of raiders have arrived at the entrance. After a certain amount of preliminary investigation a large number of the raiders will force their way into the foreign nest. This is ordinarily followed by a frantic exodus of the rightful owners who carry away with them what brood they can. Thereafter the raiders pillage the remaining brood at their leisure and straggle back to their own nest loaded down with the pilfered brood. It seems certain that much of this brood is eaten, for the number of slaves in a colony is never as great as the amount of slave brood brought into it" (Creighton, 1950: 461).

#### KEY TO THE SPECIES OF THE SANGUINEA GROUP

- 1a. Concolorous yellowish red ..... *curiosa*
- b. Bicolored: head and thorax reddish brown or yellow, gaster brown or black ..... 2
- 2a. Dorsum of thorax entirely devoid of erect hairs or with a few fine short inconspicuous erect hairs on pronotum only ..... 3
- b. Dorsum of pronotum and mesonotum with conspicuous erect hairs; erect hairs usually present on epinotum also ..... 4
- 3a. Scape of largest worker robust, shorter than head; head of largest worker narrow, in full face view with no space between margin of eye and margin of head; head and thorax sordid yellowish red or brown ..... *\*emeryi*
- b. Scape of largest worker slender, longer than head; head of largest worker broad, in full face view with distinct space between margin of eye and margin of head; head and thorax red ..... *subnuda*
- 4a. Gaster evenly covered with long stout silvery erect hairs, which are blunt at tip; hairs elsewhere only a little less abundant ..... *obtusopilosa*
- b. Erect gastric hairs yellow and not notably blunt; erect hairs elsewhere much shorter and sparser ..... 5
- 5a. Eye large and protuberant, its longest diameter approximately  $\frac{1}{3}$  length of head, in front view always interrupting lateral border of head ..... 6
- b. Eye flattened, less than  $\frac{1}{3}$  length of head, in front view not interrupting lateral border of head; pubescence on scape abundant, suberect, and conspicuous ... *puberula*
- 6a. Head distinctly darker than thorax; petiolar crest blunt, sometimes with median notch ..... *wheeleri*
- b. Head and thorax concolorous yellowish red, gaster brown with edge of somites darker; petiole crest rather sharp, without median notch ..... *curiosa*

#### *Formica curiosa* Creighton

**WORKER.** Medium-sized to large. Concolorous strong brown (i.e., yellowish red) or with gaster dark brown or black. Dull.

**RANGE.** Montana to Oregon and northern Nevada; British Columbia.

**NEVADA NOTES.** We have 2 records from 2 localities near the northern border of the state, based on concolorous strays. Both were in the *Sarcobatus* Subclimax of the Cool Desert.

**NEVADA LOCALITIES.** Map 72. *Humboldt Co.*: 8 mi. SW Denio 4,300 ft.; 6 mi. W Oroville 4,100 ft.

#### *Formica obtusopilosa* Emery

**WORKER.** Small to large. Head and thorax dark reddish brown to yellowish red, gaster black. Head and gaster moderately shining, thorax dull.

**RANGE.** Minnesota to Alberta and southward to Nebraska, Nevada, Utah, and New Mexico.

**LITERATURE NOTES.** This species has previously been thought to be without slaves, but we have 4 records of *Formica neogagates* in nests in North Dakota (Wheeler and Wheeler, 1963:219).

**NEVADA NOTES.** This species is widely scattered throughout the state. We have 45 records from 29 localities; 3,900–9,000 ft.; but 80% are between 6,000 ft. and 8,000 ft. Fourteen are in the Cool Desert (4 in *Atriplex* Subclimax and 1 in *Sarcobatus* Subclimax) and 28 are in the Pinyon-Juniper Biome. We have descriptions of 36 nests: 13 were under stones; of the exposed nests 11 were surmounted by craters, 7 by messy piles of excavated soil, while 5 had no excavated soil (just a hole in the ground). Craters ranged from 5 to 19 cm in diameter, average 14 cm; entrances ranged from 5 to 25 mm in diameter, average 8.6 mm. Workers were fast and timid, erratic (i.e., stopped suddenly and changed

direction), but in a populous colony they were aggressive. In 2 colonies we found *Formica fusca* as slaves.

**NEVADA LOCALITIES.** Map 72. *Clark Co.*: Lee Canyon road 6 mi. N Charleston Park 7,700 ft. *Douglas Co.*: Spring Gulch (5-13N-25) 5,400 ft. *Elko Co.*: 5 mi. N North Fork 6,500 ft. *Eureka Co.*: 8 mi. SSE Eureka 6,800 ft.; 10 mi. S Eureka 6,300 ft. *Lincoln Co.*: Panaca Summit 6,700; 6 mi. E Panaca 5,800 ft.; Atlanta 7,000 ft. *Lyon Co.*: Sweetwater Summit 7,100 ft.; Rye Grass Spring 7,200 ft. *Mineral Co.*: 3 mi. SE Montgomery Pass 9,000 ft.; 2.7 mi. SSE Montgomery Pass 8,400 ft. *Nye Co.*: Morey Mine in Hot Creek Valley 7,000 ft., 7,100 ft.; 8 mi. ENE Gabbs 6,700 ft.; 6-14N-44 in Big Smoky Valley 5,700 ft.; Willow Spring 6,400 ft.; at mouth of Meadow Creek in Monitor Valley 7,200 ft.; Test Site (Cole, 1966:26). *Ormsby Co.*: McClellan Peak (22-16N-20) 7,000 ft. *Washoe Co.*: 17 mi. NNW Gerlach 3,900 ft.; 9 mi. N Reno (24-21N-19) 5,000 ft. *White Pine Co.*: 15 mi. NNW Atlanta 6,100 ft.; Pancake Summit 6,500 ft.; 19 mi. SW Ely 6,000 ft.; 11 mi. SW Ely 6,800 ft.; 2 mi. N McGill 6,000 ft.; Connors Pass 7,700 ft.; 1 mi. S Blind Spring (-11N-67) 5,800 ft.

### *Formica puberula* Emery

**WORKER.** Medium-sized to large. Head dark red to yellowish red with dark brown to yellowish red markings, thorax reddish brown to strong brown, gaster dark reddish brown. Feebly shining.

**RANGE.** Manitoba, North Dakota, South Dakota, Wyoming, Colorado, and Texas westward to California, Washington, and British Columbia.

**NEVADA NOTES.** We have 11 records from 6 localities widely scattered north of the Hot Desert; 4,500–8,200 ft. Seven records are from the Coniferous Forest Biome, usually at the edge of mountain meadows; 2 are from disturbed habitats. We have descriptions of 2 nests: (1) under 2 stones 13 cm apart; (2) surmounted by a pile of excavated soil 22 × 28 cm around the base of an aspen tree, with the entrance near the trunk. We found *Formica lasioides* as slaves in 2 nests and *F. subsericea* in 1.

**NEVADA LOCALITIES.** Map 73. *Elko Co.*: Lamoille Canyon road 8,200 ft.; Thomas Canyon off Lamoille Canyon 7,600 ft. *Nye Co.*: Mt. Jefferson 8,100 ft. *Washoe Co.*: Little Valley 6,400 ft.; Reno 4,500 ft. *White Pine Co.*: Little Antelope Summit 7,400 ft.

### *Formica subnuda* Emery

**WORKERS.** Medium-sized to large. Head and gaster moderately shining, thorax dull. **LARGEST WORKER.** Head red with dark red markings, thorax dark red, gaster with each somite dark reddish brown anteriorly and black posteriorly varying to head yellowish red, thorax reddish yellow, gaster dark reddish brown. **SMALL WORKER.** Head dark reddish brown dorsally and yellowish ventrally, thorax reddish brown, gaster with each somite dark reddish brown anteriorly and very dusky red posteriorly varying to head and gaster dark reddish brown, thorax yellowish red.

**RANGE.** From Newfoundland westward to the Yukon and central Alaska and southward to New York, Minnesota, North

Dakota, Colorado, New Mexico, Arizona, Nevada, and California.

**NEVADA NOTES.** We have 26 records from 20 localities, all near the northeastern, eastern, and southern borders of the state; 6,600–11,000 ft., with 68% above 10,000 ft. Twelve records are from the Coniferous Forest Biome and 9 from the ecotone above it. Seven nests were in and/or under decaying wood lying on the ground; usually thatch and soil were piled against or on top of the log. One nest was in needle thatch under and beside a stone. Another was in thatch and soil under a 10-cm stump 38 cm long and leaning against a huge stone. One colony was populous and aggressive. As slaves we found *Formica argentea* in 1 colony, *F. neorufibarbis* in 1 colony, and *F. fusca* in 3 colonies.

**NEVADA LOCALITIES.** Map 73. *Clark Co.*: Lee Canyon; Kyle Canyon. *Elko Co.*: Lamoille; Lamoille Canyon road 8,200 ft.; Lamoille Lake, 9,700 ft.; 13 mi. SW Mountain City 6,600 ft.; 8 mi. SW Wells 8,400 ft.; Grays Peak in East Humboldt Ra., 9,000 ft.; Liberty Pass in Ruby Mts. 10,300 ft.; Ruby Dome in Ruby Mts. 10,500 ft. *White Pine Co.*: Wheeler Peak 10,000 ft., 10,500 ft.; saddle between Mt. Washington and Mt. Lincoln 11,000 ft.; Mt. Washington 10,400 ft.; North Schell Peak 9,900 ft., 10,600 ft.; Pyramid Peak, 9,900 ft., 10,500 ft., 10,600 ft.; Mt. Moriah 10,500 ft.

### *Formica wheeleri* Creighton

**WORKER.** Medium-sized to large. Head dark red to red, thorax yellowish red to reddish yellow, gaster with each somite dark reddish brown to yellowish red anteriorly and dark reddish brown to black posteriorly. Feebly shining.

**RANGE.** New Mexico, Arizona, and Nevada northward to North Dakota, Montana, and Idaho.

**NEVADA NOTES AND LOCALITY.** Map 72. We have 2 records from the same locality in the Cool Desert: *Washoe Co.*: 11 mi. S Reno, 5,500 ft. One nest was under a stone; the other was exposed and surmounted by a low crater of fine soil 37 cm in diameter. The workers were fast and aggressive.

### Genus *Polyergus* Latreille

“The activities of *Polyergus* are so spectacular that the genus has long been a favorite for habit studies. All the species are obligatory slave-makers and they carry out their raids with great spirit and remarkable precision” (Creighton, 1950:554).

We had the opportunity of witnessing one of these raids on 19 July 1965 in Pend Oreille County, Washington (4 mi. SW Tiger). The scene was an opening in a pine-fir forest and the principal actors were *Polyergus breviceps* (slave-maker) and *Formica argentea* (slave), which lived in and under an earthen mound 1 m in diameter and 30 cm in height. The nest to be raided was under an earthen mound 15 m to the north at the base of a pine tree. When we arrived at 4:10 P.M. the *Polyergus* workers were running about on the surface of their mound—an unusual activity—and the raiding column had just started. No slaves were on the surface and none participated in the raid. The compact column attained a

length of 122 cm; its usual width was 10 cm. At times the head of the column would pause and spread out laterally (at one pause, to 45 cm); then a point would push forward, others would fall in behind and the column would narrow to 10 cm. A few stragglers followed alongside the column. The speed of the raiding column was timed once at 91 cm per minute, but the advance was not steady. The column reached the victims' nest at 4:30 P.M. and entered the main entrance without pause. A few seconds later the raiders began emerging from many entrances each with a larva, a naked pupa or a cocoon between its mandibles and started homeward along the same route it had followed when outward bound. The head of the booty-laden column was therefore homeward bound before the rear of the raiding column had entered the victims' nest. Few victim-workers appeared on the surface; they did nothing and were completely ignored by the raiders. The last raider left the victims' nest at 4:37 P.M. The column returning with the booty was 7.3 m long. We counted 120 returning raiders passing a given point in one minute. Eight minutes were required for the column to pass that point. This gives us an estimate of 1,000 workers participating in the raid.

Raiding columns have no leaders; those at the front are continually being passed by raiders overtaking them from farther back in the column.

Most of the booty is consumed for food. Those workers that are not eaten emerge and become new slaves in the colony.

The nests to be raided are located by scouts—*Polyergus* workers exploring alone.

The slaves of American *Polyergus* are all in the genus *Formica*, mostly in the *fusca* species group but also in the *neogagates* and *pallidefulva* species groups.

#### KEY TO THE SPECIES OF *POLYERGUS*

- 1a. Scape reaching or surpassing occipital border; gastric pubescence very dilute, hairs widely spaced and inconspicuous ..... *\*lucidus*
- b. Scape not reaching occipital border, often not surpassing level of lateral ocelli; gastric pubescence dense, giving surface a distinctly grayish sheen ..... *breviceps*

#### *Polyergus breviceps* Emery

**WORKER.** Medium-sized to large. Concolorous yellowish red varying to head and thorax red, gaster very dusky red. Head and thorax dull, gaster feebly shining.

**RANGE.** Ontario and Michigan westward to British Columbia and southwestward to Indiana, Illinois, Missouri, Kansas, New Mexico, Arizona, Nevada, and California.

**NEVADA NOTES.** Our 26 records representing 21 localities are sparsely scattered throughout the state; 5,900–10,500 ft. Three records are from the Cool Desert, 3 from the Pinyon-Juniper Biome, 9 from the Coniferous Forest Biome, and 1 from the ecotone above it. Slaves were reported for 13 colonies: *Formica argentea* 5, *F. fusca* 5, *F. manni* 1, *F. subpolita* 1, and *F. subsericea* 1.

**NEVADA LOCALITIES.** Map 74. *Clark Co.*: Kyle Canyon. *Elko Co.*: 8 mi. NE Wildhorse Reservoir 6,600 ft.; Pole Canyon in East Humboldt Ra.; Ruby Dome in Ruby Mts. 10,500 ft.; Snowslide Gulch in Jarbidge Mts. 9,000 ft. *Nye Co.*: Troy Peak 7,400 ft.; South Twin River in Toiyabe Ra. 6,800 ft. *Storey Co.*: Virginia City; 8 mi. NE Virginia City. *Washoe Co.*: Little Valley 6,400 ft., 6,500 ft.; Hwy. 27 nr Mt. Rose 8,800 ft., 9,100 ft.; 30 mi. NNE Vya 5,900 ft.; 6 mi. SW Reno 6,400 ft.; Clear Creek. *White Pine Co.*: Ellison Ranger Sta. in White Pine Mts. 6,900 ft.; 10 mi. SW Ely 7,500 ft.; 2 mi. E McGill 7,700 ft.; Ely; -12N-59 7,000 ft.





## BIONOMICS

### SUMMARY OF RECORDS

Table 2 (except Column 3) is a summary of the information we have given in the species accounts. The significance of each column is explained below.

Column 1. A taxonomic list of the ants of Nevada. The subfamilies and genera follow the order in Creighton (1950); species are arranged alphabetically under each genus.

Column 2. Records. This column gives the number of collections for each species. A *record* is the sample collected from a nest: it may consist of several hundred individuals or it might be a single stray whose nest was never found. The number of records is a rough measure of the abundance of a species in the state. It is apt to be an underestimate of some species, because once a collector has learned to recognize certain species in the field, he will collect fewer samples (or none) of that species.

Column 3. We have counted and recorded here the number of localities in which each species has been collected. The ratio of number of records to number of localities is another indicator of species abundance. It is only a rough estimate, because more collections have been made in the easily accessible localities and of easily found species.

The concentration of records and localities in the vicinity of Reno may be related to collecting effort.

Column 4. Relative abundance is measured by the number of records. Therefore we regard *Pogonomyrmex californicus* as the commonest ant in Nevada, in spite of its absence from the northeastern corner, because we have the greatest number of records (261); it will therefore rank number 1. Naturally several species will have the same rank, especially as the number of collections diminishes.

Using number of records as the index to abundance we have ranked species: very abundant, 197–261 collections per species; moderately abundant, 60–137 collections per species; rare, 1–53. The very abundant category includes five species: *Pogonomyrmex californicus*, *P. salinus*, *P. occidentalis*, *Formica subpolita*, and *Camponotus vicinus*. The moderately abundant group includes 23 species; the rare group includes 149 species.

Columns 5 to 10. These columns give the principal distribution of each species in the various biomes. A few records in other biomes are ignored because almost any species of ant is sufficiently plastic in its adaptations to survive occasionally in unusual environments.

Our data for distribution by biome do not balance against total records because other collectors have rarely mentioned the habitat. While some records can be placed with some degree of certainty, many cannot.

Columns 11 to 13. These columns give the more common nest types for each species. "Under stones" (Column 11) is one of the commonest nesting sites. Column 12 refers to exposed nests where the entrance is surmounted by a crater of excavated soil; a "crater" may vary from the symmetrical compact structure made by *Myrmecocystus* spp. to very messy piles of earth. Sometimes the entire crater is washed or blown away leaving only the entrance hole. Exposed nests are about as common as those under stones. Column 13 is reserved for various less common types of nests, which are indicated by letters: a = under covering objects other than stones (wood, rubbish); b = thatch mounds (e.g., the *rufa* group of *Formica*); c = the large mounds of gravel and soil surrounded by a bare area (e.g., *Pogonomyrmex* spp.); d = in rotten wood; e = gravel disc; f = base of shrub; x = having this type of nest. We have indicated only the commonest types of nest for each species; odd types are omitted, because insects as plastic as ants are apt to build exceptional types of nests to fit exceptional conditions. The Dorylinae (*Neivamyrmex* spp.) are exceptional in that they have no permanent nests.

### CHARACTERISTIC ANT FAUNAS OF THE BIOMES

We call a species "characteristic" of a biome if a large portion of the records are from that biome and if the total number of records exceeds 10. We temper the assignment for some species on the basis of our own field experience. A few records from other biomes may be expected in a taxon as plastic as Formicidae.

In Table 3, we list the ant species characteristic of each biome (except the Alpine).

**Table 2. Summary of records of the ants of Nevada. The organization of this table and the meaning of the notations in the last column are given on page 97.**

1 Taxonomic list	2 Records	3 Local- ities	4 Abun- dance	Biome						Nest		
				5 Hot Desert	6 Cool Desert	7 Pinyon- Juniper	8 Coni- ferous Forest	9 Ecotone	10 Alpine	11 Under stone	12 With crater	13 Misc.
Subfamily Ponerinae												
<i>Amblyopone</i>												
<i>pallipes</i>	1	1	66			1						
<i>Hypoponera</i>												
<i>opaciceps</i>	1	1	66	1								
<i>opacior</i>	1	1	66	1								
Subfamily Dorylinae												
<i>Neivamyrmex</i>												
<i>californicus</i>	1	1	66		1							
<i>minor</i>	1	1	66	1								
<i>nyensis</i>	1	1	66	1								
Subfamily Myrmicinae												
<i>Myrmica</i>												
<i>americana</i>	7	6	60		1	3	2	1		X		
<i>brevispinosa</i>	1	1	66									
<i>emeryana</i>	2	2	65				1	1		X		
<i>fratricornis</i>	37	22	35			1	9	3		X		
<i>incompleta</i>	20	10	47				20					d
<i>lobifrons</i>	6	6	61			1	1	3		X		
<i>tahoensis</i>	20	15	47			1	13		1	X		
<i>Manica</i>												
<i>bradleyi</i>	35	7	36				35			X	X	
<i>hunteri</i>	12	6	55				11	1		X	X	
<i>mutica</i>	130	70	7		50	2	13			X	X	
<i>Pogonomyrmex</i>												
( <i>barbatus</i> group)												
<i>apache</i>	1	1	66	1								
<i>colei</i>	1	1	66	1								
<i>rugosus</i>	67	47	22	32	2							e
( <i>occidentalis</i> group)												
<i>brevispinosus</i>	4	3	63		4							c
<i>occidentalis</i>	238	149	3		56	43						c
<i>owyheei</i>	75	47	19		19	3						c
<i>salinus</i>	245	202	2		79	23						c
<i>subdentatus</i>	16	16	51		4							
<i>subnitidus</i>	10	9	57		4	1					X	
( <i>maricopa</i> group)												
<i>californicus</i>	261	161	1	28	83						X	
<i>magnacanthus</i>	13	10	54	13							X	
<i>maricopa</i>	15	12	52	10								
<i>Ephebomyrmex</i>												
<i>imberbicus</i>	5	5	62	5						X	X	
<i>Stenamma</i>												
<i>diecki</i>	1	1	66				1					

Table 2. Continued.

1 Taxonomic list	2 Records	3 Local- ities	4 Abun- dance	Biome						Nest		
				5 Hot Desert	6 Cool Desert	7 Pinyon- Juniper	8 Coni- ferous Forest	9 Ecotone	10 Alpine	11 Under stone	12 With crater	13 Misc.
<i>heathi</i>	1	1	66				1					
<i>smithi</i>	3	3	64		1		1					
<i>wheelerorum</i>	1	1	66				1			X		
<i>Aphaenogaster</i>												
<i>boulderensis</i>	1	1	66	1								
<i>cockerelli</i>	10	7	57	7								e
<i>megommata</i>	48	44	31	13	20					X	X	
<i>occidentalis</i>	92	52	15		18	6	18			X		
<i>uinta</i>	37	31	35		8	15	1			X		
<i>Veromessor</i>												
<i>andrei</i>	1	1	66									
<i>lariversi</i>	52	31	28	3	31						X	
<i>lobognathus</i>	15	12	52		5	11				X	X	
<i>pergandei</i>	50	38	29	50							X	
<i>smithi</i>	24	14	44		15	3				X	X	
<i>Pheidole</i>												
<i>barbata</i>	5	2	62	5							X	
<i>californica</i>	49	37	30		17	8	2			X	X	
<i>cerebrosior</i>	1	1	66	1						X		
<i>ceres</i>	1	1	66			1				X		
<i>clydei</i>	1	1	66	1								
<i>creightoni</i>	8	8	59		3						X	
<i>desertorum</i>	52	25	28	25		3				X	X	
<i>gilvescens</i>	14	7	53	13	1						X	
<i>hyatti</i>	15	12	52	2	6	4				X		
<i>inquilina</i>	1	1	66			1						
<i>paiute</i>	65	39	24	12	28	2				X		
<i>pilifera</i>	25	19	43	1	6	9				X	X	
<i>tucsonica</i>	15	8	52	15							X	
<i>vistana</i>	3	3	64	3								
<i>Crematogaster</i>												
<i>californica</i>	6	5	61	6								
<i>coarctata</i>	46	27	32		16	12	3			X		
<i>colei</i>	1	1	66			1				X		
<i>depilis</i>	13	12	54	15								f
<i>emeryana</i>	5	4	62							X		
<i>hespera</i>	5	5	62	1	3							
<i>larreae</i>	7	6	60	7								
<i>mormonum</i>	107	86	10	1	36	34				X		
<i>mutans</i>	8	6	59			7				X		
<i>nocturna</i>	5	4	62	5								
<i>opuntiae</i>	4	3	63	4								
<i>Monomorium</i>												
<i>minimum</i>	66	51	23	1	18	18	5			X		
<i>Solenopsis</i>												
<i>aurea</i>	1	1	66	1								

Table 2. Continued.

1 Taxonomic list	2 Records	3 Local- ities	4 Abun- dance	Biome						Nest		
				5 Hot Desert	6 Cool Desert	7 Pinyon- Juniper	8 Coni- ferous Forest	9 Ecotone	10 Alpine	11 Under stone	12 With crater	13 Misc.
<i>maniosa</i>	18	17	49	18								
<i>molesta</i>	62	57	25	6	19	9	3			X		
<i>Leptothorax</i>												
<i>andrei</i>	4	4	63		2	1	1			X		
<i>carinatus</i>	1	1	66									
<i>crassipilis</i>	7	4	60				2			X		
<i>muscorum</i>	25	17	43				14		4	X		d
<i>nevadensis</i>	43	31	33		14	10	13		1	X		
<i>nitens</i>	10	7	57			2	3			X		
<i>obliquicanthus</i>	2	2	65		1							
<i>rugatulus</i>	30	19	39		4	5	15			X		
<i>tricarinatus</i>	6	5	61		3	2						
<i>Tetramorium</i>												
<i>caespitum</i>	22	8	45									
Subfamily Dolichoderinae												
<i>Liometopum</i>												
<i>luctuosum</i>	26	19	42			7	6					
<i>Iridomyrmex</i>												
<i>humilis</i>	3	3	64									
<i>Forelius</i>												
<i>foetidus</i>	5	5	62	1	2	1				X	X	
<i>pruinosis</i>	100	54	13	11	62	10				X	X	
<i>Conomyrma</i>												
<i>bicolor</i>	15	11	52	7	6						X	
<i>insana</i>	94	76	14	15	42	13					X	
<i>Tapinoma</i>												
<i>sessile</i>	137	73	6		31	17	27	8	2	X		a
Subfamily Formicinae												
<i>Brachymyrmex</i>												
<i>depilis</i>	1	1	66		1							
<i>Camponotus</i>												
( <i>Camponotus</i> )												
<i>herculeanus</i>	1	1	66									
<i>laevigatus</i>	11	11	56			1	5					d
<i>modoc</i>	88	50	17				59	7	3			d
( <i>Myrmentoma</i> )												
<i>essigi</i>	6	6	61				4					d
<i>hyatti</i>	24	23	44		15	2	1					d
<i>sayi</i>	20	10	47			3						
( <i>Tanaemyrmex</i> )												
<i>ocreatus</i>	6	6	61		1	3				X	X	
<i>sansabeanus</i>	18	18	49			18				X	X	
<i>semitestaceus</i>	90	67	16		17	41				X	X	
<i>vicinus</i>	197	141	5		28	74	37			X	X	a



Table 2. Continued.

