

## A Study of *Polyergus* in the United States, Based on the Workers (Hymenoptera: Formicidae)

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The genus *Polyergus*, subfamily Formicinae, includes the obligatory or true slave-making ants commonly referred to as Amazons. Unlike most ants, their workers are entirely dependent on slaves for the construction of nests and for the feeding of themselves and their brood. Their chief occupation appears to be the raiding and pillaging of nests of *Formica*, especially of those forms belonging to the *pallidefulva* and *fusca* groups. That portion of the stolen brood which is not eaten develops into auxiliary slaves in the nests of the *Polyergus*.

The Amazons are easily recognized generically by the falcate mandibles, often shining yellowish to reddish body, thick petiole, and clavate antennal scapes.

Although there are only three recognized species and about a dozen subspecies and varieties of *Polyergus* in the world, the ants of this genus nevertheless have a very wide distribution in the Holarctic region. Emery records them from the Caucasus, Central Asia, China, Mongolia, Japan, and in North America as far south as Mexico. The most common form in the Old World is *rufescens* Latreille. In the United States there are nine forms. They consist of three subspecies and three varieties of *rufescens*, and *lucidus* with its two subspecies. The distribution of these forms is not yet fully known, but it is the author's opinion that *Polyergus* may occur in every state with the possible exceptions of Florida, Alabama, and Mississippi, although it should be noted that no specimens have yet been recorded from Texas. *P. lucidus* is the most common form in the East, extending as far west as Iowa and Kansas; *rufescens breviceps*, on the other hand, is the common western form, but its known range extends as far east as Illinois and Indiana. *P. rufescens bicolor* appears to be common in the northern section of the United States, at least from Michigan to Montana and southward to Illinois and Iowa.

The most dependable characters for separating *lucidus* and its forms from those of *rufescens* are the length of the scape as compared with the interocular distance, the sparsity or density of the pubescence on the gaster, and the degree of enlargement of the apical portion of the scape. So far as the author is aware, the slaves of *lucidus* and its forms are ants of the *Formica pallidefulva* group, whereas the slaves of the various forms of *rufescens* are those of the *F. fusca* group (in the broad sense).

In conducting this study the author has been greatly impressed by the amount of variation within a species. This is especially marked in color and pilosity, and to a less extent in sculpturing. In some instances the color of

preserved individuals appears to have faded with age, but often the color varies to a large degree even in fresh individuals from different localities. The general color of *lucidus*, for example, may vary from yellowish to very dark reddish. The infuscation at the apex of the gaster, moreover, may vary considerably even in individuals from the same colony. Not only do the erect hairs that normally occur on certain areas of the body vary with regard to placement and number, but they may occasionally be absent.

The measurements given in this article are to be interpreted as follows: The length of the head is the median length from the anterior border of the clypeus to the posterior border of the head. The width of the head is the greatest distance between the external borders of the eyes. The length of the scape is the length exclusive of the bulblike base, which is buried and therefore cannot be accurately measured.

In conducting this study, which is based entirely on workers, the author has described one new subspecies, *lucidus longicornis*. He has examined co-types of *rufescens laeviceps*, *rufescens bicolor*, *rufescens breviceps umbratus*, and *lucidus montivagus*. He has also examined specimens of typical *lucidus* and of *rufescens breviceps* which are presumably from the original nest series. No specimens have been seen of either *rufescens breviceps fusciventris* or *rufescens breviceps silvestrii*. The original description of each of these forms is quoted, but only *fusciventris* is included in the key. Specimens have been examined from the collection of the United States National Museum, the Museum of Comparative Zoology, the Peabody Museum of Natural History, the Illinois State Natural History Survey, Cornell University, the University of Nebraska, the University of Minnesota, and in those of W. M. Mann, Robert E. Gregg, and Mary Talbot.