1 Taxonomic list	2 Records	3 Local- ities	4 Abun- dance	Biome						Nest		
				5 Hot Desert	6 Cool Desert	7 Pinyon- Juniper	8 Coni- ferous Forest	9 Ecotone	10 Alpine	11 Under stone	12 With crater	13 Misc.
<i>Paratrechina</i>												
<i>hystrix</i>	1	1	66									
<i>vividula</i>	17	3	50	2								
undescribed ?	1	1	66									
<i>Prenolepis</i>												
<i>imparis</i>	1	1	66									
<i>Lasius (Lasius)</i>												
<i>alienus</i>	40	27	34		7	2	28	3		X		
<i>crypticus</i>	24	19	44		14	5	1			X	X	
<i>neoniger</i>	16	10	51	2	3	4						
<i>pallitarsis</i>	34	28	37				34					d
<i>sitiens</i>	22	19	45		3	18				X		
<i>(Cautolasius)</i>												
<i>flavus</i>	26	14	42				26				X	
<i>(Chthonolasius)</i>												
<i>humilis</i>	6	6	61		2	4				X		
<i>nevadensis</i>	1	1	66				1			X		
<i>subumbratus</i>	2	2	65									
<i>umbratus</i>	1	1	66									
<i>vestitus</i>	5	3	62				5			X		
<i>Acanthomyops</i>												
<i>californicus</i>	1	1	66		1					X		
<i>coloradensis</i>	3	2	64			2	1			X		
<i>latipes</i>	9	9	58		2	5				X		
<i>Myrmecocystus</i>												
<i>(Endiodiocetes)</i>												
<i>depilis</i>	2	2	65	2							X	
<i>flaviceps</i>	32	27	38	12	10	1					X	
<i>kennedyi</i>	71	59	21	2	40	3					X	
<i>koso</i>	53	39	27	23	14	6					X	
<i>mendax</i>	10	12	57	4		1						
<i>mimicus</i>	1	1	66		1						X	
<i>romainei</i>	7	7	60	1	6						X	
<i>semirufus</i>	2	2	65	1	1						X	
<i>(Eremnocystus)</i>												
<i>arenarius</i>	4	4	63		4						X	
<i>creightoni</i>	1	1	66	1								
<i>hammettensis</i>	14	14	53		14						X	
<i>lugubris</i>	6	3	61	6						X		
<i>yuma</i>	7	5	60	7							X	
<i>(Myrmecocystus)</i>												
<i>ewarti</i>	2	2	65	2							X	
<i>mexicanus</i>	47	47	31	25	9						X	
<i>navajo</i>	19	18	48	3	3	8					X	
<i>pyramicus</i>	27	19	41		27						X	
<i>testaceus</i>	106	78	11		36	40					X	

Table 2. Continued.

1 Taxonomic list	2 Records	3 Local- ities	4 Abun- dance	Biome						Nest		
				5 Hot Desert	6 Cool Desert	7 Pinyon- Juniper	8 Coni- ferous Forest	9 Ecotone	10 Alpine	11 Under stone	12 With crater	13 Misc.
Formica												
(neogagates group)												
lasioides	79	56	18		16	8	40		4	X	X	
limata	1	1	66									
manni	120	100	8		78	29				X	X	
neogagates	74	57	20		29	10	2		5	X	X	
perpilosa	16	8	51	16								
(rufa group)												
ciliata	1	1	66		1							
coloradensis	2	2	65				1					d
dakotensis	8	7	59			2	2	1	1	X		
densiventris	24	16	44			5	6	1		X		abd
haemorrhoidalis	40	23	34		6	11	1			X		bd
integroides	6	3	61				3					bd
laeviceps	8	7	59		1		1					b
microgyna	6	5	61		1				1	X		
nevadensis	7	5	60				7					
obscuripes	60	36	26		20	5	6		1			b
obscuriventris	48	38	31		9	8	6		1			b
oreas	16	11	51		5		4					bd
planipilis	46	25	32		5	3	4					b
propinqua	21	16	46		3	2	9					b
querquetulana	3	3	64						1			
subnitens	10	10	57		2		2					b
whymperi	1	1	66									
(fusca group)												
aerata	61	35	31		33		1			X	X	
argentea	109	100	9		23	26	30	7	4	X	X	
fusca	101	82	12		5	4	65	20	17	X		
hewitti	10	10	57		1		3	1	3	X		
microphthalma	7	3	60				7					
moki	8	3	59			3						
neoclara	17	11	50		3		4					d
neorufibarbis	106	43	11				20	7	37	X		d
sibylla	30	14	39				33				X	
subelongata	11	9	56		4	3				X		
subpolita	204	103	4		64	51	19	8	5	X	X	
subsericea	37	30	35		2		18	10	1	X		
xerophila	29	20	40	1	3	19				X	X	
(sanguinea group)												
curiosa	3	3	64		3							
obtusopilosa	49	29	30		14	28				X	X	
puberula	11	6	56				7					
subnuda	26	21	42				12	9				bd
wheeleri	2	1	65		2							
Polyergus												
breviceps	26	19	42		3	3	9	1				

**Table 3. Ant faunas characteristic of the biomes of Nevada. The number in parentheses after the name of each biome is the total number of species reported from that biome. For the Alpine, because of its unusual interest, we list all species with more than 1 record and after each species the number of Alpine records.**

<b>Hot Desert (58)</b>	
<i>Pogonomyrmex rugosus</i>	<i>Formica manni</i>
<i>Pogonomyrmex magnacanthus</i>	<i>Formica neogagates</i>
<i>Pogonomyrmex californicus</i>	<i>Formica obscuripes</i>
<i>Pogonomyrmex maricopa</i>	<i>Formica aerata</i>
<i>Aphaenogaster megommata</i>	<i>Formica argentea</i>
<i>Veromessor pergandei</i>	<i>Formica subpolita</i>
<i>Pheidole desertorum</i>	<i>Formica obtusopilosa</i>
<i>Pheidole gilvescens</i>	
<i>Pheidole paiute</i>	<b>Pinyon-Juniper (76)</b>
<i>Pheidole tucsonica</i>	<i>Pogonomyrmex occidentalis</i>
<i>Crematogaster depilis</i>	<i>Pogonomyrmex salinus</i>
<i>Solenopsis maniosa</i>	<i>Aphaenogaster uinta</i>
<i>Forelius pruinosus</i>	<i>Veromessor lobognathus</i>
<i>Conomyrma insana</i>	<i>Crematogaster coarctata</i>
<i>Myrmecocystus flaviceps</i>	<i>Crematogaster mormonum</i>
<i>Myrmecocystus koso</i>	<i>Monomorium minimum</i>
<i>Myrmecocystus mexicanus</i>	<i>Leptothorax nevadensis</i>
	<i>Forelius pruinosus</i>
	<i>Conomyrma insana</i>
	<i>Tapinoma sessile</i>
<b>Cool Desert (88)</b>	<i>Camponotus sansabeanus</i>
<i>Manica mutica</i>	<i>Camponotus semitestaceus</i>
<i>Pogonomyrmex occidentalis</i>	<i>Camponotus vicinus</i>
<i>Pogonomyrmex owyheeii</i>	<i>Lasius siliens</i>
<i>Pogonomyrmex salinus</i>	<i>Myrmecocystus testaceus</i>
<i>Pogonomyrmex californicus</i>	<i>Formica manni</i>
<i>Aphaenogaster megommata</i>	<i>Formica neogagates</i>
<i>Aphaenogaster occidentalis</i>	<i>Formica haemorrhoidalis</i>
<i>Veromessor lariversi</i>	<i>Formica argentea</i>
<i>Veromessor smithi</i>	<i>Formica subpolita</i>
<i>Pheidole californica</i>	<i>Formica xerophila</i>
<i>Pheidole paiute</i>	<i>Formica obtusopilosa</i>
<i>Crematogaster mormonum</i>	
<i>Monomorium minimum</i>	<b>Coniferous Forest (66)</b>
<i>Solenopsis molesta</i>	<i>Myrmica fracticornis</i>
<i>Leptothorax nevadensis</i>	<i>Myrmica incompleta</i>
<i>Forelius pruinosus</i>	<i>Myrmica tahoensis</i>
<i>Conomyrma insana</i>	<i>Manica bradleyi</i>
<i>Tapinoma sessile</i>	<i>Manica hunteri</i>
<i>Camponotus hyatti</i>	<i>Aphaenogaster occidentalis</i>
<i>Camponotus semitestaceus</i>	<i>Leptothorax muscorum</i>
<i>Camponotus vicinus</i>	<i>Leptothorax nevadensis</i>
<i>Lasius crypticus</i>	<i>Leptothorax rugatulus</i>
<i>Myrmecocystus flaviceps</i>	<i>Tapinoma sessile</i>
<i>Myrmecocystus kennedyi</i>	<i>Camponotus modoc</i>
<i>Myrmecocystus koso</i>	<i>Camponotus vicinus</i>
<i>Myrmecocystus hammettensis</i>	<i>Lasius alienus</i>
<i>Myrmecocystus pyramicus</i>	<i>Lasius pallitarsis</i>
<i>Myrmecocystus testaceus</i>	<i>Lasius flavus</i>
<i>Formica lasioides</i>	<i>Formica lasioides</i>

**Table 3. Continued.**

<i>Formica argentea</i>	<i>Tapinoma sessile</i> (2)
<i>Formica fusca</i>	<i>Camponotus modoc</i> (3)
<i>Formica neorufibarbis</i>	<i>Formica lasioides</i> (4)
<i>Formica sibylla</i>	<i>Formica neogagates</i> (5)
<i>Formica subpolita</i>	<i>Formica argentea</i> (4)
<i>Formica subsericea</i>	<i>Formica fusca</i> (17)
<i>Formica subnuda</i>	<i>Formica hewitti</i> (3)
<b>Alpine (18)</b>	<i>Formica neorufibarbis</i> (37)
<i>Leptothorax muscorum</i> (4)	<i>Formica subpolita</i> (5)

## MYRMECOPHILES

We have referred to all myrmecophiles in our Nevada collection. The references will be found in Nevada Notes under the host species. There is one exception to the above. It is *Mirolepisma deserticola* Silvestri (Thysanura: Lepismatidae) (det. R.C. Bechtel). This species was such a common inhabitant of the nests of so many species that we stopped collecting or recording it. This creature has a beautiful golden color due to its covering of golden scales. It is very fast and difficult to collect without injuring it, and the golden color is completely lost upon preservation.

R.C. Bechtel has given us his list of 61 records (with hosts) of *Mirolepisma deserticola*; to this we have added our 21. These records are distributed over the entire state except the northeastern corner (Elko, White Pine, Eureka, and Lander counties): 500–6,500 ft., but 70% of the records are between 3,000 and 5,000 ft. A list of the 18 host species follows; the numeral after each name is the number of records with that host: *Manica mutica* 2, *Pogonomyrmex rugosus* 15, *P. occidentalis* 1, *P. owyheeii* 4, *P. salinus* 4, *P. subdentatus* 5, *P. californicus* 36, *P. maricopa* 1, *Aphaenogaster cockerelli* 1, *Veromessor lariversi* 2, *V. pergandei* 3, *Pheidole vistana* 1, *Crematogaster coarctata* 1, *Solenopsis maniosa* 1, *Camponotus sayi* 1, *Myrmecocystus kennedyi* 2, *Formica argentea* 1.



## BIOGEOGRAPHY

### PLEISTOCENE HISTORY OF NEVADA

Cronquist et al. (1972:34) have given an account of the Pleistocene history of the Great Basin which is based on plants. Because ants are indirectly dependent on plants, we may apply that account to the ant fauna:

"The relatively small glaciers and large pluvial lakes in the Great Basin indicate that the bulk of the snow melted, and that the temperature decrease [5°F] was minor and the precipitation, particularly the rainfall, was greater than at present."

There were many biotic changes during the Pleistocene; biomes moved southward and northward and up and down, but the result was that the present floras of the Great Basin are essentially the same as they were at the beginning of the Pleistocene.

We found it easy to understand the biogeography of the ants of North Dakota (Wheeler and Wheeler, 1963). That state was mostly covered by the Wisconsin Ice Sheet and is now physiographically and climatically homogeneous, without physical or climatic barriers. One could easily guess the source of postglacial immigrants.

But Nevada's story is utterly different. A land of physiographic and climatic extremes hemmed in by the mountains, it never was covered by an ice sheet; there always were refugia. We tend to think of an ant fauna as comprising immigrants from all points of the compass. But in the absence of a fossil record, who is to say that Nevada did not supply many emigrant species (e.g., in *Pogonomyrmex*, *Veromessor*, *Pheidole*, and *Myrmecocystus*) to other regions?

### THE PRESENT ANT FAUNA

Our list of the presently known Nevada ants totals 177 species, of which 28% are montane. But only 30 species are exclusively montane. All 50 montane species occur in the Coniferous Forest Biome. Fourteen species have been reported from the Alpine, none of them exclusive to that biome.

Only the Sierra montane forest fauna is at all distinctive; six species occur in the Sierra Nevada, which are found no-

where else in the state. Conversely, there are seven montane species that do *not* occur in the Sierra, but are found in many other parts of the state. Most of the montane species are too widely distributed to show any clear pattern.

The montane species limited in Nevada to the Carson Range of the Sierra Nevada include *Manica bradleyi*, *Stenamma heathi*, *S. wheelerorum*, *Formica integroides*, *F. microphthalma*, and *F. sibylla*.

The greatest altitudinal record for Nevada ants is that of *Formica neorufibarbis*, collected on Boundary Peak in the White Mountains at 12,160 ft.

The ant fauna of the North American Hot Desert comprises 94 species, of which 36 are limited thereto. The area of Hot Desert in Nevada is small—about 20% (22,100 square miles) of the area of the state (110,540 square miles). Ecologically it is even smaller; a glance at a topographic map suggests that perhaps only two-thirds of the area would be low enough to support Hot Desert Biota, or about 15% of the total area of the state—about 16,600 square miles. This small area supports a Hot Desert fauna of 62 species, which is 65% of the North American Hot Desert species. Considering only those 36 species restricted to the Hot Desert, Nevada has 15 species or 42% of the total.

### NEVADA ANTS IN THE NEARCTIC FAUNA

Tables 4 and 5 are intended to give the reader an idea of the size (in number of species) of the Nevada ant fauna when compared to the fauna of the entire Nearctic Realm.

Thirty-one percent (177 species) of the 578 native Nearctic species are found in Nevada. If, however, we deduct the 80 rare species that have been collected only once (known only from type material) or in only one place (known only from type locality) and also the 115 species collected only in the Gulf and Border states (Florida to California), which are essentially tropical, the remaining 383 are species which myrmecologists might expect to collect in the temperate part of the Nearctic Realm. Of this number the Nevada ant fauna comprises 46%, which we would consider a rich fauna.



**Table 4. Nevada ant fauna compared with the Nearctic ant fauna: subfamilies.**

Subfamily	Genera		Species	
	Nearctic	Nevada	Nearctic	Nevada
Ponerinae	13	2	25	3
Cerapachyinae	2	—	3	—
Dorylinae	3	1	26	3
Pseudomyrmecinae	1	—	5	—
Myrmicinae	37	13	307	76
Dolichoderinae	6	5	18	7
Formicinae	12	9	194	88
Totals	74	31	578	177

**Table 5. Nevada ant fauna compared with the Nearctic ant fauna: genera.**

Genus	Species	
	Nearctic	Nevada
Ponerinae		
<i>Amblyopone</i>	3	1
<i>Hypoponera</i>	4	2
Dorylinae		
<i>Neivamyrmex</i>	24	3
Myrmicinae		
<i>Myrmica</i>	20	7
<i>Manica</i>	4	3
<i>Pogonomyrmex</i>	19	12
<i>Ephebomyrmex</i>	3	1
<i>Stenamma</i>	18	4
<i>Aphaenogaster</i>	20	5
<i>Veromessor</i>	7	5
<i>Pheidole</i>	56	14
<i>Crematogaster</i>	27	11
<i>Monomorium</i>	7	1
<i>Solenopsis</i>	18	3
<i>Leptothorax</i>	34	9
<i>Tetramorium</i>	4	1
Dolichoderinae		
<i>Liometopum</i>	3	1
<i>Iridomyrmex</i>	3	1
<i>Forelius</i>	2	2
<i>Tapinoma</i>	4	1
<i>Conomyrma</i>	3	2
Formicinae		
<i>Brachymyrmex</i>	3	1
<i>Camponotus</i>	43	10
<i>Paratrechina</i>	8	3
<i>Prenolepis</i>	1	1
<i>Lasius</i>	16	11
<i>Acanthomyops</i>	14	3
<i>Myrmecocystus</i>	24	18
<i>Formica</i>	74	40
<i>Polyergus</i>	2	1

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## APPENDIXES

### APPENDIX 1. PRONUNCIATION AND DERIVATION OF THE NAMES OF THE ANT TAXA

#### KEY TO PRONUNCIATION

Symbol	Example	Symbol	Example
a	cat	ô	corn
ā	late	oi	boil
ä	part	ōō	moon
e	pet	ou	about
ē	eat	s	sand
g	got	sh	shine
i	hit	th	think
ī	price	u, uh*	cup
o	pot	ū	union
ō	go	û	burn

#### ABBREVIATIONS AND SYMBOLS

gen.—genitive; Gr.—Greek; L.—Latin; Lz.—Latinization; q.v.—which see. A hyphen at the end (or beginning) of a word indicates an inseparable (i.e., never used alone) prefix (or suffix). The heavy accent is indicated by " , the light by '.

#### PRONUNCIATIONS AND DERIVATIONS

Acanthomyops (a-kan'thō-mī'ops) Gr. *akantha* thorn, spine + Gr. *myops* short-sighted  
aerata (ā'uh-rā'tuh) L. *aeratus* covered with brass or bronze  
alienus (āl'yen-us) L. *alienus* foreign, not related  
Amblyopone (am'bli-ō-pō'nē) Gr. *amblys* blunt + Gr. *-pone* shortened form of *ponera* wretched, laborious  
americana (a-mer'i-kā'nuh) Lz. *america* America + L. *-ana* pertaining to  
andrei (an'drē-ī) gen. of *andreas* Lz. of surname of Ernst André, French myrmecologist (1838–1914)

\* When the short "u" sound occurs at the end of a word or syllable, we add "h" for sake of clarity; of course, the "h" is not pronounced.

apache (a-patch"ē) *Apache*, a group of Amerindian tribes of the southwestern United States  
Aphaenogaster (a-fē'nō-gas"tûr) Gr. *a-* without + Gr. *phaino* I shine + Gr. *gaster* belly  
arenarius (a'rē-nā"ri-us) L. *arenarius* sandy  
argentea (ār-jen"tē-uh) L. *argenteus* silvery  
aurea (ôr"ē-uh) L. *aureus* golden  
barbatus, -a (bār-bā'tus, -tuh) L. *barbatus* bearded  
bicolor (bī'kul'ûr) L. *bicolor* two-colored  
boulderensis (bōl'dûr-en'sis) *boulderus* Lz. of Boulder Dam on the Colorado River + L. *-ensis* signifying locality or country  
Brachymyrmex (brak'i-mûr"mek) Gr. *brachys* short + Gr. *myrmex* ant  
bradleyi (brad'li-ī) gen. of *bradleyus* Lz. of surname of J.C. Bradley, American entomologist (1884–1975)  
breviceps (brev'i-seps) L. *brevis* short + L. *-ceps* head  
brevispinosus, -a (brev'i-spī-nō'sus, -suh) L. *brevis* + L. *spinosus* thorny, armed with spines  
caespitum (ses"pi-tum) L. gen. pl. of *caespes* turf, sod  
californicus, -a (kal'i-fôr"ni-kus, -kuh) Lz. *californicus* Californian  
Camponotus (kam'pō-nō'tus) Gr. *kampe* a bending + Gr. *notos* back  
carinatus (kar'i-nā'tus) L. *carinatus* keeled  
Cautolasius (kô'tō-lā'si-us) L. *cautus* provident, cautious + *Lasius* q.v.  
cerebrosior (ser'ē-brō'si-ôr) L. *cerebrosior* more hot-tempered  
ceres (sē'rēz) L. *Ceres* Roman goddess of agriculture  
Chthonolasius (thon'ō-lā'si-us) Gr. *chthon* earth + *Lasius* q.v.  
ciliata (sil'i-ā'tuh) L. *cilium* eyelid, eyelash + L. *-ata* provided with  
clydei (klī'dē-ī) gen. of *clydeus* Lz. of first name of Clyde Stroud  
coarctata (kō'ärk-tā'tuh) L. *coarctatus* compressed, confined, drawn together, shortened  
cockerelli (kok'ûr-el'ī) gen. of *cockerellus* Lz. of surname of T.D.A. Cockerell, American entomologist (1866–1948)  
colei (kō'lē-ī) gen. of *coleus* Lz. of surname of Arthur C. Cole, American myrmecologist

- coloradensis (kol'ō-ra-den"sis) Lz. *colorado* Colorado + L. *-ensis* denoting locality or country
- Conomyrma (kō'nō-mûr"muh) Gr. *konos* cone + Gr. *myrmos* ant
- crassipilis (kras'i-pī"lis) L. *crassus* thick + L. *pilus* a hair + L. *-is* with, having
- creightoni (krā'tuh-nī) gen. of *creightonus* Lz. of surname of William Steel Creighton, American myrmecologist (1902–1973)
- Crematogaster (krē-mat"ō-gas'tûr) Gr. *krema(s)tos* hung, suspended + Gr. *gaster* belly
- crypticus (krip"ti-kus) Gr. *kryptikos* hidden, secret
- curiosa (kū'ri-ō"suh) L. *curiosus* inquisitive
- dakotensis (da'kō-ten"sis) Lz. of Dakota + L. *-ensis* denoting locality or country
- densiventris (den'si-ven"tris) L. *densus* dense, thick + L. *venter* belly + L. *-is* with, having
- depilis (dep"i-lis) L. *depilis* without hair
- desertorum (dez'ûr-tō"rum) gen. pl. of L. *desertum* desert
- diecki (dē"ki) gen. of *dieckus* Lz. of surname Dieck
- Dolichoderinae (dol'i-kō-dē-rī"nē) *Dolichoderus* a genus of ants + L. *-inae* denoting a subfamily of animals
- Dorylinae (dō'ri-lī"nē) *Dorylus* a genus of ants + L. *-inae* denoting a subfamily of animals
- emeryana (em'ûr-i-ā"nuh) *emeryus* Lz. of surname of Carlo Emery, Italian myrmecologist (1848–1925) + L. *-ana* pertaining to
- Endiodictes (en'di-ō-dī-ok"tēz) Gr. *endio* at midday + Gr. *dioktes* hunter
- Ephebomyrmex (ef-ē'bō-mûr"mek) Gr. *ephebos* youth (without a beard) + Gr. *myrmex* ant
- Eremnocystus (e-rem'nō-sis"tus) Gr. *eremnos* swarthy, dark + Gr. *kystis* bladder, pouch, sac
- essigi (es"ig-i) gen. of *essigus* Lz. of surname of E.O. Essig (1884–1964) American entomologist
- ewarti (û"är-tī) gen. of *ewartus* Lz. of surname of William Ewart, American entomologist
- flaviceps (fla"vi-seps) L. *flavus* yellow + L. *-ceps* head
- flavus (fla"vus) L. *flavus* yellow, gold, golden yellow
- foetidus (fet"i-dus) L. *foetidus* stinking
- Forelius (fō-rel"i-us) Lz. of surname of Auguste Forel (1848–1931), Swiss psychiatrist and myrmecologist
- Formica (fôr-mī"kuh) L. *formica* ant
- Formicidae (fôr-mis"i-dē) *Formica* q.v. + L. *-idae* denoting a family of animals
- Formicinae (fôr-mi-sī"nē) *Formica* q.v. + L. *-inae* denoting a subfamily of animals
- fracticornis (frak'ti-kôr"nis) L. *fractus* broken + L. *cornu* horn + L. *-is* with, having
- fusca (fus"kuh) L. *fuscus* dark-colored, dark, black
- gilvescens (gil-ves"enz) L. *gilvus* pale yellow + L. *-escens* participial ending meaning becoming or beginning
- haemorrhoidalis (hem'ûr-oid"a-lis) Gr. *haima* blood + Gr. *-rrhos* from *rhein* to flow + L. *-alis* pertaining to
- hammettensis (ham'et-en"sis) Lz. of Hammett, a village in Idaho + L. *-ensis* denoting place
- heathi (hē"thī) gen. of *heathus* Lz. of surname of Harold Heath
- herculeanus (hûr-kû'lē-ā"nus) L. *hercules* Hercules + L. *-anus* pertaining to
- hespera (hes"per-uh) incorrectly derived from L. *hesperius* or L. *hesperis* or Gr. *hesperios* western
- hewitti (hū"i-i) gen. of *hewittus* Lz. of surname of C.G. Hewitt, Canadian entomologist (1885–1920)
- humilis (hū"mi-lis) L. *humilis* on the ground
- hunteri (hun"tûr-i) gen. of *hunterus* Lz. of surname of S.J. Hunter
- hyatti (hī"at-i) gen. of *hyattus* Lz. of surname of Ed Hyatt
- Hypoponera (hī'pō-pō-nē"ruh) Gr. *hypo-* somewhat, to a limited degree + *Ponera* a genus of ants
- imberbicus (im'bûr-bik"û-lus) L. *imberbis* beardless + L. *-culus* diminutive
- imparis (im-pār"is) L. *impar* uneven, odd + L. *-is* with, having
- incompleta (in'com-plē"tuh) L. *in-* not + L. *completus* complete
- inquilina (in'kwi-līn"uh) L. *inquilinus* one living in a place not his own, tenant, lodger
- insana (in-sā"nuh) L. *insanus* insane
- integroides (in'tē-groi"dēz) *integra* a species of *Formica* + Gr. *-oeides* having the form of, like
- Iridomyrmex (ir'id-o-mûr"mek) Gr. *iris* (*iridos*) rainbow + Gr. *myrmex* ant
- kennedyi (ken"i-di-i) gen. of *kennedyus* Lz. of surname of C.H. Kennedy, American entomologist
- koso (kō"sō) "Named for the Koso Amerindian tribe, a Paiute-Shoshonean group who formerly inhabited the Panamint Range. The word *koso* in Shoshoni means 'Land of Fire,' appropriately descriptive of the region where this species occurs" (Snelling, 1976:77)
- laeviceps (lē"vi-seps) L. *laevis* smooth + L. *-ceps* head
- laevigatus (lē'vi-gā"tus) l. *laevigatus* smooth, slippery
- lariversi (la-riv"ûr-zī) gen. of *lariversus* Lz. of surname of Ira LaRivers, American biologist (1915–1977)
- larrae (lar"ē-ē) gen. of *Larrea*, a genus of plants
- lasioides (lā'si-oid"ēz) *Lasius* q.v. + Gr. *-oeides* like
- Lasius (lā'si-us) Gr. *lasios* shaggy, hairy
- latipes (lat"i-pēz) L. *latus* broad + L. *pes* foot
- Leptothorax (lep'tō-thō"raks) Gr. *leptos* slender, thin + Gr. *thorax* thorax
- limata (lī-mā"tuh) L. *limatus* polished
- Liometopum (lī'ō-mē-tō"pum) Gr. *leios* smooth + Gr. *metopon* forehead
- lobognathus (lō'bog-nath"us) Gr. *lobos* a rounded projection + Gr. *gnathos* jaw
- lobifrons (lō'bi-fronz) L. *lobus* (Gr. *lobos*) a rounded projection + L. *frons* forehead
- luctuosum (luk'tû-ō"sum) L. *luctuosus* mournful, lamentable, baleful
- lugubris (lu-gōō"bris) L. *lugubris* lugubrious, mournful
- magnacanthus (mag'nuh-kan"thus) L. *magnus* large + Gr. *kanthus* corner of the eye, eye
- Manica (man"i-kuh) Gr. *manikos* mad, insane
- maniosa (man'i-ō"suh) Gr. *mania* madness, frenzy + L. *-osus* having (with connotation of "to a high degree")