For the sake of brevity collectors' names are given by initials. In alphabetical order the names of the collectors are: C. C. Adams, C. N. Ainslie, W. V. Balduf, O. S. Bare, Joseph Bequaert, F. H. Benjamin, W. S. Blatchley, J. C. Bradley, J. C. Bridwell, Wm. F. Buren, A. C. Burrill, A. Champlain, E. A. Chapin, T. D. A. Cockerell, A. C. Cole, Jr., K. W. Cooper, C. H. Curran, W. T. Davis, Edward Norton, Finley (initials unknown), W. J. Fox, A. B. Gahan, Elizabeth V. Gregg, Robert E. Gregg, H. Heath, H. H. Jewett, J. W. Jones, Jr., C. H. Kennedy, G. F. Knowlton, S. H. Lyman, Arnold Mallis, Wm. M. Mann, Henry McCook, H. Muckermann, W. A. Nason, Paul W. Oman, Theodore Pergande, D. M. Rees, B. Rotger, J. A. Rowe, P. J. Schmitt, R. Schuster, L. E. Shinn, F. Silvestri, M. R. Smith, Thomas E. Snyder, A. H. Sturtevant, Mary Talbot, M. C. Tanquary, E. S. G. Titus, Mary Treat, Titus Ulke, H. T. Vanderford, Morton Vogel, L. G. Wesson, Jr., R. G. Wesson, A. Wetmore, W. M. Wheeler, A. S. Windsor.

The only J. C. Bridwell record is that of *breviceps* from Baldwin, Kans.; the other J. C. B. records are those of J. C. Bradley. The only Mary Treat record is that of *lucidus* at Vineland, N. J., and Cape Cod, Mass.; the other M. T. records pertain to Mary Talbot.

The illustration of *Polyergus lucidus* is by Sara H. DeBord.

KEY TO WORKERS<sup>1</sup>

1. Antennal scape usually longer than interocular distance, and although enlarged distally not suddenly dilated to form a club; gaster shining in all lights because of the extremely sparse pubescence; occipital lobes usually with erect hairs; eyes noticeably convex ..... 2  
 Antennal scape usually shorter than interocular distance, suddenly dilated distally to form a prominent club; gaster subopaque, at least in some lights, because of the dense pubescence; occipital lobes usually without erect hairs; eye often not noticeably convex ..... 4
2. Gaster distinctly infuscated at apex; occipital lobes usually with erect hairs ..... 3  
 Gaster very faintly or not at all infuscated at apex; occipital lobes often without erect hairs. Colorado ..... *lucidus montivagus* Wheeler
3. Body, with the possible exception of the gaster, subopaque, with a distinct grayish sheen; antennal scape unusually long, 1.45 to 1.55 times the interocular distance. South Carolina ..... *lucidus longicornis*, new subspecies  
 Body, with the exception of the meso- and metapleura, polished and shining; antennal scape usually less than 1.4 times the interocular distance. Common form in the Eastern States ..... *lucidus* Mayr
4. Entire body of a sordid, reddish-brown color; large and robust, 5.7-6 mm. in length. California ..... *rufescens breviceps umbratus* Wheeler  
 Color of body not as above; size variable ..... 5
5. Entire gaster, or all but the basal half of the first segment and the anal region, deeply infuscated or blackish ..... 6  
 If infuscated, the gaster is never so extensively or deeply so as described above .... 7
6. Entire gaster infuscated or blackish and much darker than the head and thorax, thus giving the body a bicolored appearance. Known range, northern United States from at least Michigan to Montana and southward to Illinois and Iowa ..... *rufescens bicolor* Wasmann  
 Basal half of the first gastric segment, and the anal region, not infuscated. Colorado. .... *rufescens breviceps fusciventris* Wheeler
7. Most of the body, but especially the head, shining in nearly all lights; length 4-5.5 mm. (Last 3 or 4 gastric segments more or less infuscated.) California ..... *rufescens laeviceps* Wheeler  
 Most of body, including the head, subopaque in nearly all lights; length 5-7 mm.  
 A common subspecies with a wide distributional range which includes most, if not all, the Western and Midwestern States ..... *rufescens breviceps* Emery

## POLYERGUS LUCIDUS Mayr

Figs. 1, 1a

*Polyergus lucidus* Mayr, 1870, Zool.-Bot. Gesell. Wein, Verhandl. **20**:952, worker, female, male; 1886, *op. cit.* **36**:424; McCook, 1880, Acad. Nat. Sci. Phila. Proc. **32**:376-384, pl. 19 (biology); Burrill, 1908, N. Y. Ent. Soc. Jour. **16**:144-151 (slave raids); Wheeler, 1916, Ind. Acad. Sci. Proc. **26**:465; 1917, Amer. Acad. Arts and Sci. **52**:555; 1926, *Ants*, 2d ed., pp. 482-486, figs. 270, 271; Wesson & Wesson, 1940, Amer. Midl. Nat. **24**:102; Jones, 1943, Amer. Midl. Nat. **29**:185 (distribution); Buren, 1944, Iowa State Col. Jour. Sci. **18**:310 (key to workers); Gregg, 1944, Ent. Soc. Amer. Ann. **37**:476 (key to workers).

<sup>1</sup> *P. rufescens breviceps silvestrii* Santschi is not included in the key.

*Polyergus rufescens lucidus* Forel, 1886, Soc. Ent. de Belg. Ann. 30:200; Emery, 1893, Zool. Jahrb., Abt. f. System. 7:666.

*Worker*.—Length 6.5 mm.

Head longer than broad, widest through the center of the eyes, with somewhat concave cheeks, rounded occipital lobes, and approximately straight posterior border. Ocelli small, placed in a triangle with the anterior ocellus almost touching an imaginary line connecting the posterior border of each eye. Eye prominent, rather strongly convex, situated about 1.5 times its greatest diameter from the base of the mandible. Frontal carinae short, subparallel, not lobed, placed at a distance from each other approximately equal to their length. Antennal scape curved, gradually enlarging apically but not forming an abrupt and prominent club as in the forms of *rufescens*; length approximately 1.13 times that of the interocular distance. Clypeus somewhat trapeziform, subcarinate in its posterior half. Mandible falcate, depressed, with minutely serrate inner border. Thorax with a distinct promesonotal suture and a rather strong mesoepinotal impression. A prominent spiracle situated on the side of the mesoepinotal impression and another spiracle on the side of the epinotum. Mesonotum forming a gentle arch, highest at the posterior border of the pronotum and lowest at the mesoepinotal impression. Base and declivity of epinotum not clearly delimited, the two

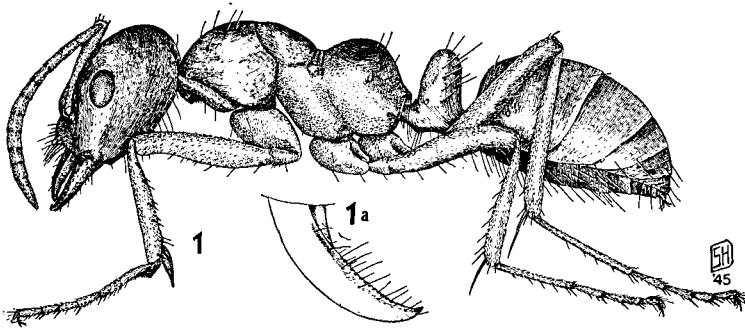


Fig. 1. *Polyergus lucidus* Mayr, worker; fig. 1a, right mandible.

surfaces meeting in such a manner as to form a rounded, obtuse angle. Legs rather long. Petiole thick anteroposteriorly, with anterior surface convex and posterior surface more flattened; sides narrowing dorsally to form a rounded and blunt superior border. Gaster oblong.

Erect hairs present on gula, mandibles, clypeus, occipital lobes, pronotum, petiole, flexor surface of each leg, and the dorsum and venter of the gaster. Pubescence fine, closely appressed, perhaps most easily seen on the appendages, especially in certain lights; very sparse and not concealing the surface of the

gaster, so that the gaster is shining in all lights. Entire body, exclusive of the meso- and metapleura, shining.