- manni (man"tī) gen. of *mannus* Lz. of surname of W.M. Mann, American myrmecologist (1886–1960)
- maricopa (mar-i-kō"puh) *Maricopa*, an Amerindian group in Arizona; a county, a town, and a mountain range in Arizona
- megommata (meg-om"uh-tuh) Gr. *megas* large + Gr. *omma* eye + L. *-ata* having
- mendax (men"daks) L. *mendax* mendacious, lying
- mexicanus (mek'si-kā"nus) Lz. *mexicanus* Mexican
- microgyna (mī'krō-jī"nuh) Gr. *mikros* small + Gr. *gyne* female
- microphthalma (mī'krof-thal"muh) Gr. *mikros* small + Gr. *ophthalmos* eye
- mimicus (mim"i-kus) L. *mimicus* mimic, imitative
- minimum (min"i-mum) L. *minus* smallest, very small
- minor (mī'nôr) L. *minor* smaller
- modoc (mō"dok) Modoc, a small tribe of Amerindians formerly living in southwestern Oregon and northeastern California
- moki (mō"ki) Moki = Hopi, an Amerindian tribe of northeastern Arizona
- molesta (mō-les"tuh) L. *molestus* annoying, troublesome
- Monomorium (mon'ō-mō"ri-um) Gr. *monos* single + Gr. *morion* part (referring to the one-segmented maxillary palps)
- mormonum (môr-mō"num) gen. pl. of *mormonis* Lz. of Mormon
- muscorum (mus-kō"rum) gen. pl. of L. *muscus* moss
- mutans (mū"tan) L. *mutans* changing
- mutica (mū"ti-kuh) L. *muticus* docked, curtailed, lacking usual defensive structure
- Myrmecocystus (mū'mē-kō-sis"tus) Gr. *myrmex* (*myrmex*) ant + Gr. *kystis* bladder, pouch, sac
- Myrmentoma (mûr-men"tō-muh) Gr. *myrmos* ant + Gr. *entomos* cut in
- Myrmica (mûr-mī"kuh) Gr. *myrmos* ant + Gr. *-icus* meaning like
- Myrmicinae (mûr'mi-sī'nē) *Myrmica* q.v. + L. *-inae* denoting a subfamily of animals
- navajo (nav"uh-hō) Navajo, an Amerindian tribe of the southwestern United States
- Neivamyrmex (nē'vuh-mûr"mek) Arturo Neiva (1880–1943), a Brazilian entomologist + Gr. *myrmex* ant
- neoclara (nē'ō-kla"ruh) Gr. *neos* new (i.e., Nearctic) + L. *clara* a Palearctic form of *Formica* (L. *clara* clear, bright)
- neogagates (nē'ō-gā-gā"tez) Gr. *neos* new (i.e., Nearctic) + *gagates* a Palearctic species of *Formica* (L. *gagates* jet black)
- neoniger (nē'ō-nī"jûr) Gr. *neos* new (i.e., Nearctic) + *niger* a Palearctic species of *Lasius* (L. *niger* black)
- neorufibarbis (nē'ō-rōō'fi-bār"bis) Gr. *neos* (i.e., Nearctic) + *rufibarbis* a Palearctic species of *Formica* (L. *rufus* red, reddish + L. *barba* beard + L. *-is* with, having)
- nevadensis (nē'vuh-den"sis) Lz. *nevada* Nevada + L. *-ensis* signifying locality or country
- nitens (nī"ten) L. *nitens* shining
- nocturna (nok-tûr"nuh) L. *nocturnus* nocturnal
- nyensis (nī-en"sis) Nye County, Nevada + L. *-ensis* denoting locality
- obliquicanthus (ō-blī"kwī-kan"thus) L. *obliquus* oblique + Gr. *kanthos* corner of the eye, eye
- obscuripes (ob-skû"ri-pēz) L. *obscurus* obscure, dark + L. *pes* foot
- obscuriventris (ob-skû'ri-ven"tris) L. *obscurus* obscure, dark + L. *venter* belly + L. *-is* with, having
- obtusopilosa (ob-tû'sō-pī-lō"suh) L. *obtusus* obtuse, blunt, dull + L. *pilosus* hairy
- occidentalis, -e (ok'si-den"tuh-lis, -lē) L. *occidentalis* western
- ocreatus (ō-krē-ā"tus) L. *ocreatus* wearing greaves or leggings
- opaciceps (ō-pas"i-seps) L. *opacus* dark + L. *-iceps* head
- opacior (ō-pas"i-ôr) L. *opacior* darker
- opuntiae (ō-pun"ti-ē) gen. of L. *Opuntia*, a genus of cacti
- oreas (ō're-as) L. *Oreas* a mountain nymph
- owyhee (ō-wī'hē-ī) gen. of *owyhees* Lz. of Owyhee, a county in southwestern Idaho
- pauite (pī-ū"tē) Lz. of name of a tribe of Shoshonean Amerindians that lived in California, Nevada, Utah, and Arizona
- pallipes (pal"i-pēz) L. *pallidus* pale + L. *pes* foot
- pallitarsis (pal-i-tār"sis) incorrectly derived from L. *pallidus* pale + Gr. *tarsos* tarsus
- Paratrechina (par'uh-tre-ki"nuh) Gr. *paratrecho* I run by or past + L. *-ina* implying diminutive
- pergandei (pûr-gan"dē-i) gen. of *pergandei* Lz. of surname of Theodore Pergande, American entomologist (1840–1916)
- perpilosa (pûr'pi-lō"suh) L. *per-* very + L. *pilosus* hairy
- Pheidole (fī-dō"lē) Gr. *phaidolos* thrifty
- pilifera (pī-lif'er-uh) L. *pilus* a hair + L. *-fer* bearing
- planipilis (plan'i-pī"lis) L. *planus* level, flat + L. *pilus* a hair + L. *-is* with, having
- Pogonomyrmex (pō-gō'nō-mûr"mek) Gr. *pogon* a beard + Gr. *myrmex* ant
- Polyergus (pol'i-ûr"gu) Gr. *polyergus* hard-working
- Ponerinae (pō'ner-i"nē) *Ponera* a genus of ants + L. *-inae* denoting a subfamily of animals
- Prenolepis (prē-nol'e-pis') Gr. *prenes* bent forward + Gr. *lepis* scale
- propinqua (prō-pin"kwuh) L. *propinquus* near
- pruinosis (prōō'i-nō"sus) L. *pruinosis* covered with hoarfrost
- puberula (pû-ber"û-luh) L. *puber* downy + L. *-ula* somewhat
- pyramicus (pi-ram"i-kus) L. *pyramis* pyramid + L. *-icus* pertaining to
- querquetulana (kwûr-kwet'û-lā"na) L. *querquetulanus* belonging to an oak woods
- romainei (rō-mā'nē-ī) gen. of *romaineus* Lz. of surname of Marjorie Romaine, collector of the type
- rufa (rōō"fu) L. *rufus* red
- rugosus (rōō-gō"sus) L. *rugosus* wrinkled
- rugatulus (rōō-gāt'û-lus) L. *rugatus* wrinkled + L. *-ulus* somewhat
- salinus (sā-lī"nus) L. *salinus* salty
- sanguinea (san-gwin"ē-uh) L. *sanguineus* blood-red
- sansabeanus (san-sab'ē-ā"nus) San Saba River in Texas + L. *-anus* pertaining to
- sayi (sā"i) gen. of *sayus* Lz. of surname of Thomas Say, American zoologist (1787–1834)

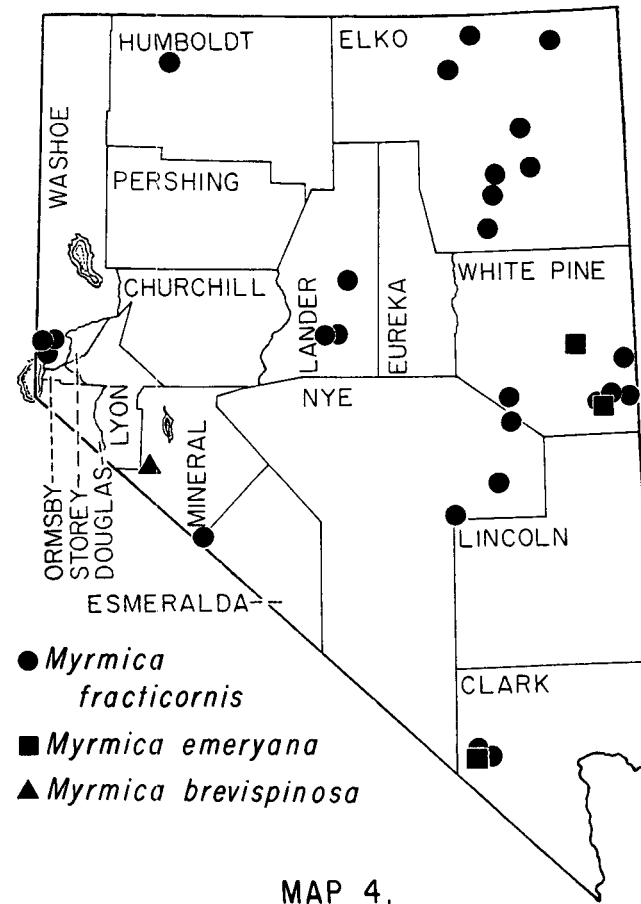
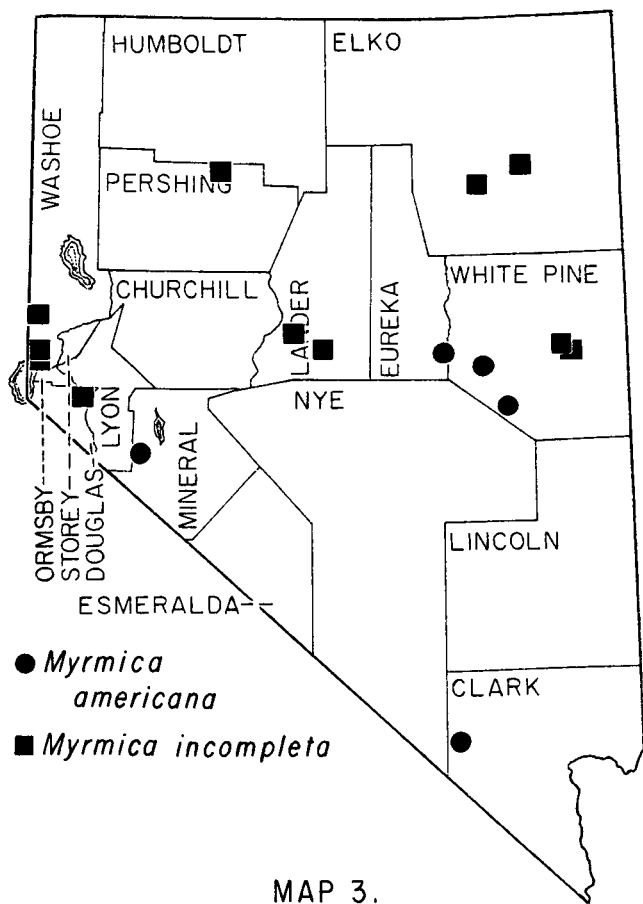
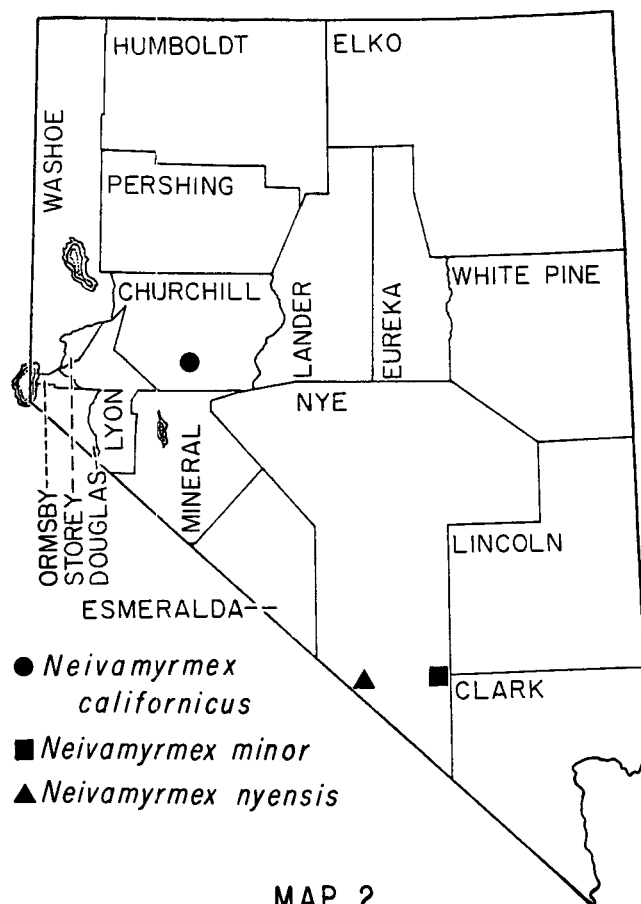
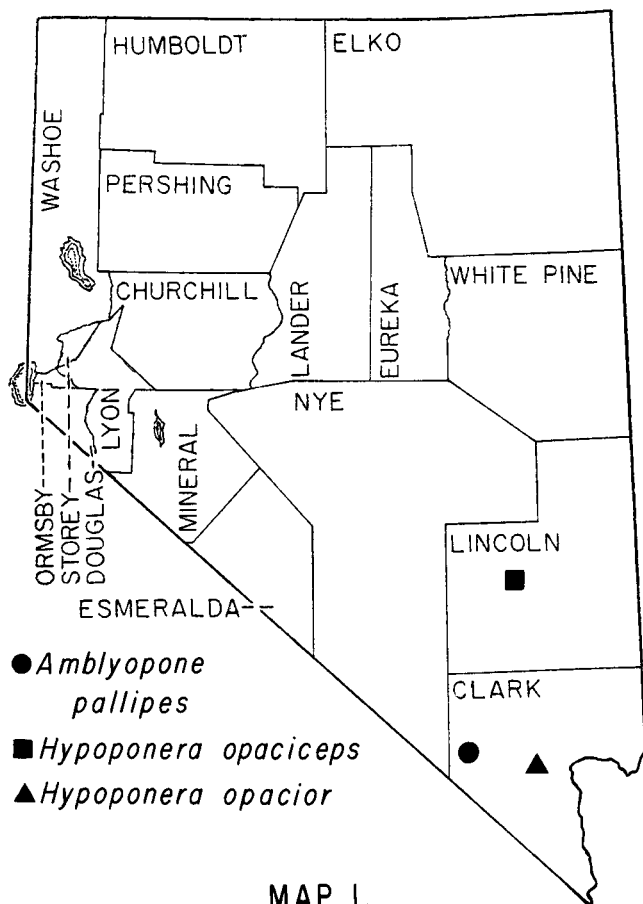
semirufus (sem'i-rōō"fus) L. *semis* half + L. *rufus* red  
 semitestaceus (sem'i-tes-tā"shus) L. *semis* half + L. *testaceus* q.v.  
 sessile (ses'i-lē) L. *sessilis* sitting  
 sibylla (si-bil"luh) Gr. and L. *Sibylla* a prophetess  
 sitiens (sit"yenz) L. *sitiens* thirsty  
 smithi (smith"i) gen. of *smithus* Lz. of surname of M.R. Smith, American myrmecologist, 1894–1981  
 Solenopsis (sō'len-op"sis) Gr. *solen* channel, pipe + Gr. *opsis* appearance, face, likeness  
 Stenamma (sten-am"uh) Gr. *stenos* narrow + Gr. *hamma* knot, connection  
 subdentatus (sub'den-tā"tus) L. *sub-* somewhat + L. *dentatus* toothed  
 subelongata (sub'ē-lōn-gā"tuh) L. *sub-* somewhat + L. *elongatus* elongate  
 subnitidus (sub'nit"i-dus) L. *sub-* somewhat + L. *nitidus* shining  
 subnitens (sub-nī"tenz) L. *sub-* somewhat + L. *nitens* bright, shining  
 subnuda (sub-nū"da) L. *sub-* somewhat + L. *nuda* bare, naked  
 subpolita (sub'pō-lī"tuh) L. *sub-* somewhat + L. *politus* polished  
 subsericea (sub'sē-rish"uh) L. *sub-* somewhat + L. *sericeus* silky  
 subumbratus (sub'um-brā"tus) L. *sub-* somewhat + L. *umbratus* q.v.  
 tahoensis (tā'hō-en"sis) Lz. from Lake Tahoe + L. *-ensis* denoting locality  
 Tanaemyrmex (tan'ē-mûr"mek) Gr. *tanae* from *tanaos* outstretched + Gr. *myrmex* ant

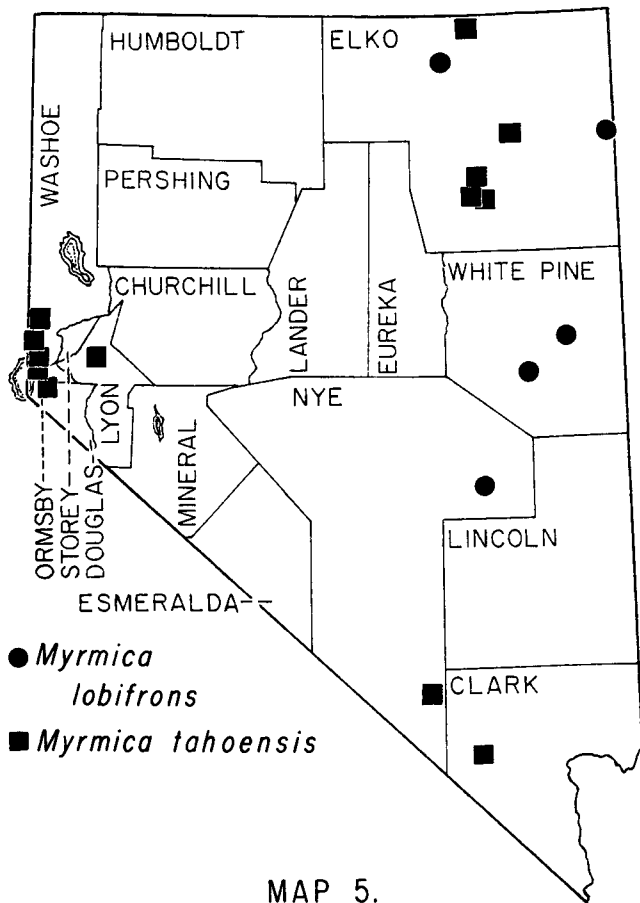
Tapinoma (tap'i-nō"muh) Gr. *tapeinoma* lowness (i.e., of the scale of the petiole)  
 testaceus (tes-tā"shus) L. *testaceus* brick-colored, brownish yellow  
 Tetramorium (tet'ruh-mō"ri-um) Gr. *tetra-* four + Gr. *morion* part (i.e., of the maxillary palp)  
 tricarinatus (trī'kar-i-nā"tus) L. *tri-* three + L. *carinatus* keeled  
 tucsonica (tū-son"i-kuh) *tucsonicus* Lz. of Tucson, city in Arizona + L. *-icus* pertaining to  
 Uinta (ū-in"tuh) Uinta Mountains, chiefly in northeastern Utah  
 umbratus (um-brā"tus) L. *umbratus* shaded, shadowed, covered  
 Veromessor (ver'ō-mes"ôr) L. *verus* true + *Messor* a Palearctic genus of harvesting ants (L. *messor* reaper)  
 vestitus (ves-tī"tus) L. *vestitus* clothed  
 vicinus (vi-sī"nus) L. *vicinus* neighboring, near  
 vistana (vis-tā"nuh) Lz. of Vista, a town in San Diego County, California + L. *-anus* pertaining to  
 vividula (vī-vid"ū-luh) L. *vividus* animated + L. *-ulus* somewhat  
 wheeleri (hwē'lûr-ī) gen. of *wheelerus* Lz. of surname of William Morton Wheeler (1865–1973), American myrmecologist  
 wheelerorum (hwē'lûr-ō"rum) gen. pl. of *wheelerus* Lz. of surname of George C. Wheeler and Jeanette Wheeler, American myrmecologists  
 whymperi (hwim"pûr-ī) gen. of *whympereus* Lz. of surname of Edward Whympere (1840–1911) British alpinist and wood engraver  
 xerophila (zir-of"i-luh) Gr. *xeros* dry + Gr. *-phila* loving  
 yuma (yōō"muh) Yuma, Arizona

## APPENDIX 2. DISTRIBUTION OF THE ANTS OF NEVADA

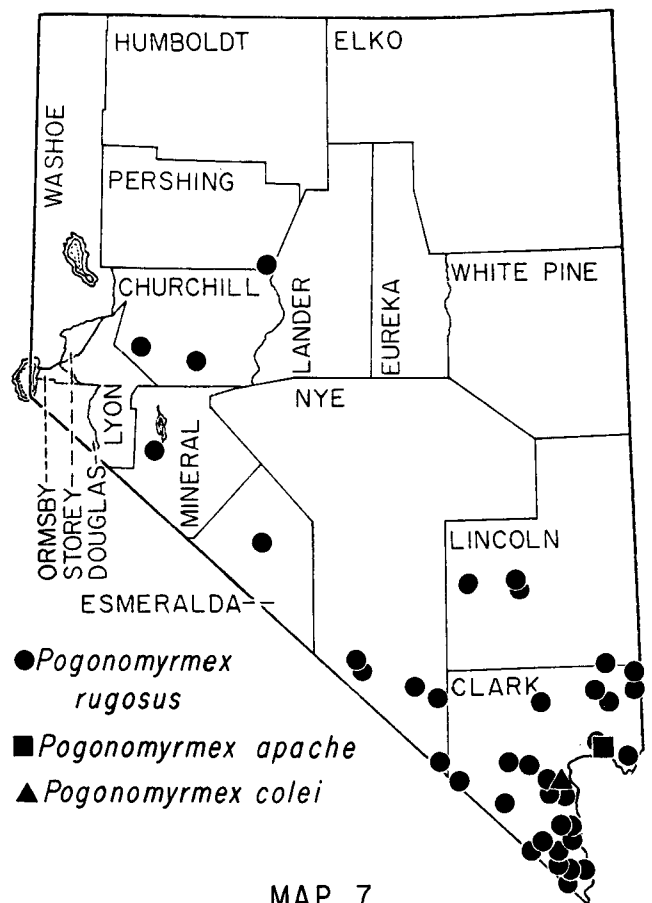
- Map 1 *Amblyopone pallipes*, *Hypoponera opaciceps*, and *H. opacior*
- Map 2 *Neivamyrmex californicus*, *N. minor*, and *N. nyensis*
- Map 3 *Myrmica americana* and *M. incompleta*
- Map 4 *Myrmica fracticornis*, *M. emeryana*, and *M. brevispinosa*
- Map 5 *Myrmica lobifrons* and *M. tahoensis*
- Map 6 *Manica mutica*, *M. bradleyi*, and *M. hunteri*
- Map 7 *Pogonomyrmex rugosus*, *P. apache*, and *P. colei*
- Map 8 *Pogonomyrmex subdentatus*, *P. subnitidus*, and *P. brevispinosus*
- Map 9 *Pogonomyrmex occidentalis* and *P. owyheeii*
- Map 10 *Pogonomyrmex salinus*
- Map 11 *Pogonomyrmex californicus*
- Map 12 *Pogonomyrmex maricopa* and *P. magnacanthus*
- Map 13 *Aphaenogaster cockerelli*, *Ephebomyrmex imberbicus*, and *Stenamma diecki*
- Map 14 *Stenamma smithi*, *S. wheelerorum*, and *S. heathi*
- Map 15 *Aphaenogaster occidentalis* and *A. boulderensis*
- Map 16 *Aphaenogaster megommata* and *A. uinta*
- Map 17 *Veromessor smithi*, *V. pergandei*, and *V. andrei*
- Map 18 *Veromessor lariversi* and *V. lobognathus*
- Map 19 *Pheidole paiute*, *P. barbata*, and *P. ceres*
- Map 20 *Pheidole californica*, *P. inquilina*, and *P. cerebro-sior*
- Map 21 *Pheidole desertorum*, *P. creightoni*, and *P. clydei*
- Map 22 *Pheidole hyatti*, *P. gilvescens*, and *P. vistana*
- Map 23 *Pheidole pilifera* and *P. tucsonica*
- Map 24 *Crematogaster coarctata*, *C. emeryana*, and *C. larreae*
- Map 25 *Crematogaster depilis*, *C. californica*, and *C. colei*
- Map 26 *Crematogaster hespera*, *C. nocturna*, and *C. opuntiae*
- Map 27 *Crematogaster mormonum* and *C. mutans*
- Map 28 *Monomorium minimum*
- Map 29 *Solenopsis molesta*, *S. maniosa*, and *S. aurea*
- Map 30 *Leptothorax muscorum*, *L. crassipilis*, and *L. carinatus*
- Map 31 *Leptothorax nevadensis*, *L. andrei*, and *L. obliquicanthus*
- Map 32 *Leptothorax rugatulus*, *L. nitens*, and *L. tricarinatus*
- Map 33 *Tetramorium caespitum*
- Map 34 *Liometopum luctuosum* and *Iridomyrmex humilis*
- Map 35 *Forelius pruinosus* and *F. foetidus*
- Map 36 *Tapinoma sessile*
- Map 37 *Conomyrma insana*, *C. bicolor*, and *Camponotus essigi*
- Map 38 *Camponotus modoc*, *C. laevigatus*, and *Brachymyrmex depilis*
- Map 39 *Camponotus hyatti*, *C. sayi*, and *C. herculeanus*
- Map 40 *Camponotus semitestaceus*, *C. sansabeanus*, and *C. ocreatus*
- Map 41 *Camponotus vicinus*
- Map 42 *Paratrechina vividula*, *P. hystrix*, and *Paratrechina* n. sp.?
- Map 43 *Lasius sitiens*, *L. alienus*, and *L. umbratus*
- Map 44 *Lasius crypticus*, *L. neoniger*, and *L. subumbratus*
- Map 45 *Lasius pallitarsis*, *L. humilis*, and *L. nevadensis*
- Map 46 *Lasius flavus* and *L. vestitus*
- Map 47 *Acanthomyops latipes*, *A. coloradensis*, and *A. californicus*
- Map 48 *Myrmecocystus kennedyi*, *M. mendax*, and *M. depilis*
- Map 49 *Myrmecocystus flaviceps*, *M. romainei*, and *M. semirufus*
- Map 50 *Myrmecocystus koso* and *M. mimicus*
- Map 51 *Myrmecocystus hammettensis*, *M. lugubris*, and *M. creightoni*
- Map 52 *Myrmecocystus navajo*, *M. arenarius*, and *M. ewarti*
- Map 53 *Myrmecocystus mexicanus*, *M. pyramicus*, and *M. yuma*
- Map 54 *Myrmecocystus testaceus*
- Map 55 *Formica manni*, *F. perpilosa*, and *F. limata*
- Map 56 *Formica lasioides*
- Map 57 *Formica neogagates*
- Map 58 *Formica densiventris*, *F. oreas*, and *F. ciliata*
- Map 59 *Formica planipilis*, *F. nevadensis*, and *F. coloradensis*
- Map 60 *Formica haemorrhoidalis*, *F. dakotensis*, and *F. microgyna*
- Map 61 *Formica obscuripes* and *F. integroides*
- Map 62 *Formica obscuriventris*, *F. subnitens*, and *F. laeviceps*
- Map 63 *Formica propinqua*, *F. querquetulana*, and *F. whymperi*
- Map 64 *Formica aerata*, *F. moki*, and *F. microphthalma*
- Map 65 *Formica neorufibarbis*
- Map 66 *Formica argentea*
- Map 67 *Formica fusca*
- Map 68 *Formica neoclara* and *F. hewitti*
- Map 69 *Formica xerophila* and *F. sibylla*
- Map 70 *Formica subsericea* and *F. subelongata*
- Map 71 *Formica subpolita*
- Map 72 *Formica obtusopilosa*, *F. curiosa*, and *F. wheeleri*
- Map 73 *Formica subnuda* and *F. puberula*
- Map 74 *Polyergus breviceps*



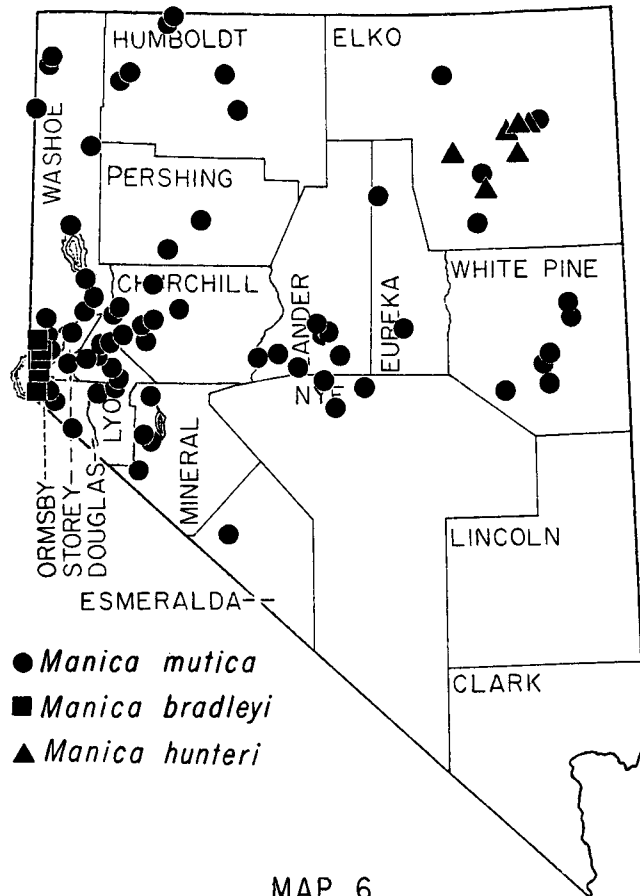




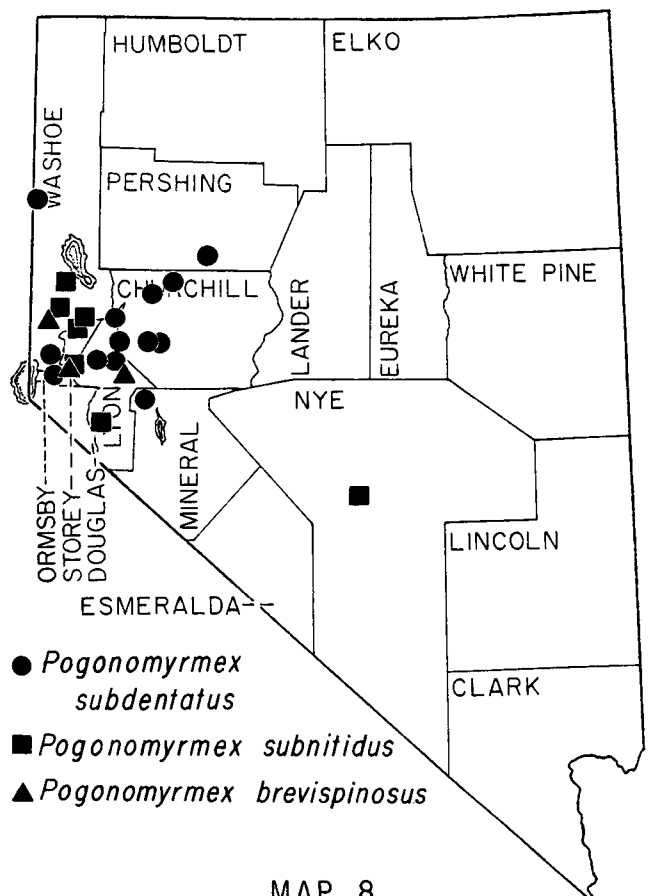
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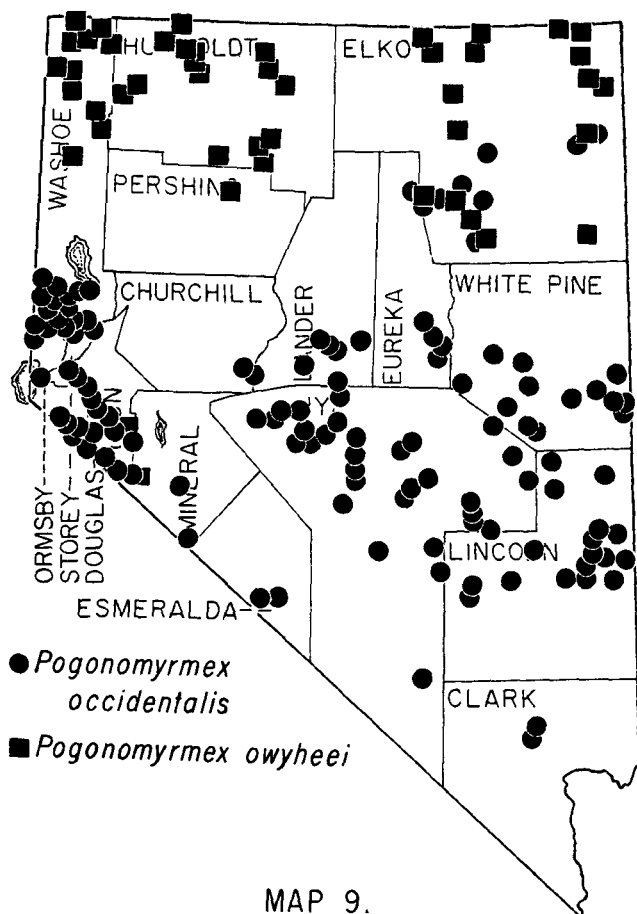
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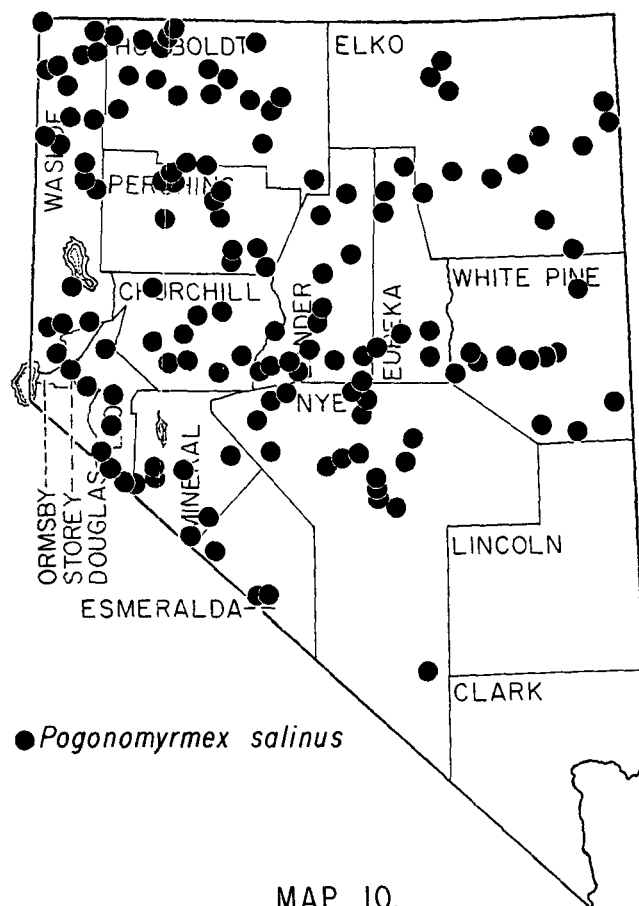
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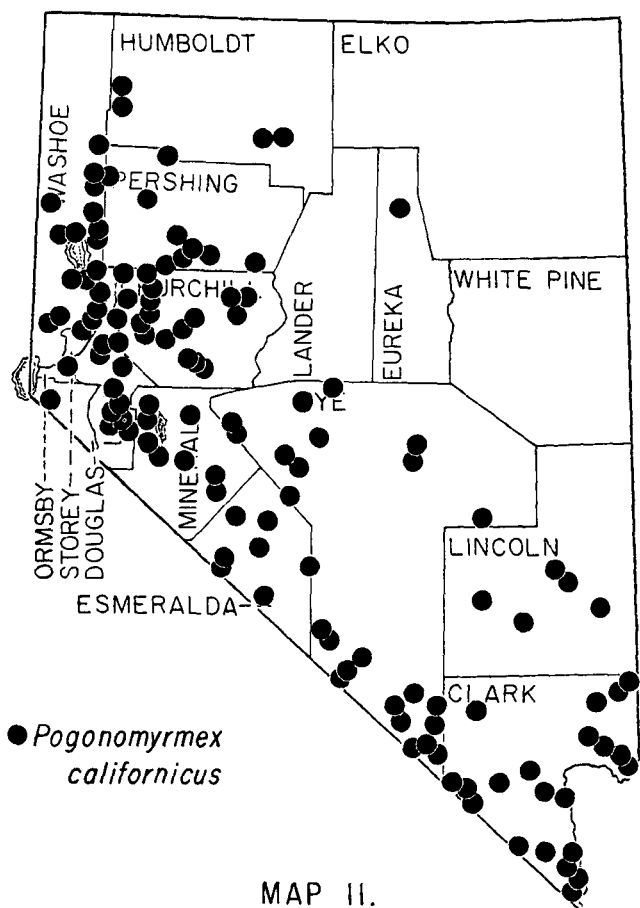
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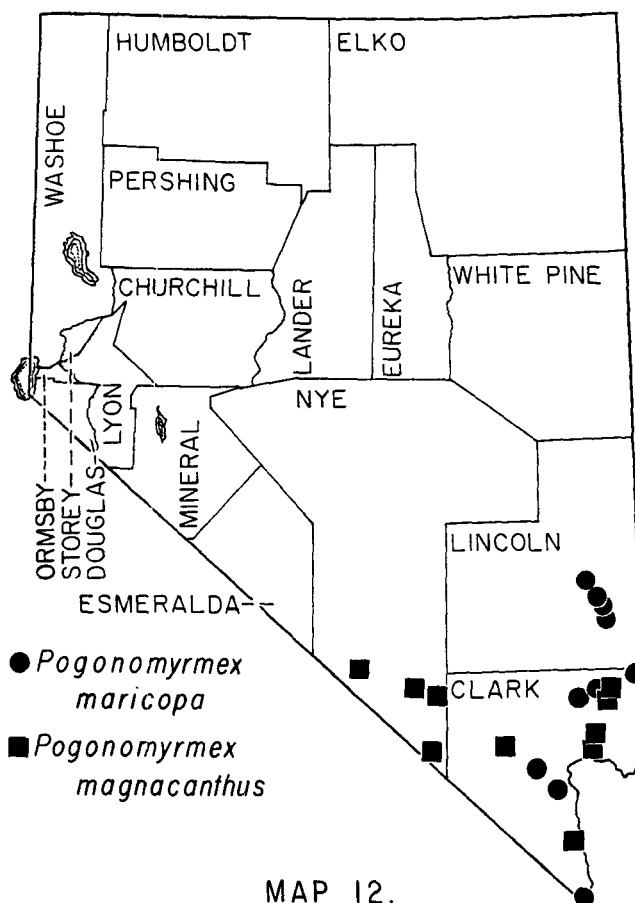
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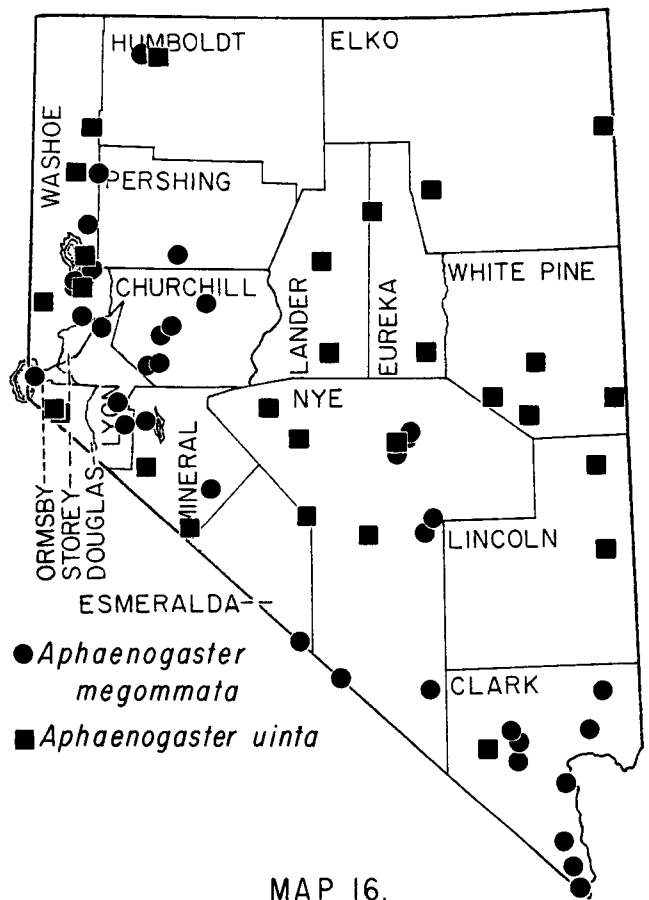
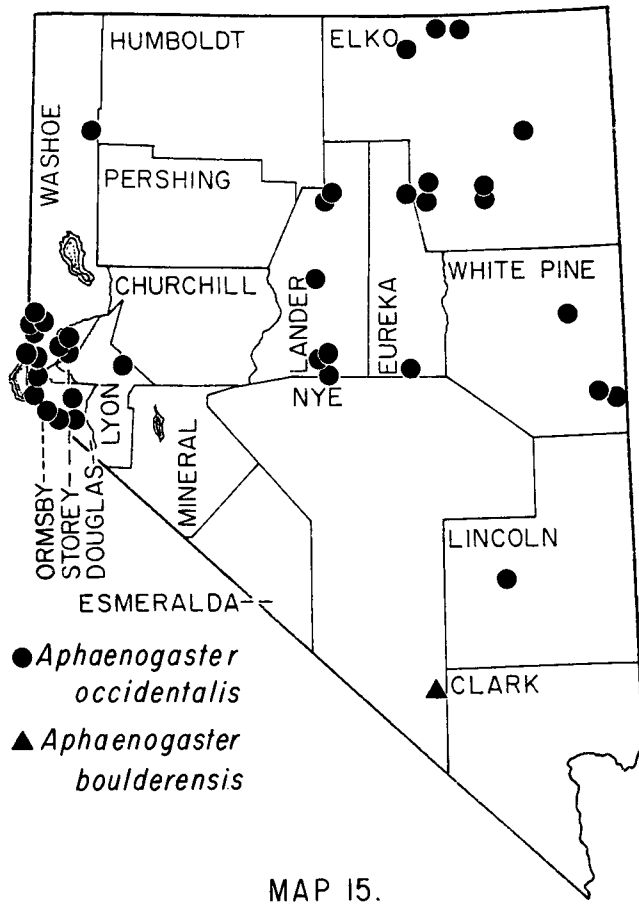
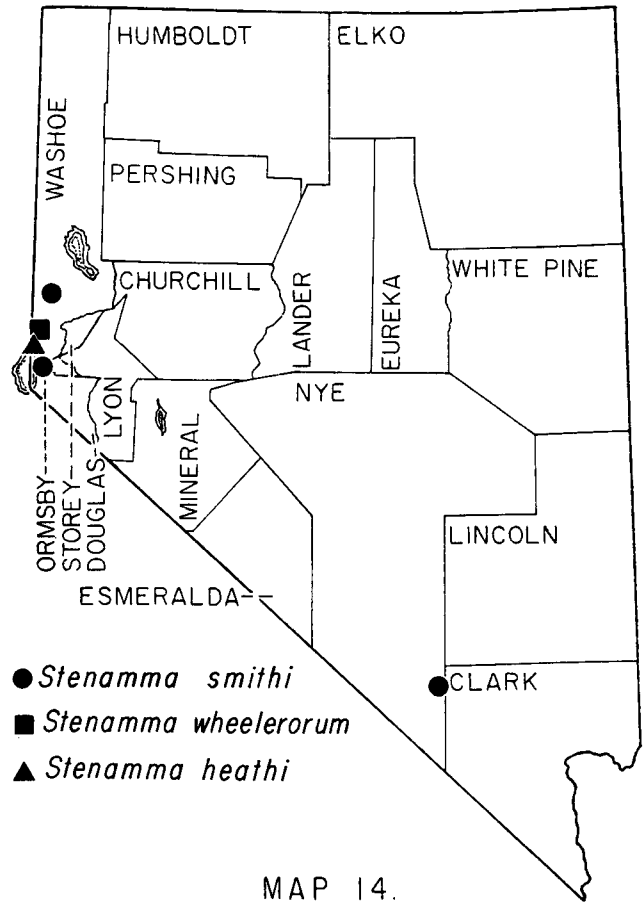
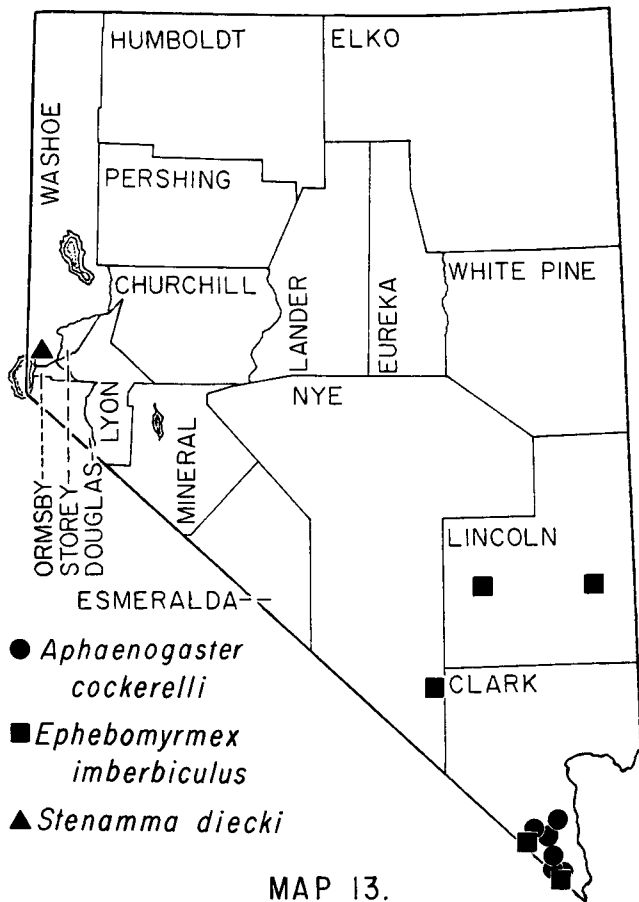
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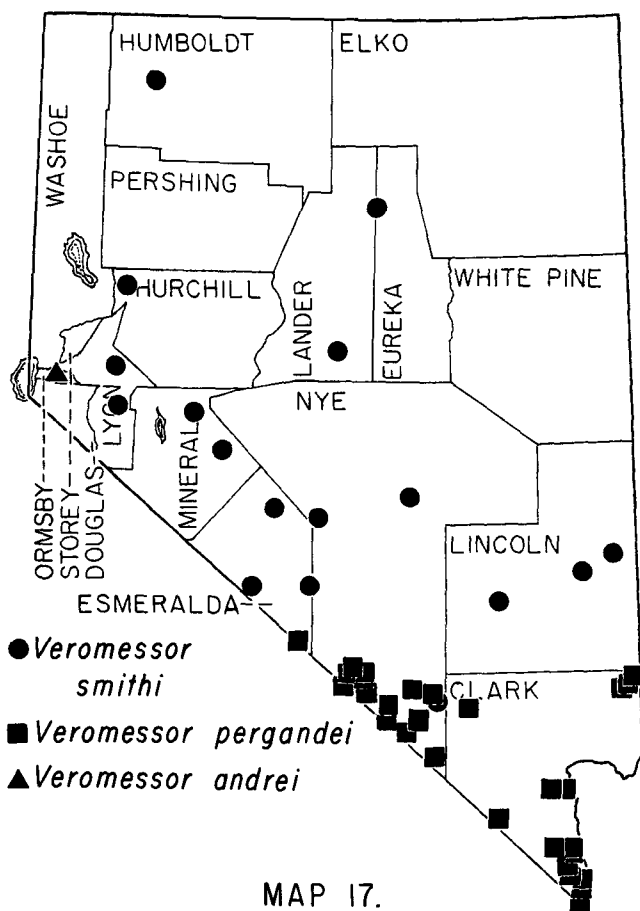


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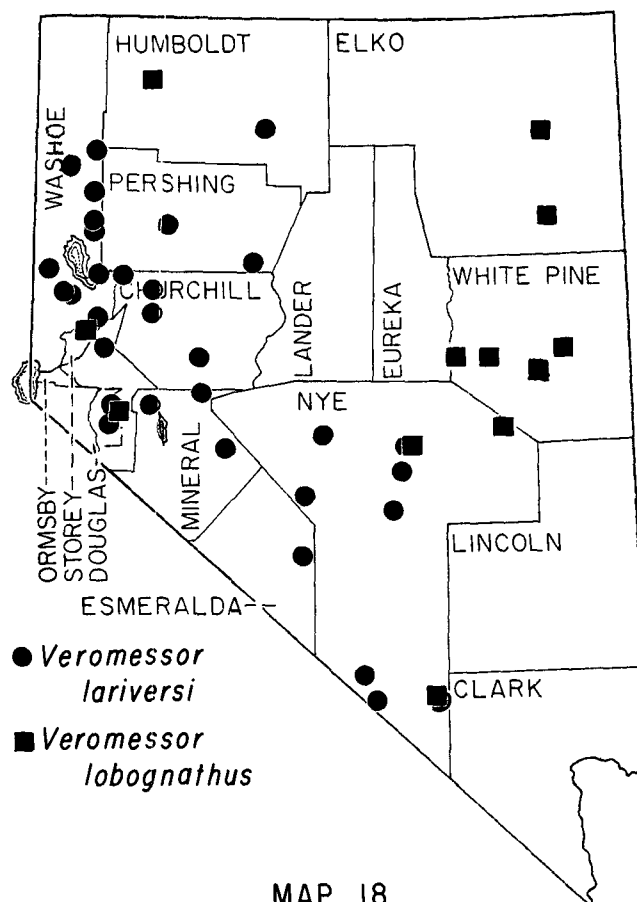


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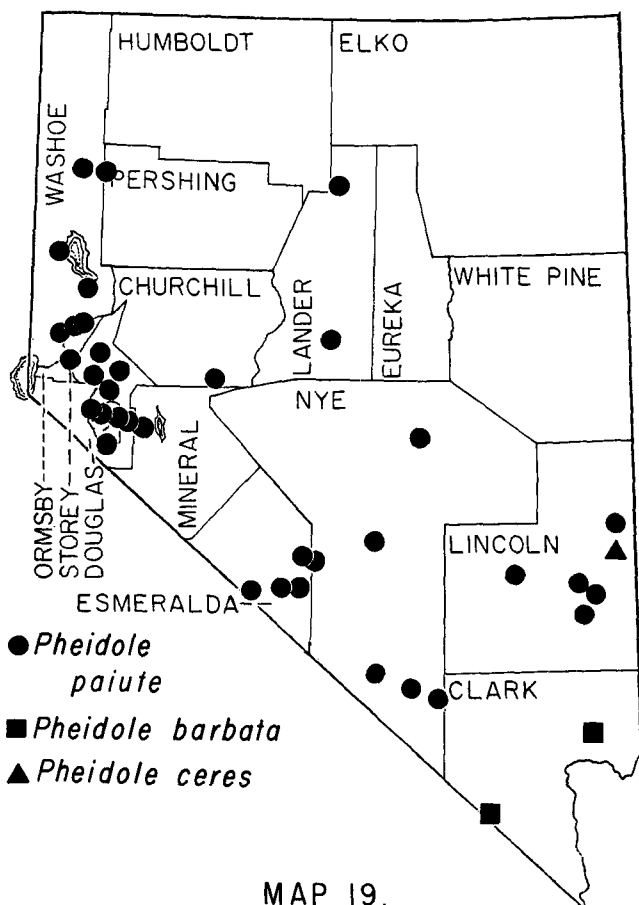




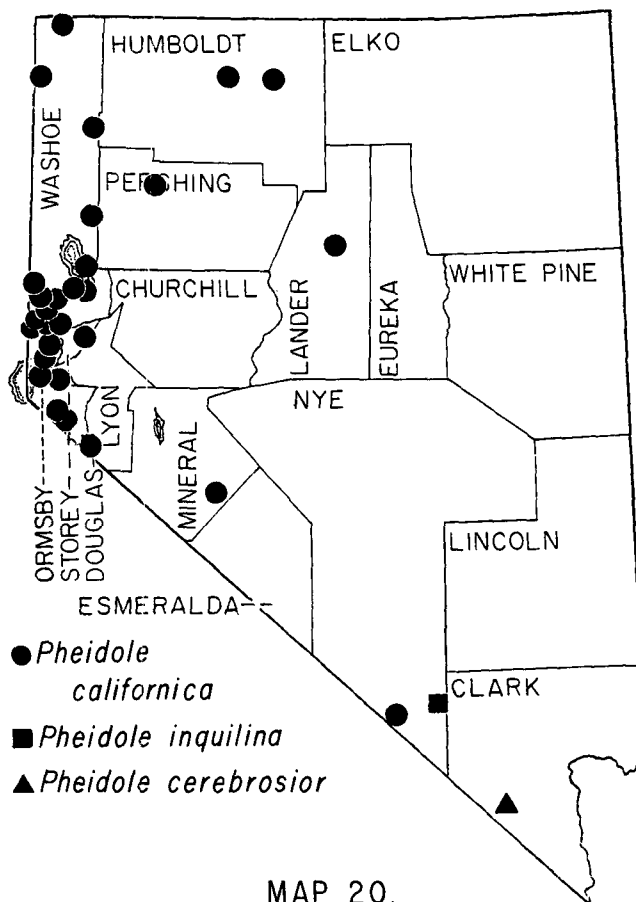
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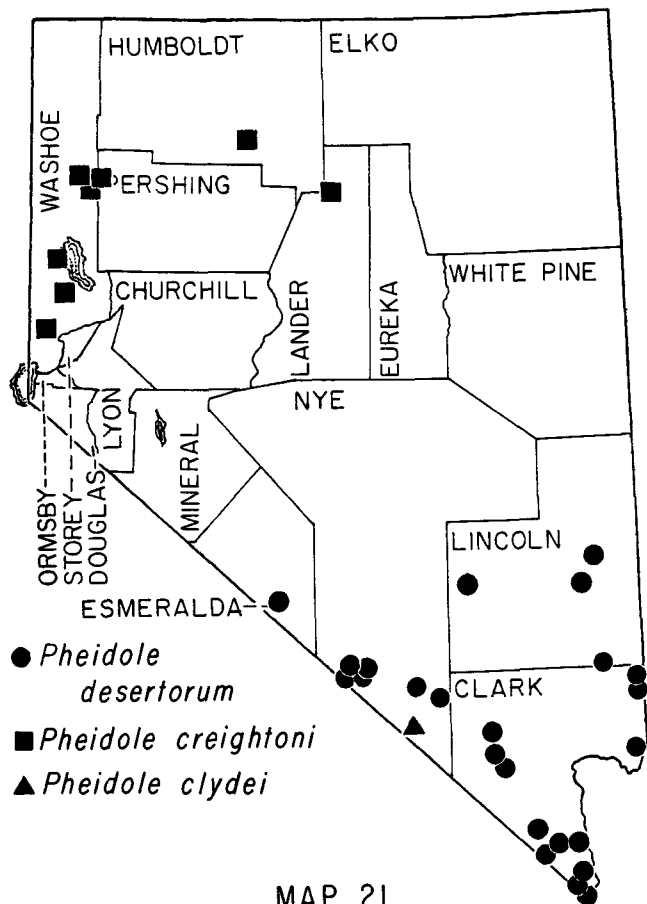
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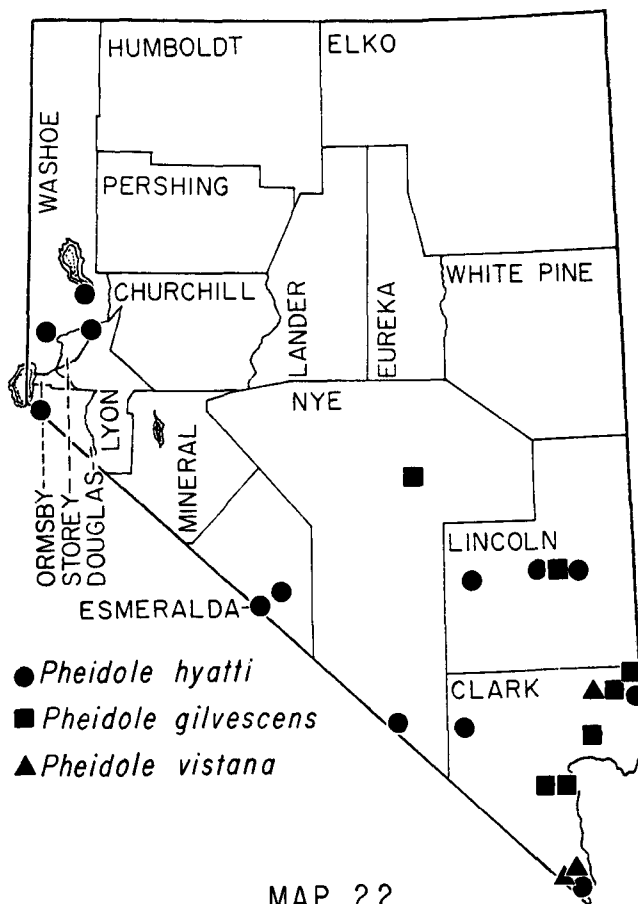
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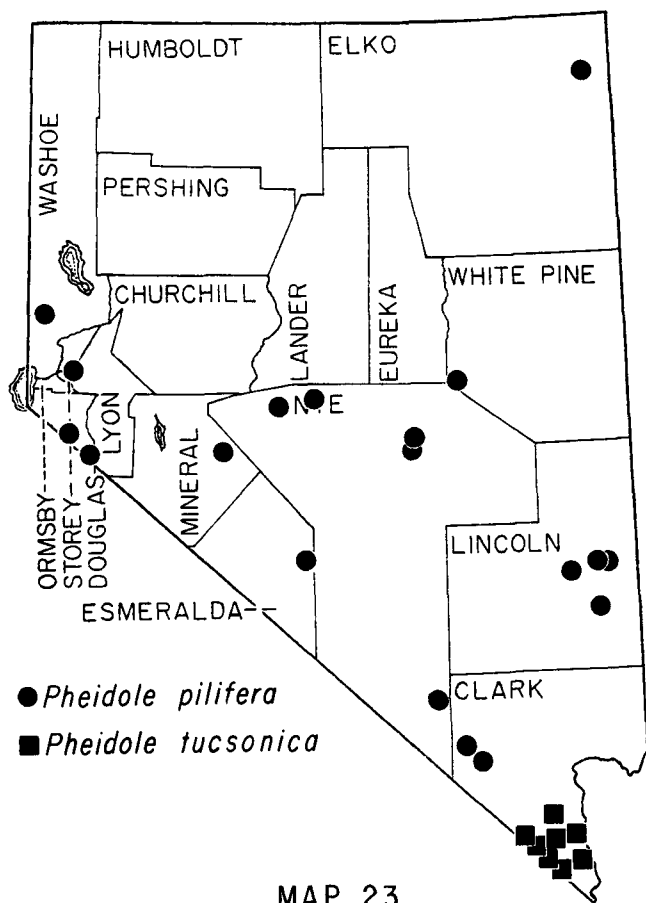
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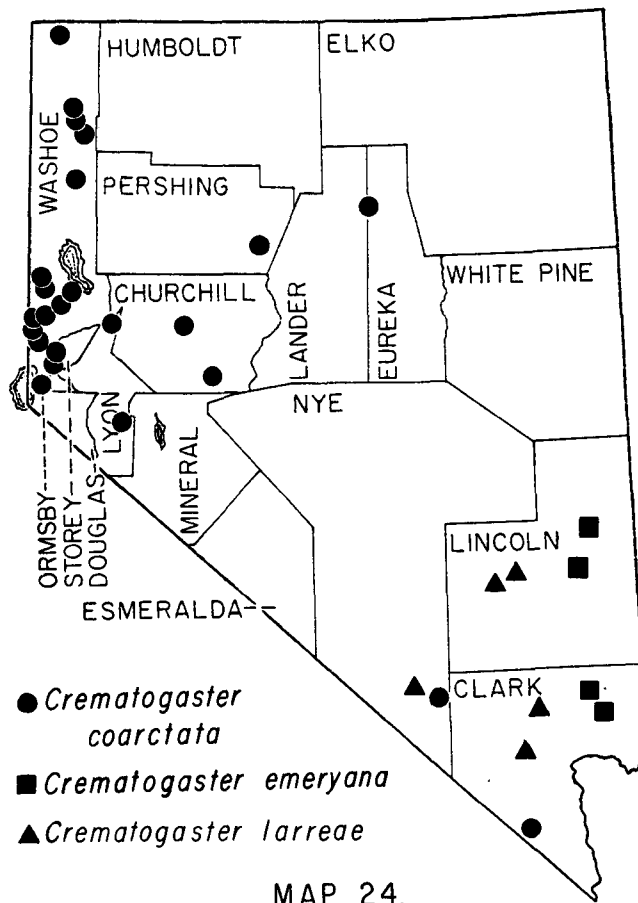
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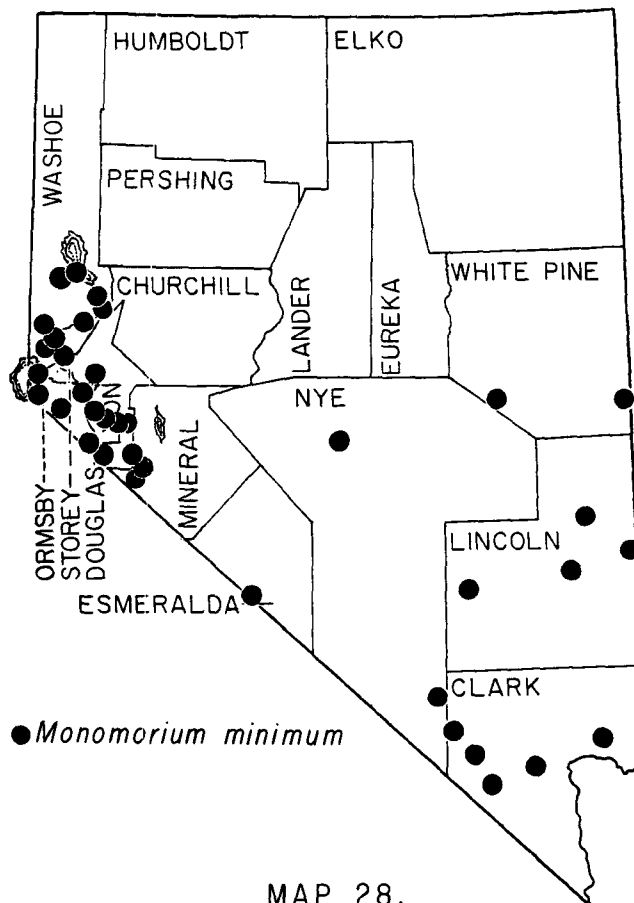
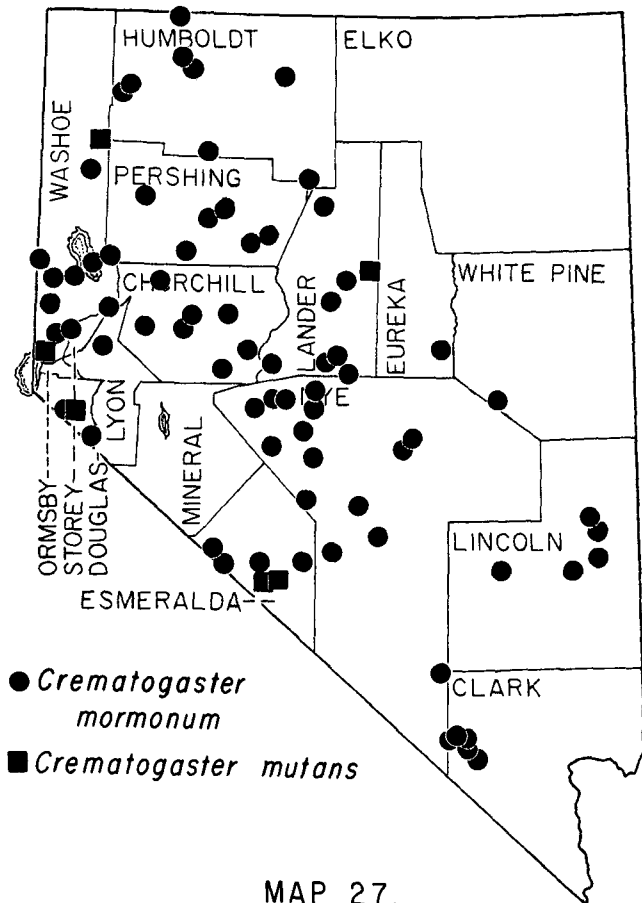
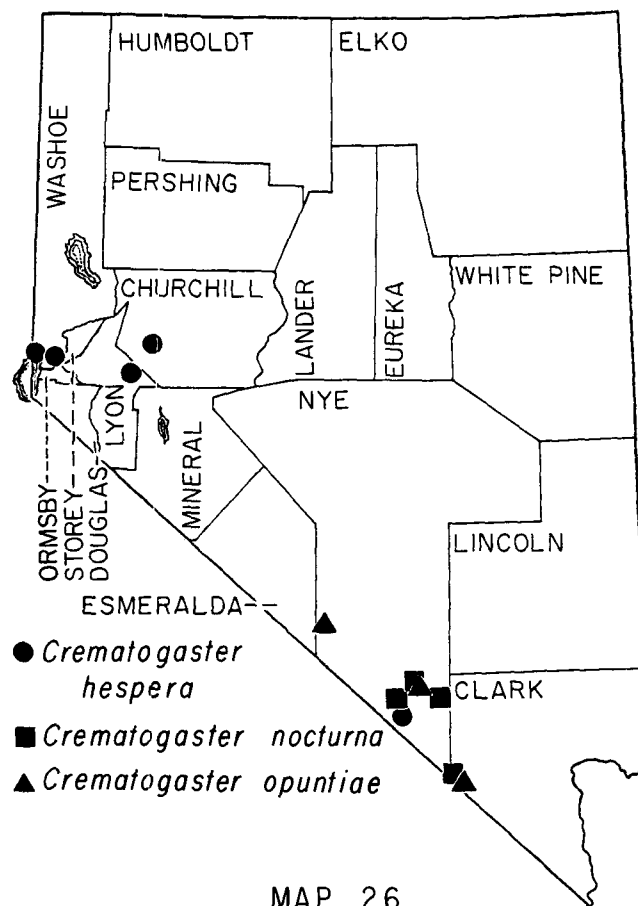
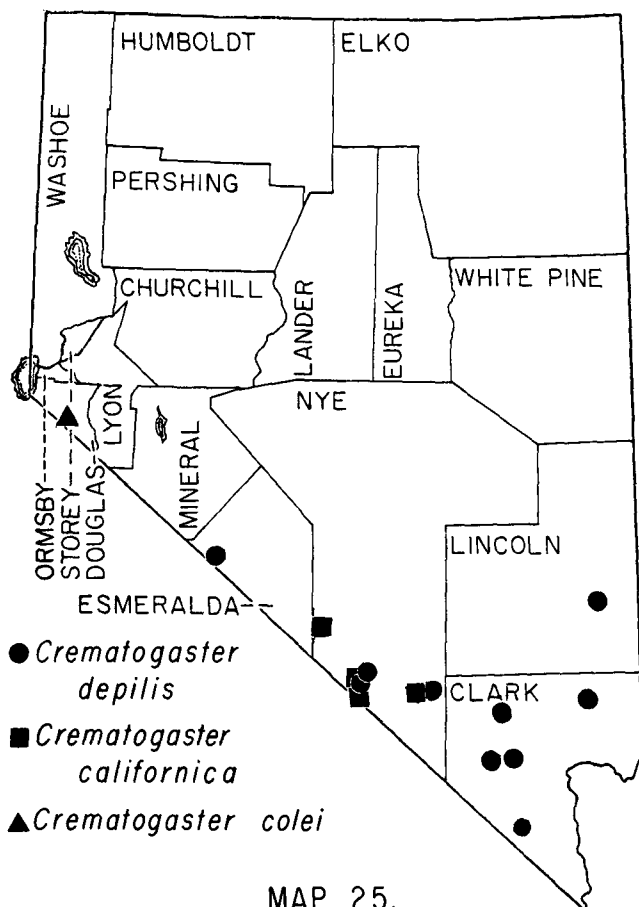


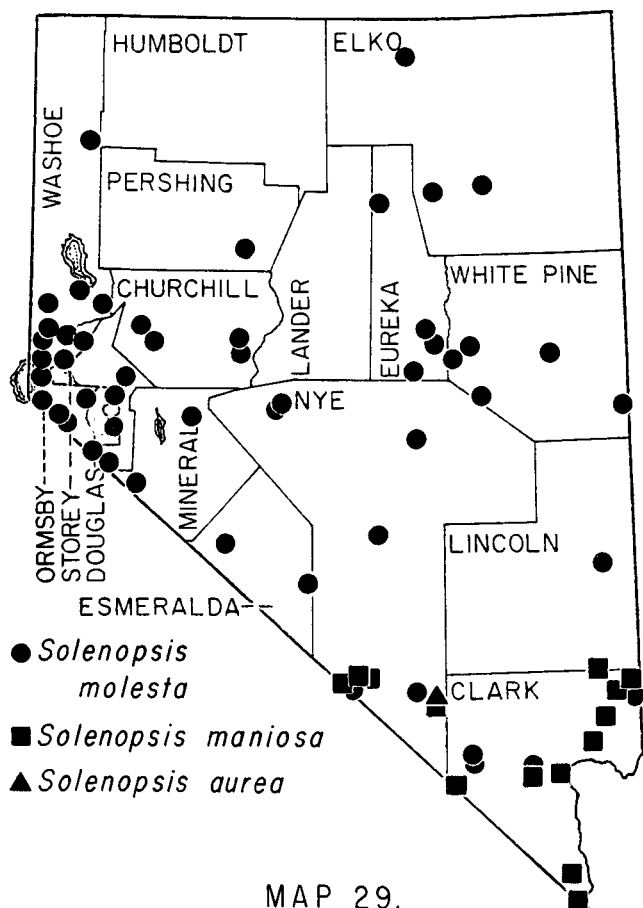
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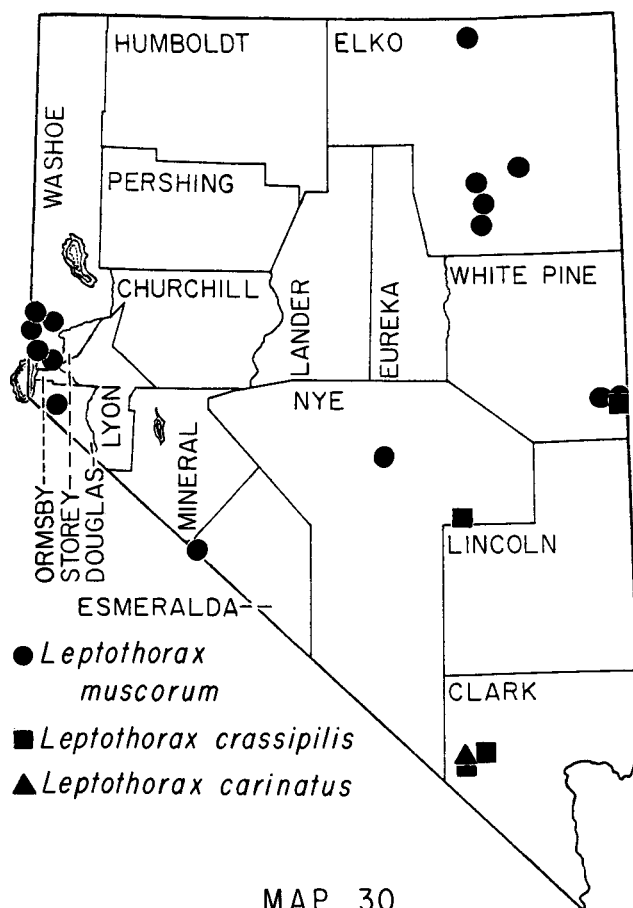
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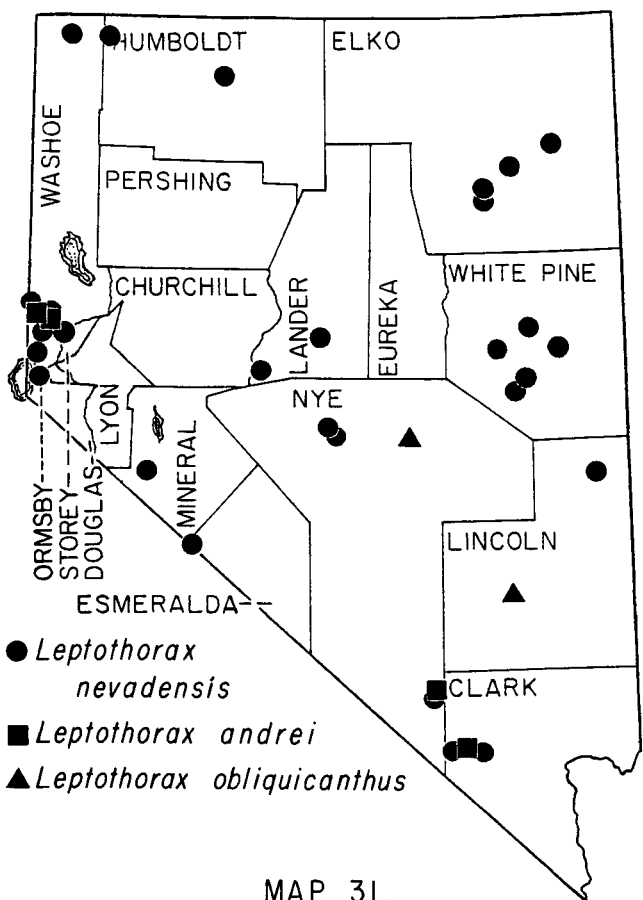




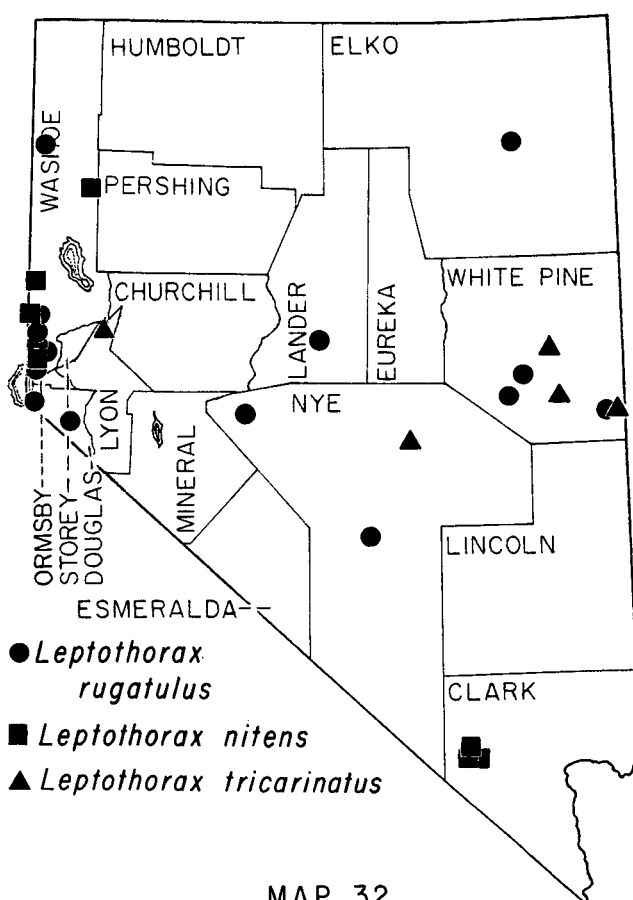
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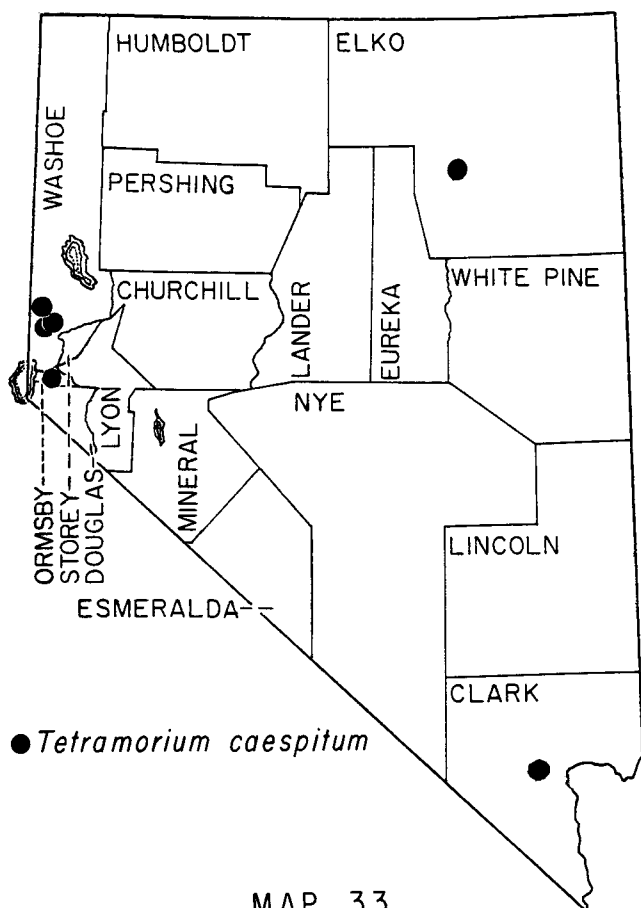
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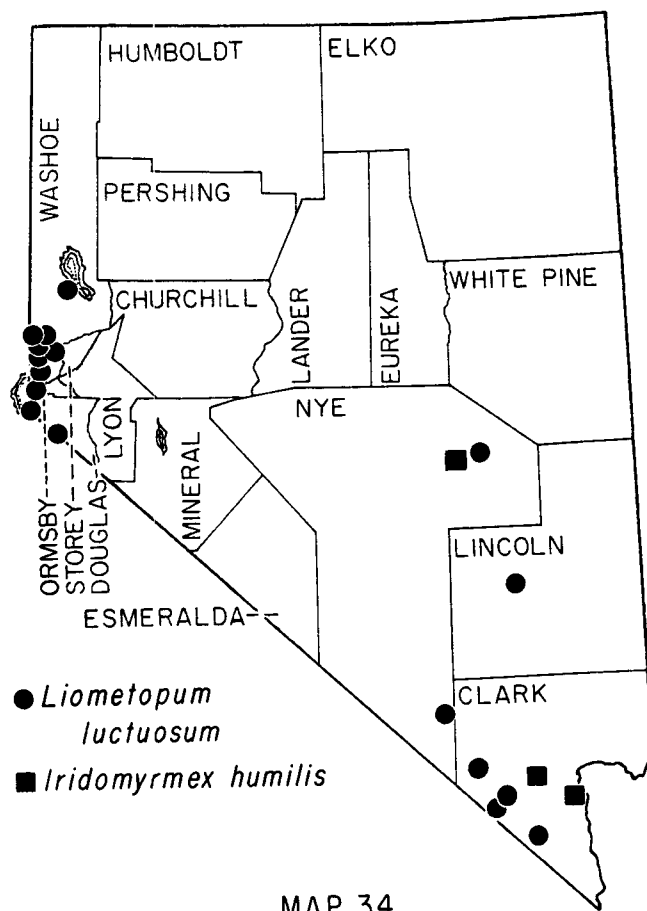
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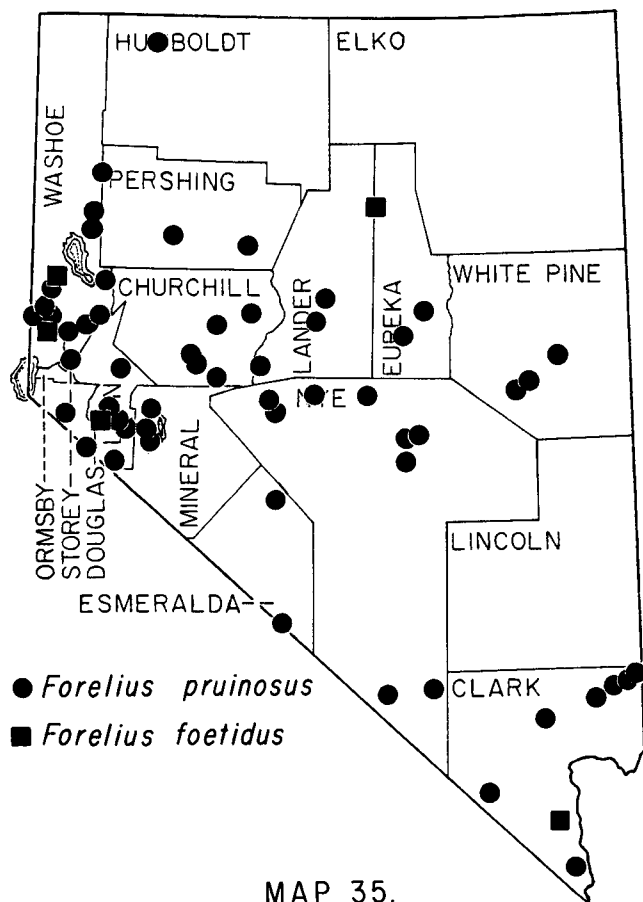
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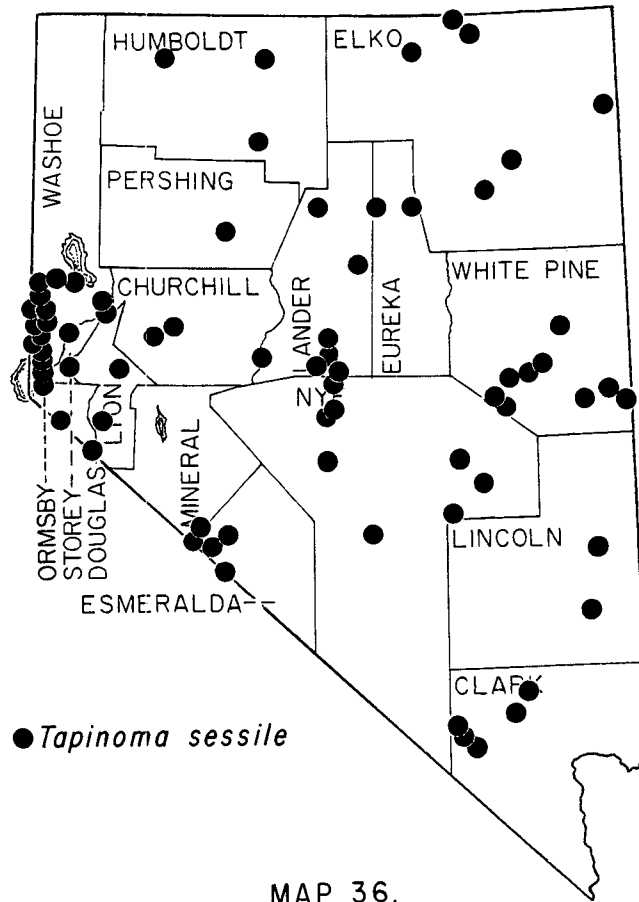
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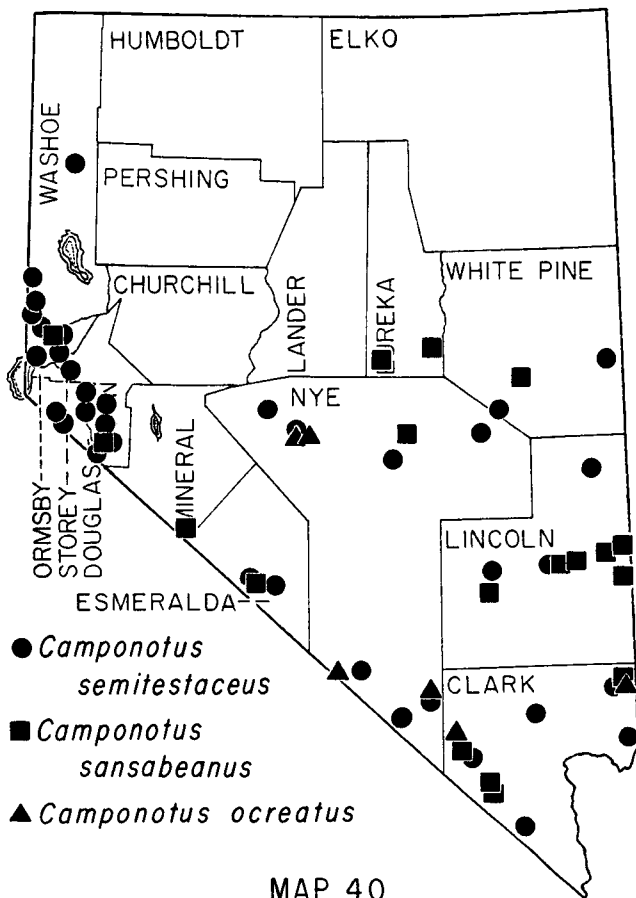
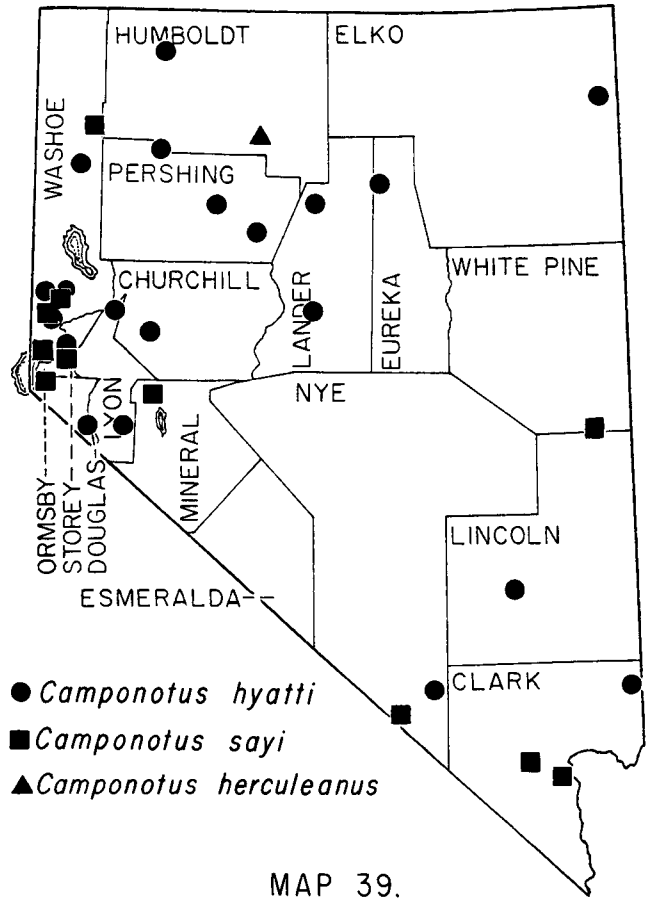
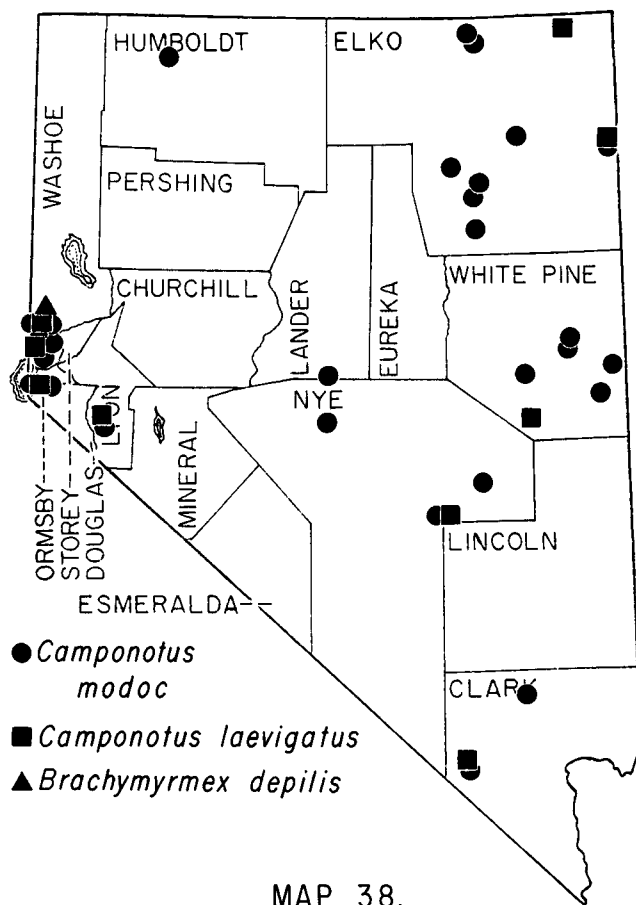
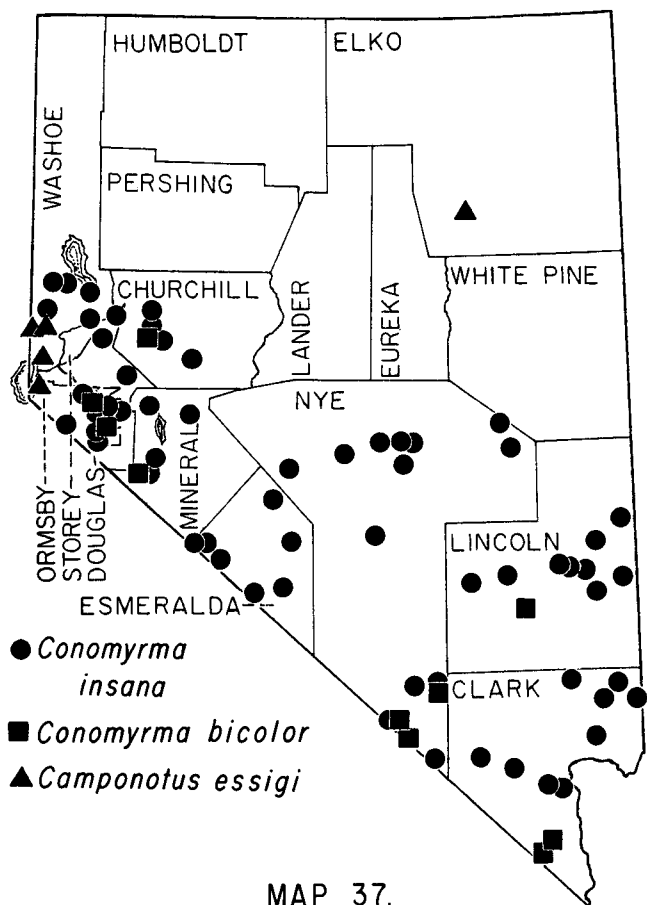
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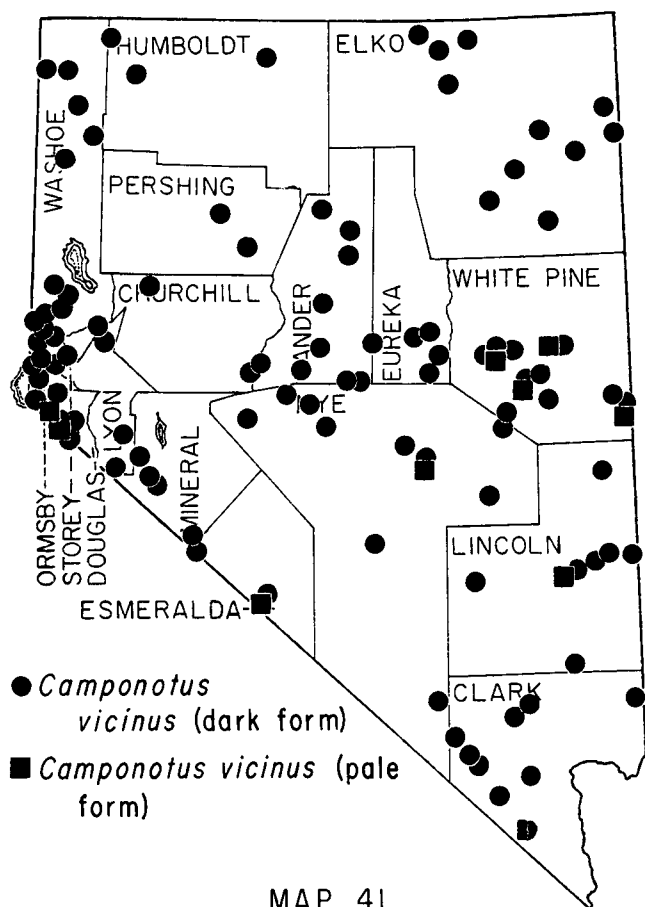


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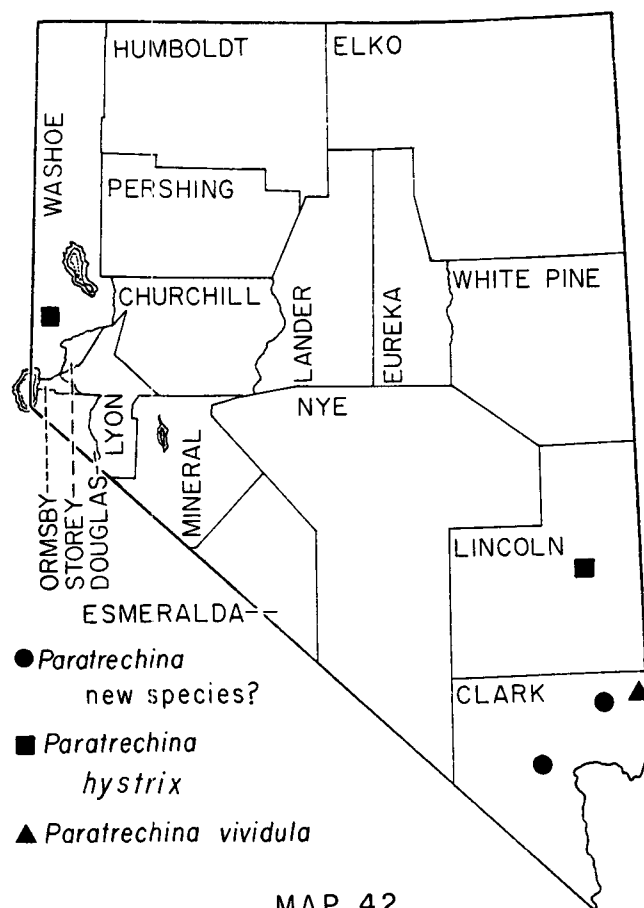


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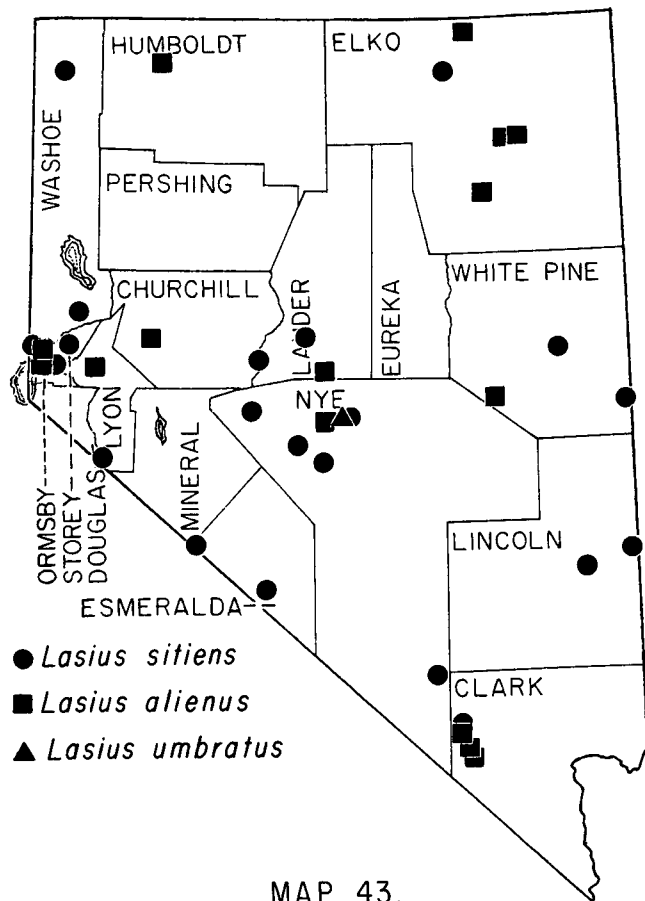




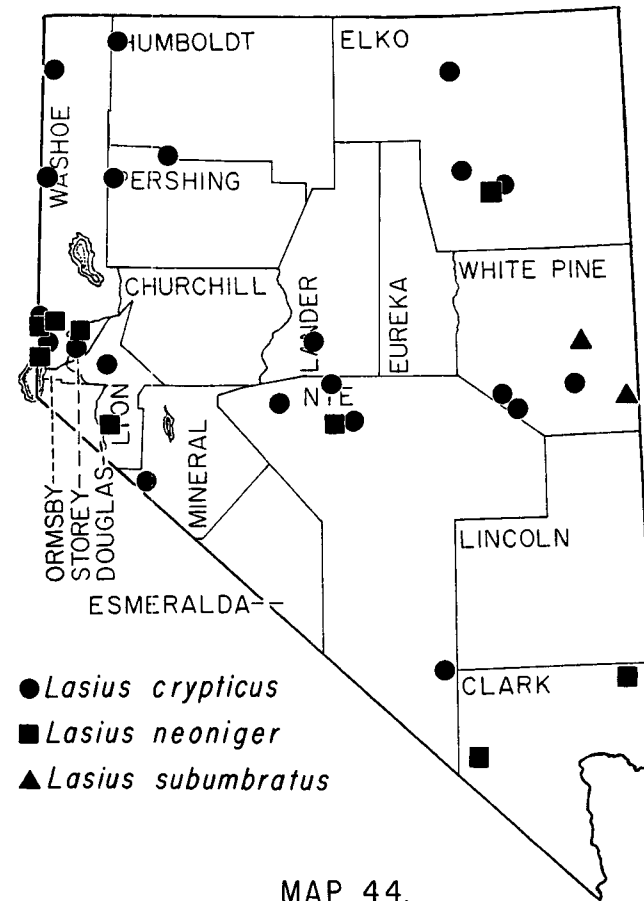
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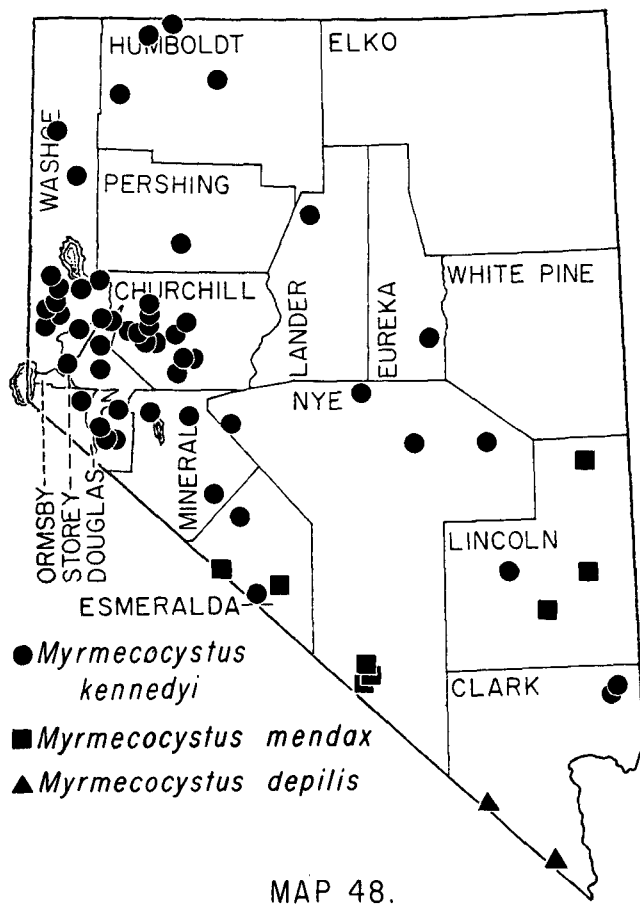
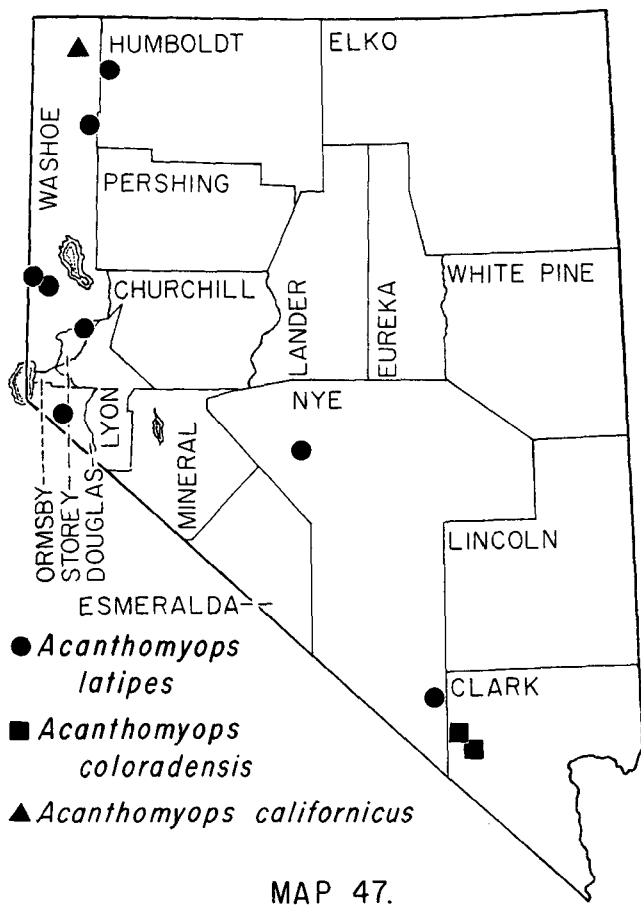
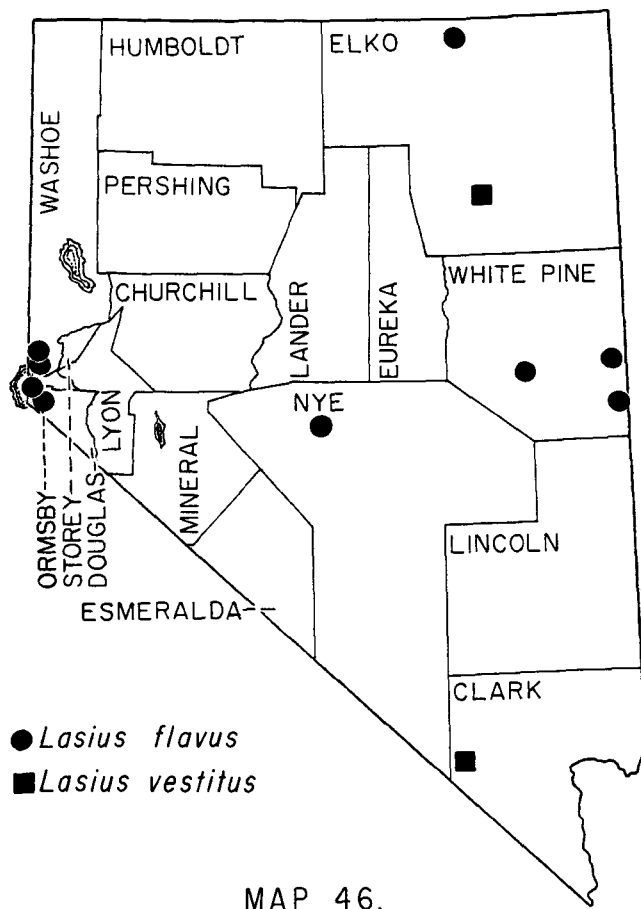
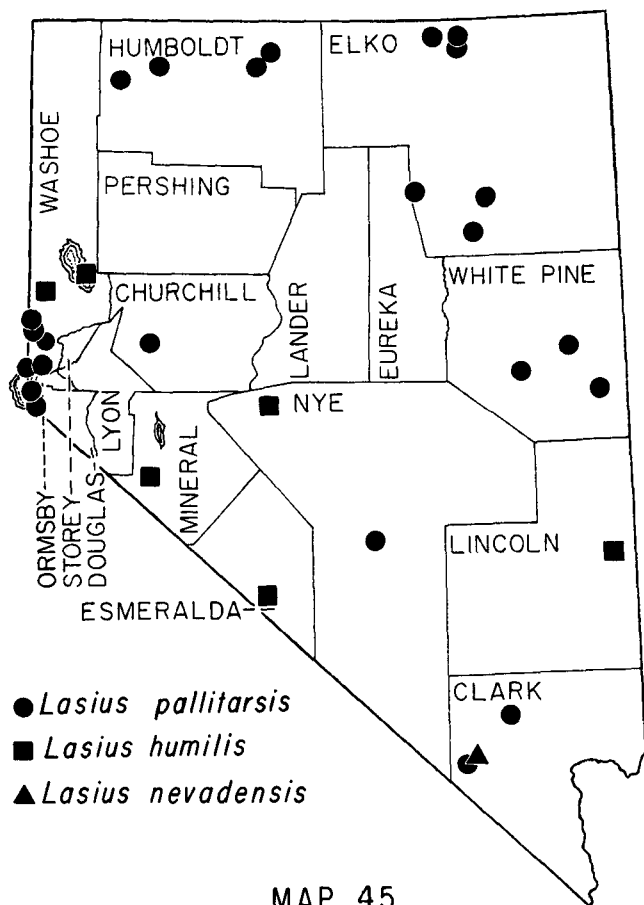
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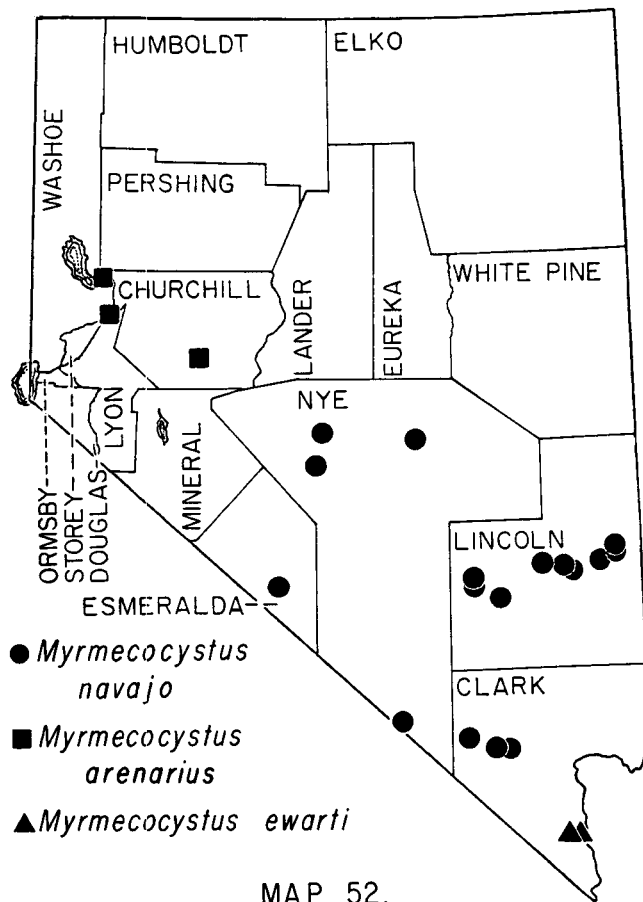
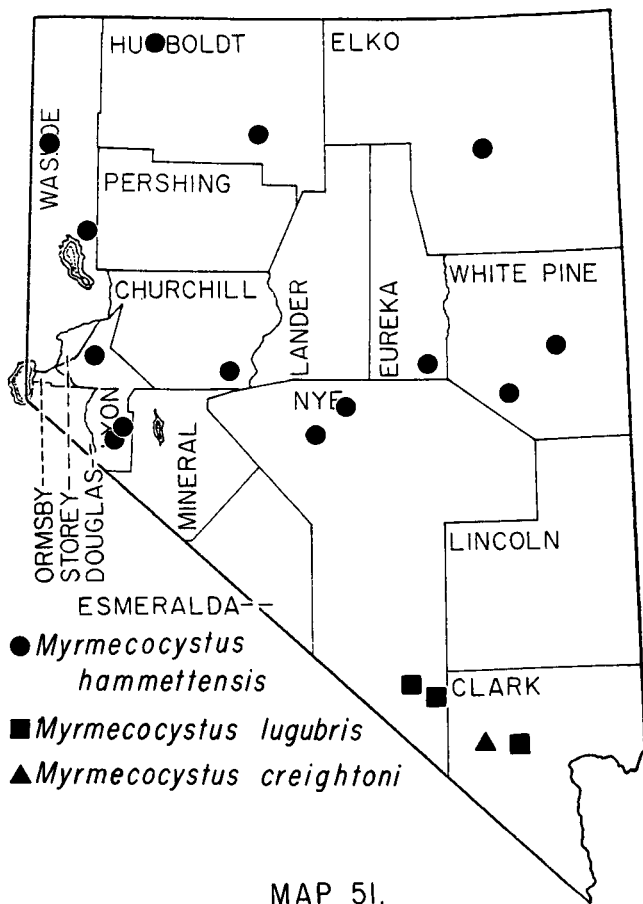
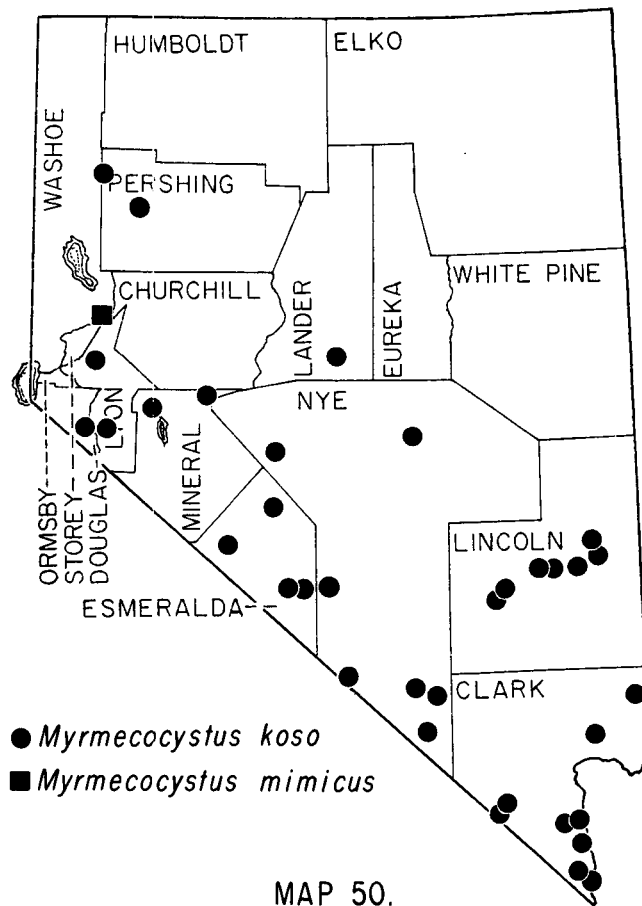
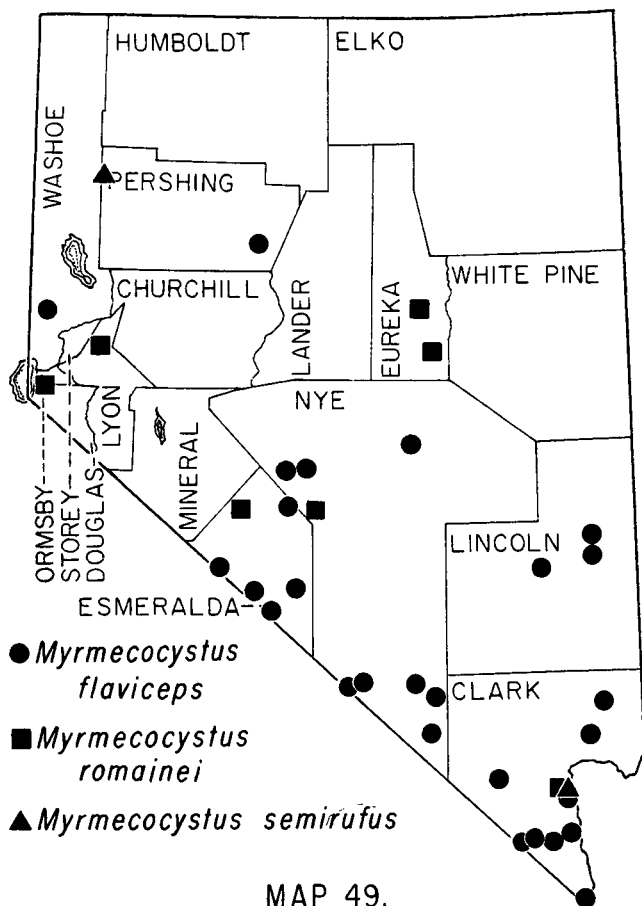
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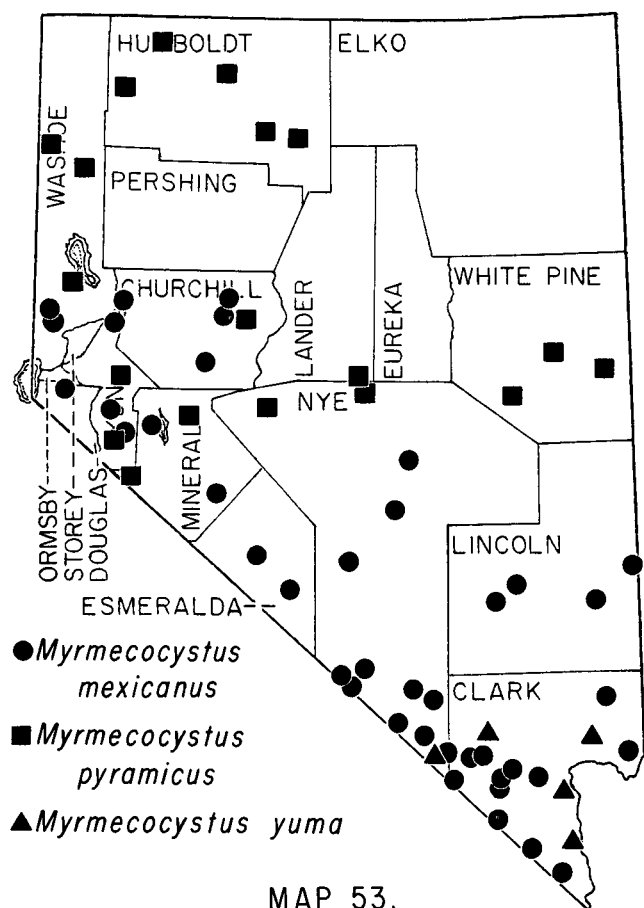


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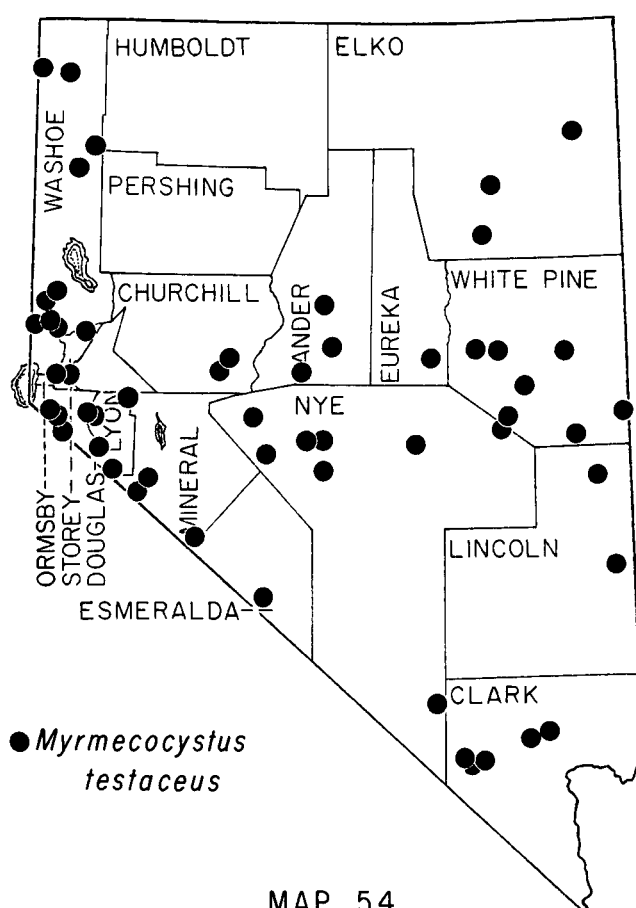




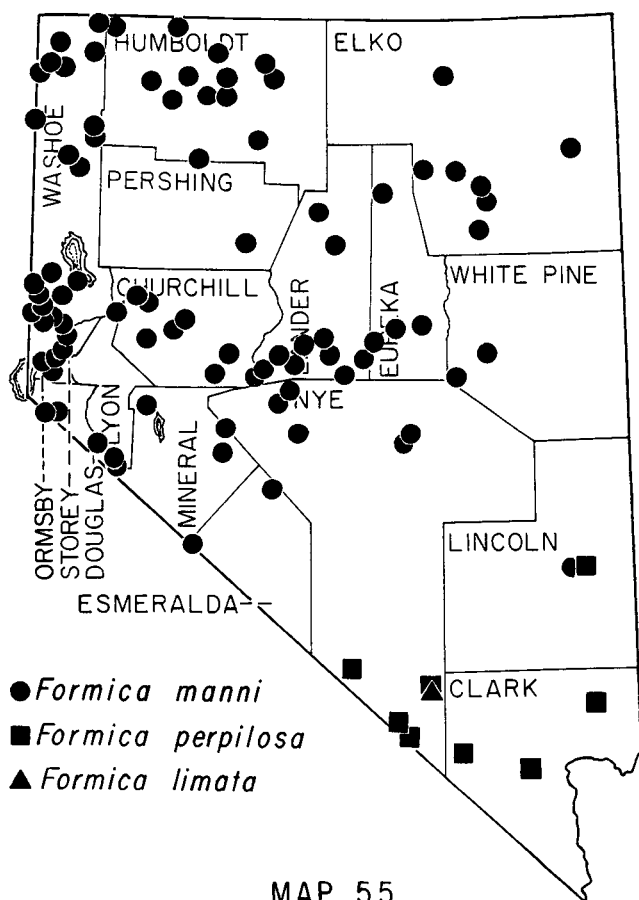




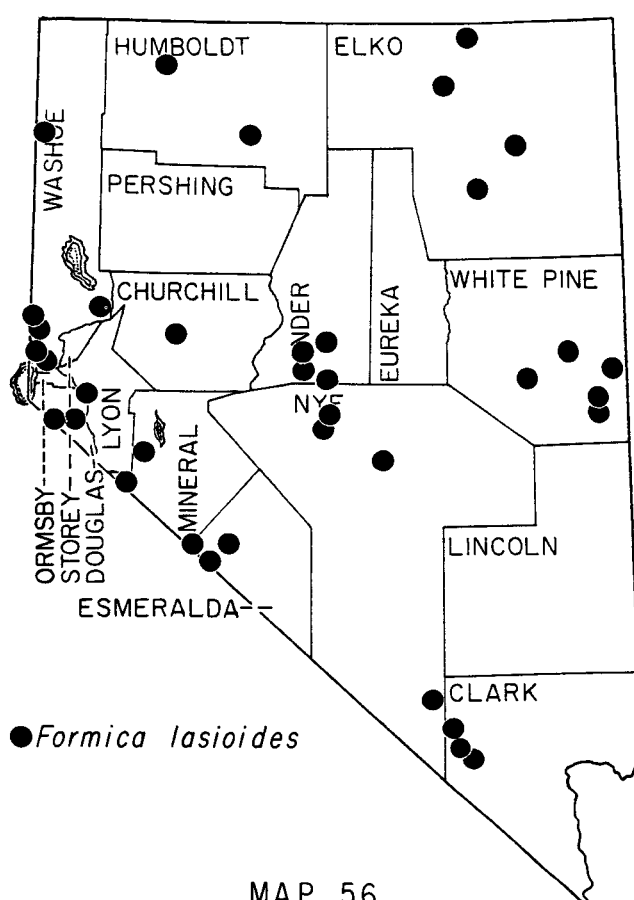
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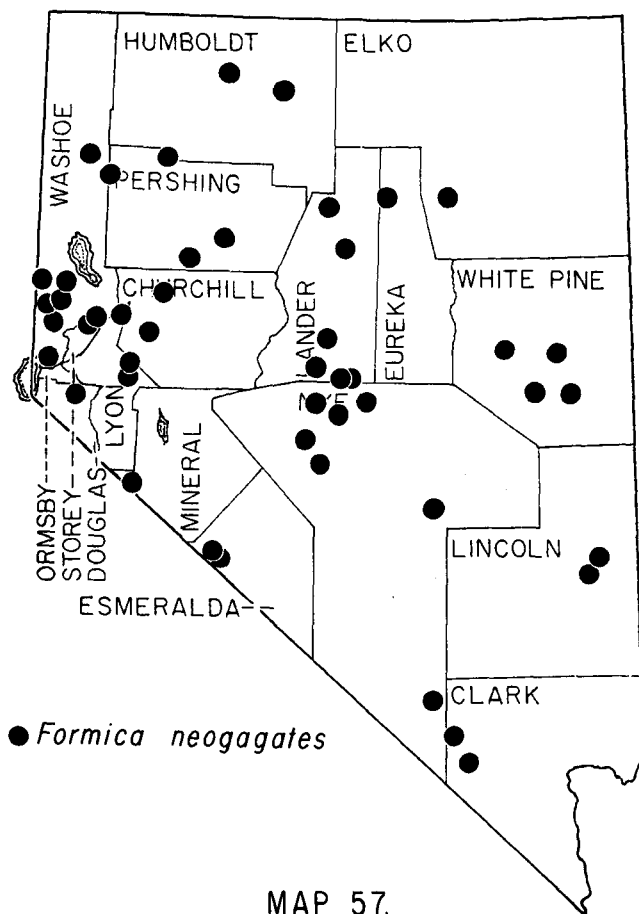
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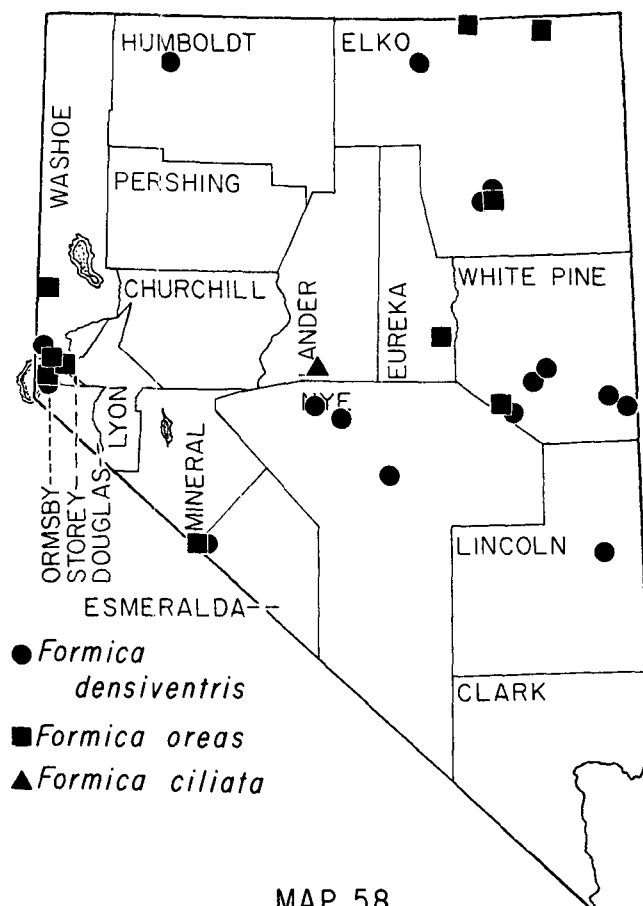
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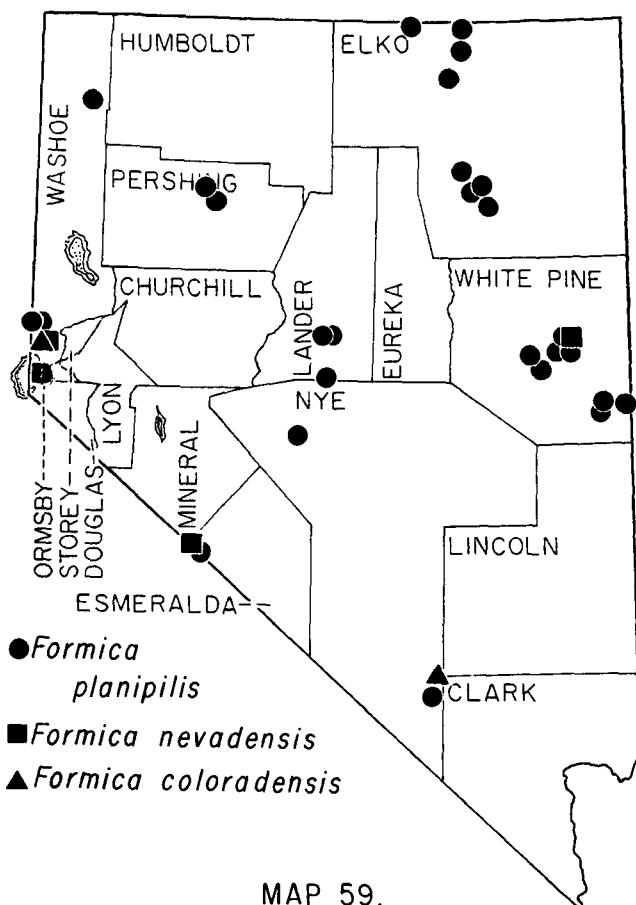
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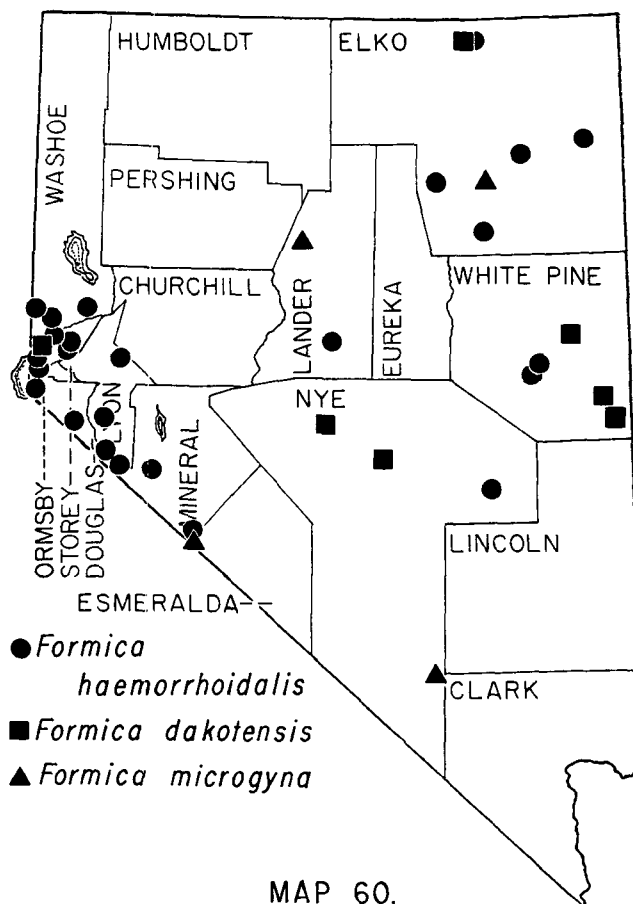
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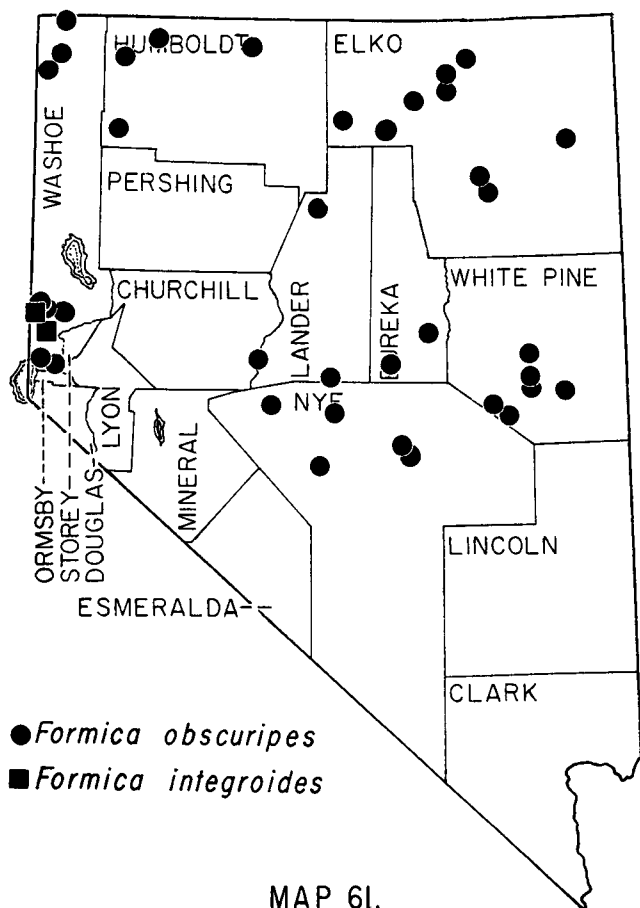
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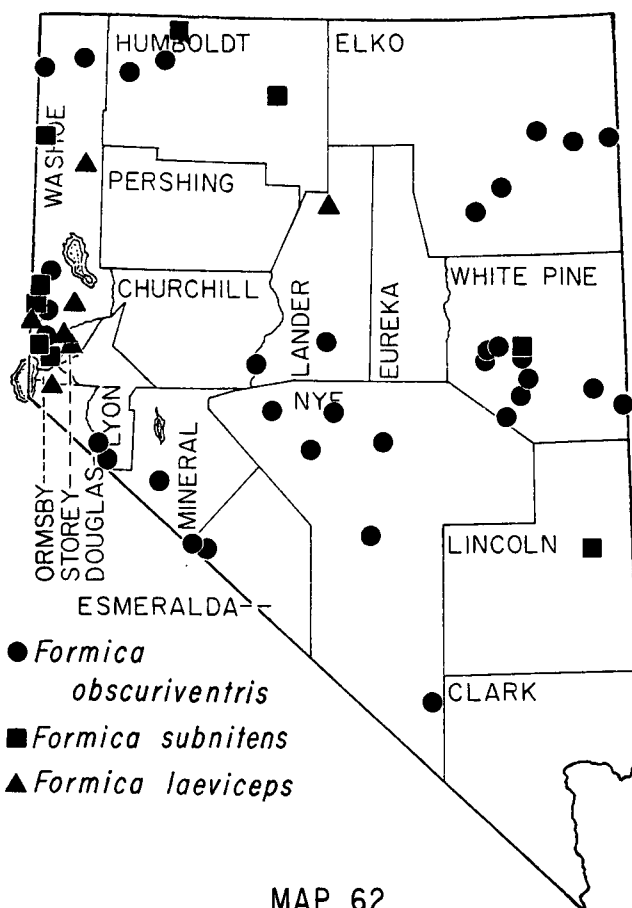
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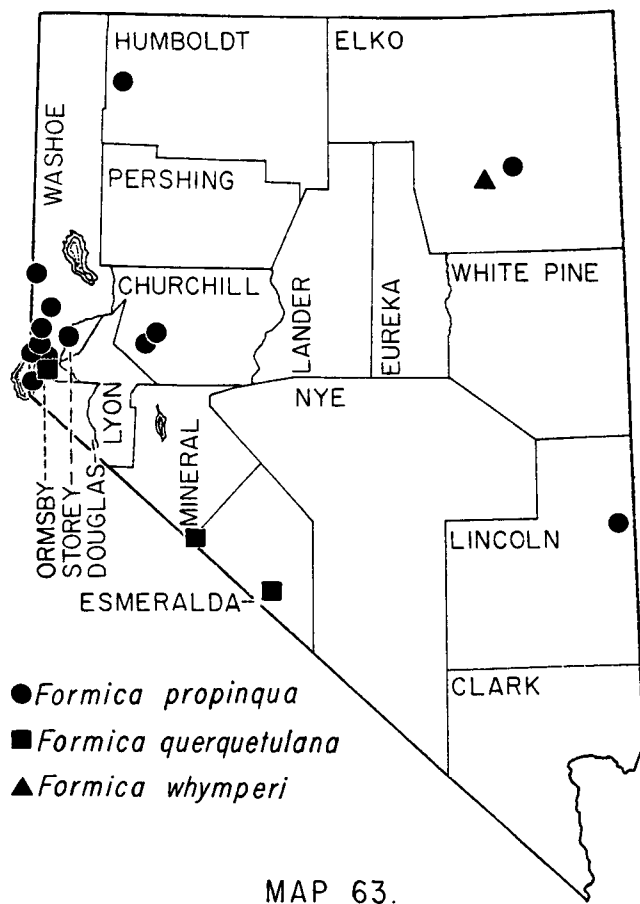
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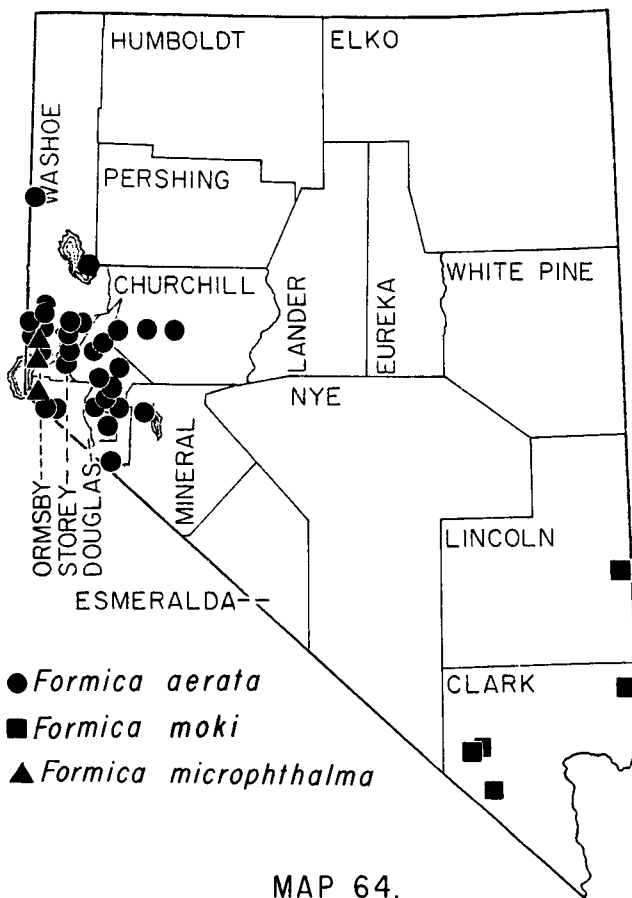
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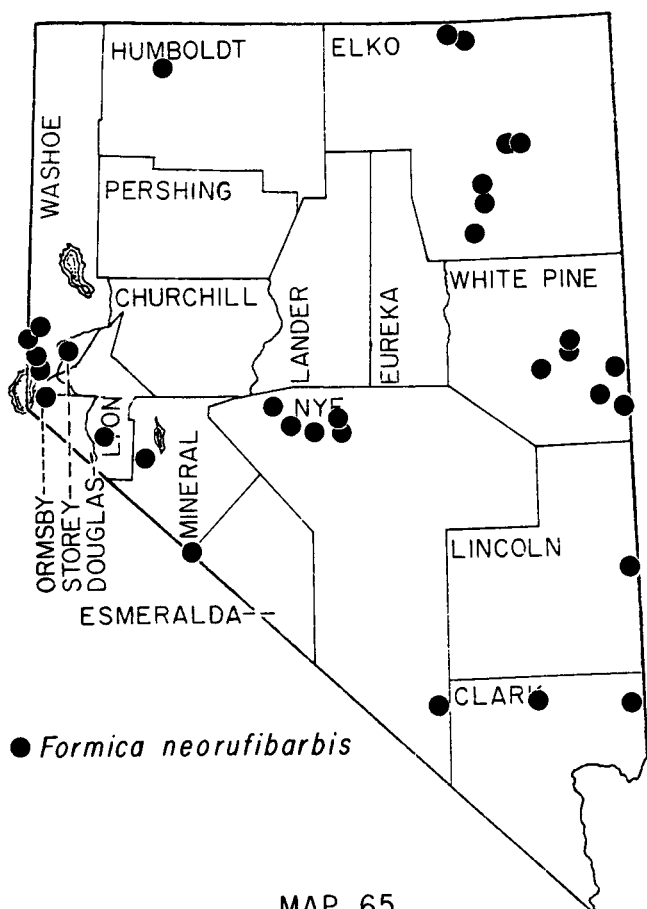
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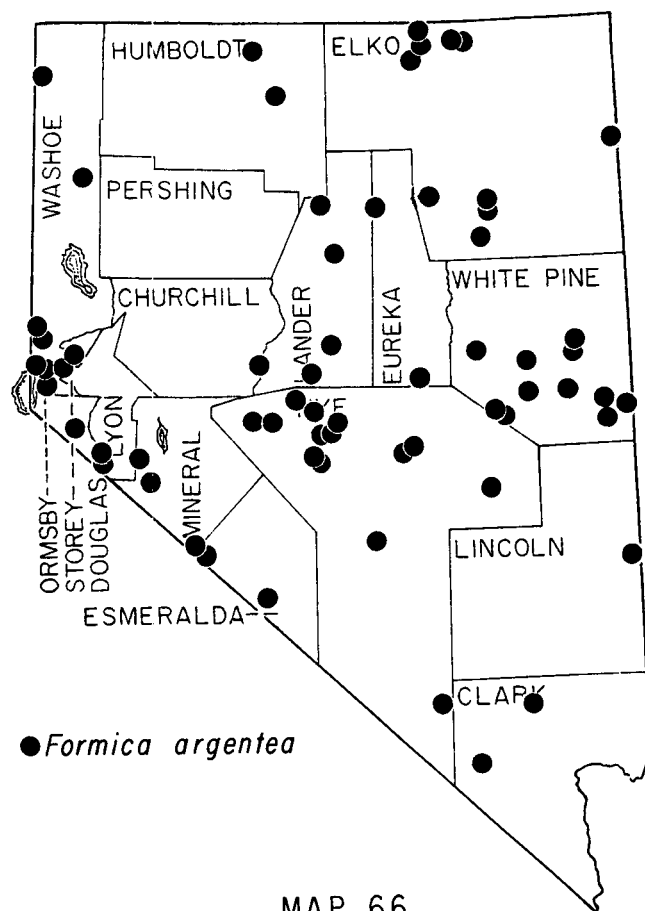
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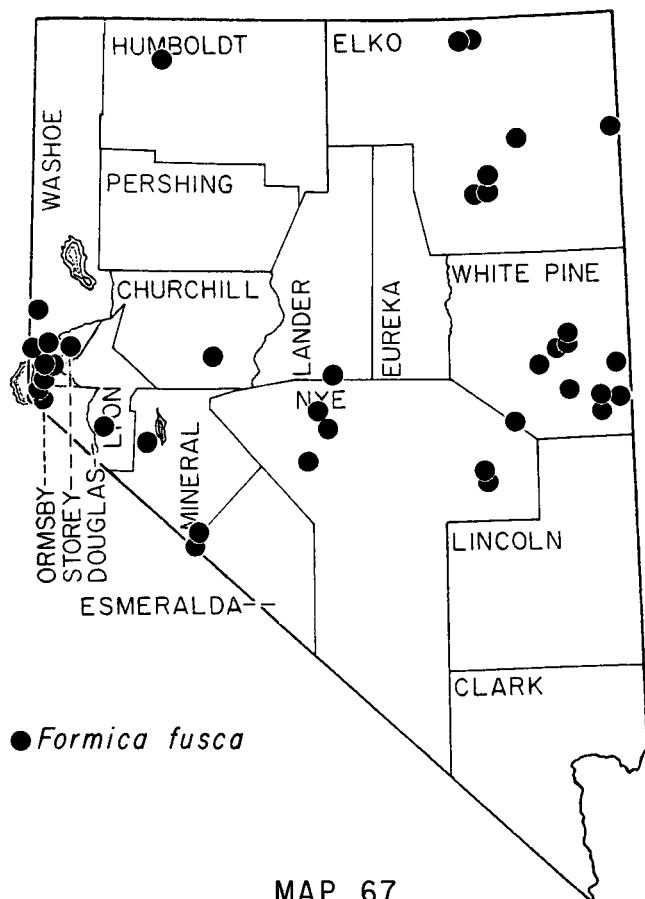
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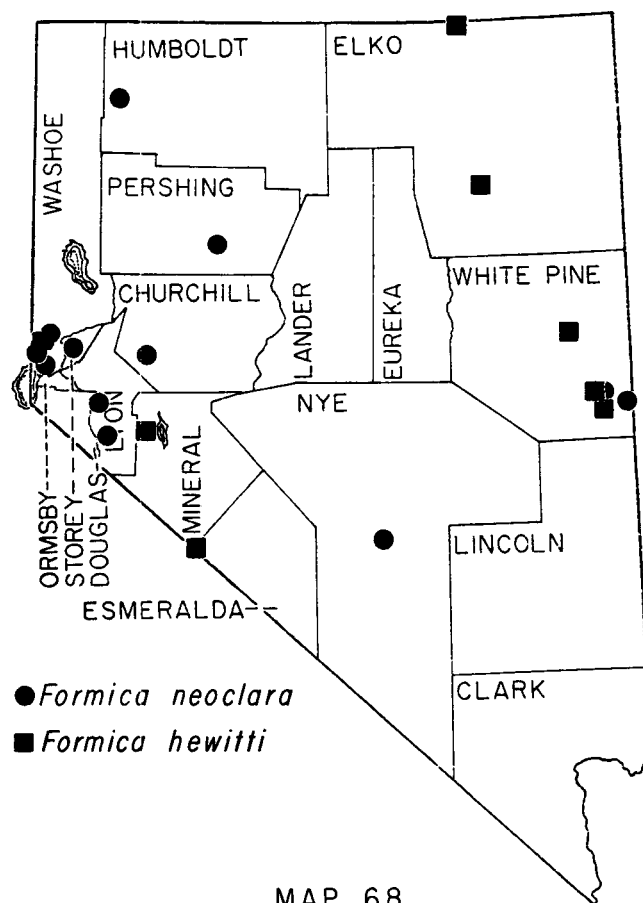
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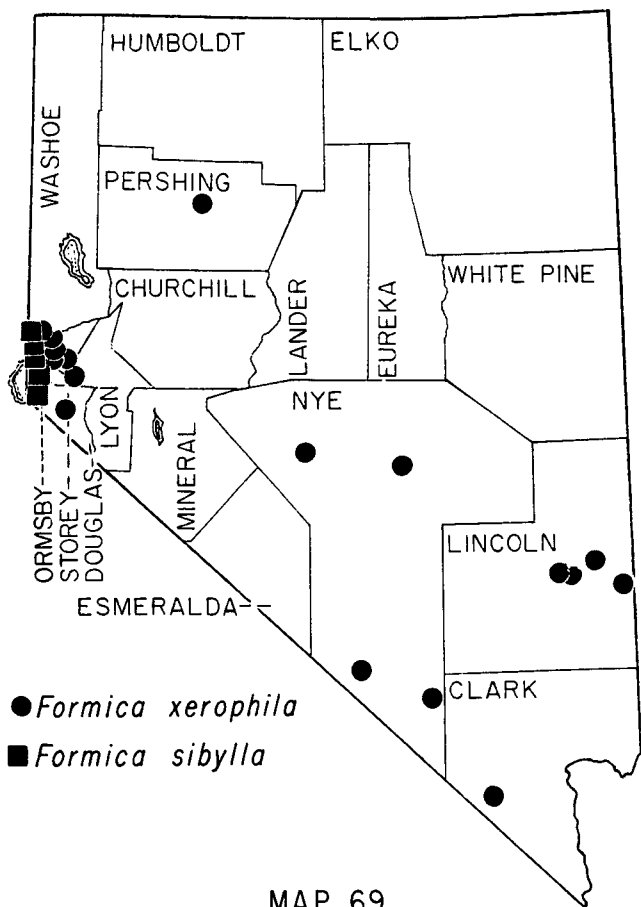
MAP 66.



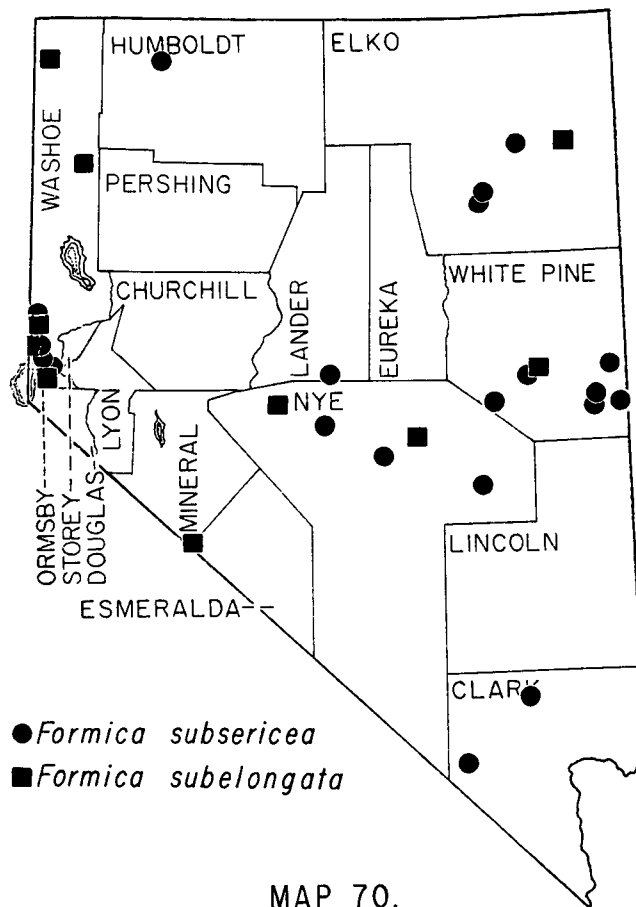
MAP 67.



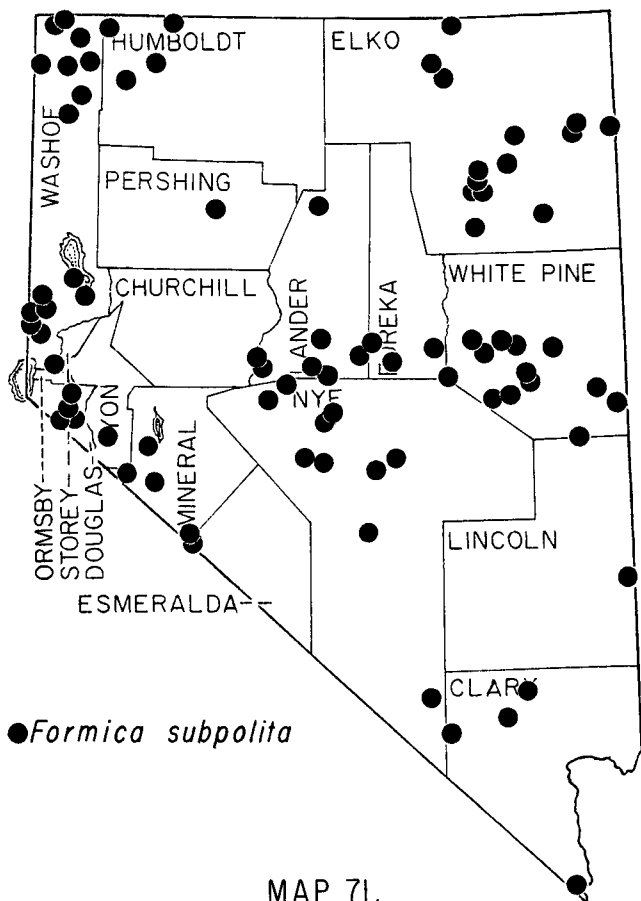
MAP 68.



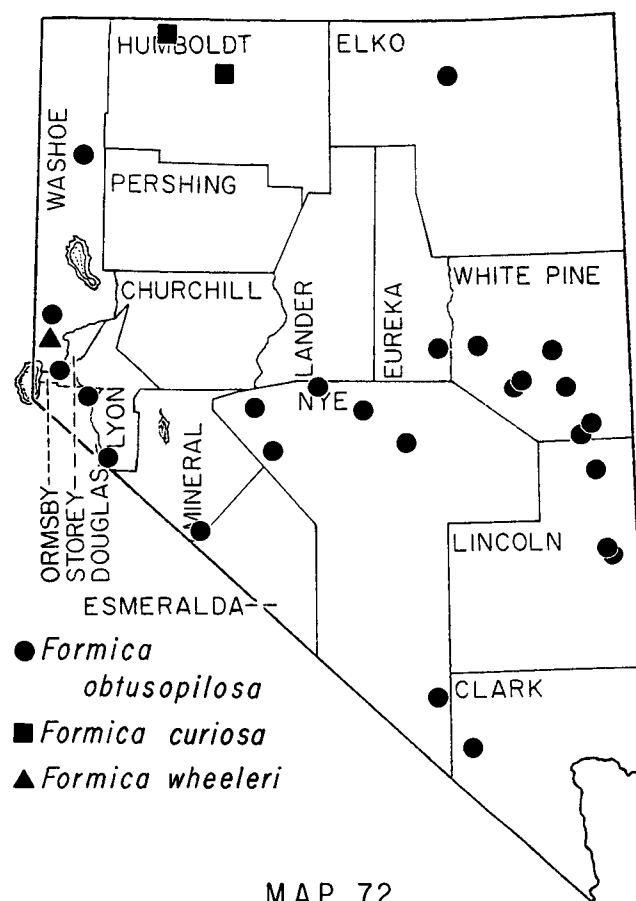
MAP 69.



MAP 70.

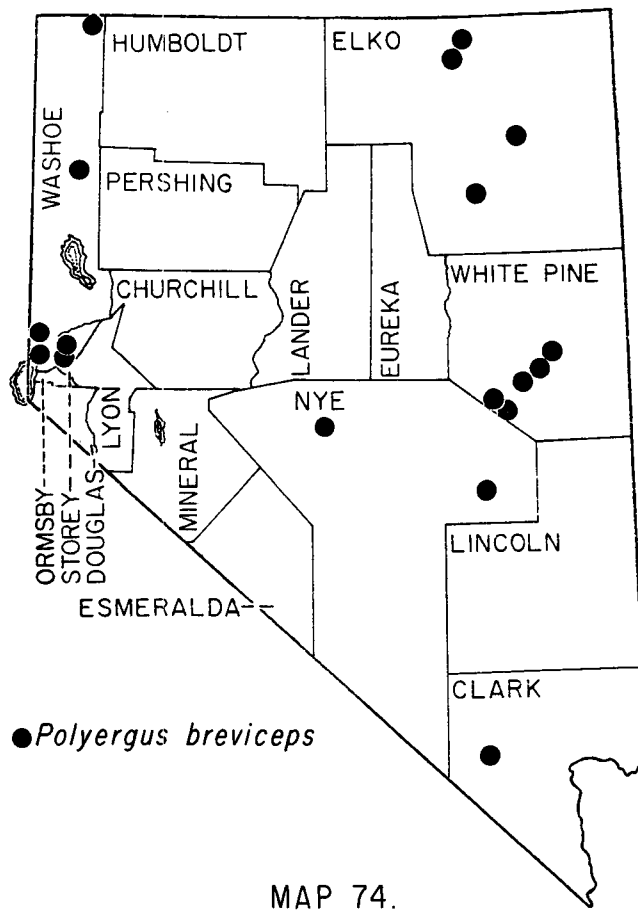
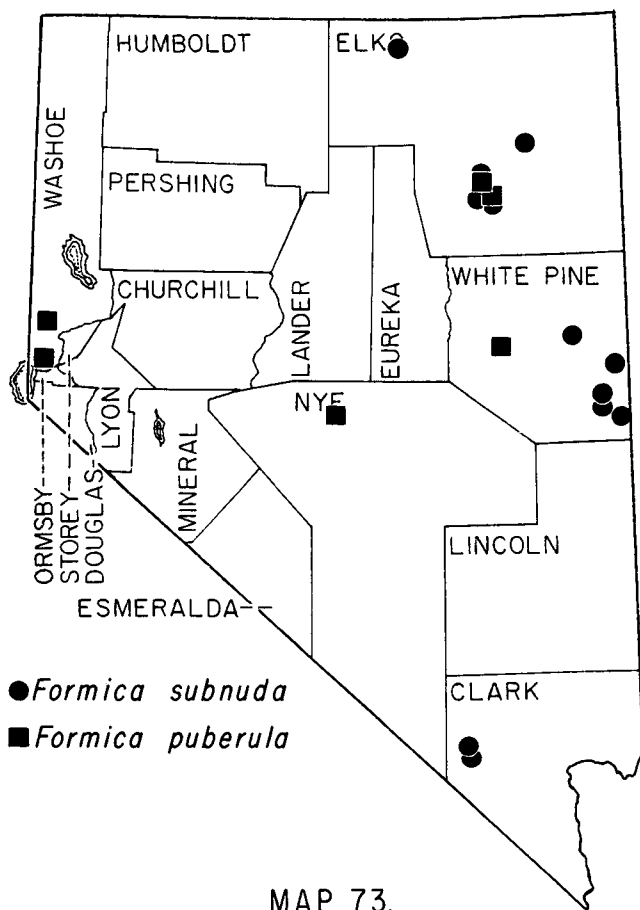


MAP 71.



MAP 72.





## INDEX

Ants are indexed to species, the name of the genus follows; the principal page reference is in bold face; ant genera are also indexed. Other insects are indexed to order and subindexed to genus. The following are not indexed: glossary, synonyms, biomes, Nevada localities, appendixes, and maps.

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