Yellowish red, with the appendages and the posterior border of the last four gastric segments infuscated.

Described from a single worker believed to belong to the original nest series from which the cotypes were selected. This worker and a female are borne on a pin to which is attached only the label "152." Three other pins bear the same number. One pin bears three males, another pin four males, and the third pin, a female, a male, and a slave worker. To the third pin is also attached a handwritten label, "*Polyergus* n. sp." The series is from the Peabody Museum of Natural History.

In individuals from different localities this species varies considerably in the length of the antennal scape, pilosity, color, and the amount of infuscation at the apex of the gaster. The length of the scape when compared with the interocular distance varies remarkably, ranging from as low as 1.05 to as much as 1.40 times the interocular distance. Erect hairs are almost always present on the gula, mandibles, clypeus, occipital lobes, pronotum, flexor surface of each leg, petiole, and dorsal and ventral surfaces of the gaster. The mesonotum seldom bears hairs, while the epinotum usually has one or more hairs but sometimes is hairless. Rarely are erect hairs absent on the occipital lobes. The color of the body varies from yellowish through yellowish red to dark reddish, the appendages being moderately to deeply infuscated. The infuscation at the apex of the gaster is also highly variable with regard to depth and extent. Usually the infuscation embraces the posterior border of the last three gastric segments, but it sometimes even includes the posterior border of the fourth segment. Even specimens from the same colony are not always uniformly infuscated.

The so-called shining Amazon is one of our most beautiful North American ants; its red body and infuscated appendages readily catch the eye. The worker can be recognized by the characters given in the key as well as by the fact that the ant apparently never enslaves any *Formica* except those of the *pallidefulva* group. It is the only *Polyergus* known to occur in the extreme Northeastern States, but farther south and west the species breaks up into several subspecies, one of which is described as new in this article. In the Midwestern States the distribution of *lucidus* is overlapped by that of *rufescens breviceps*. The distribution of the species is not yet fully known, but *lucidus* has been found as far south as northern South Carolina and at least as far west as Riley County, Kans.

*Type locality*.—Connecticut (no specific locality mentioned), Edward Norton. Since Norton lived at Farmington, the types may have been collected there, or in that vicinity.

*Other localities*.—CONNECTICUT: New Haven, G. E. H. NEW YORK: Ithaca, J. C. B.; Putnam Valley, R. S.; near Bronxville, W. M. W.; Long Pond, Wading River, Pinelawn and Selden on Long Island, W. T. D.; Hulett's Landing in Washington County, T. E. S.; White Plains and West Nyack, J. B. MASSACHUSETTS: Boston, S. H.; Falmouth and West Falmouth, A. H. S.; Cape Cod, M. T.; Blue Hills Reservation, collector? NEW JERSEY: Camden County, collector?; Clementon,

W. J. F.; Vineland, M. T.; Princeton, K. W. C.; New Brunswick, collector?; Martha, 40 miles west of Philadelphia, H. G. PENNSYLVANIA: Rebersburg, L. E. S.; Rockville, A. C. and P. R. M.; Milford, A. C. B.; Bellwood, H. McC. MARYLAND: Berwyn, A. B. G. DISTRICT OF COLUMBIA: locality?, T. P. and W. M. M.; Rock Creek Park, M. V. VIRGINIA: Bristol, J. W. J.; Vienna, E. A. C., M. R. S., and J. C. B.; East Falls Church, E. A. C.; West Falls Church, J. C. B.; Bull Run, W. M. M. NORTH CAROLINA: Belmont, P. J. S.; Conover, H. T. V. (not *lucidus* in the strict sense). SOUTH CAROLINA: Whitewater Falls, M. R. S. TENNESSEE: Bluff City, Ringgold, J. W. J. Jr. KENTUCKY: Lexington, H. H. J. OHIO: 2 miles west of Beaver, L. G. W., Jr., and R. G. W. INDIANA: Pine, W. S. B. MICHIGAN: Asca near Afton, C. H. K.; Cheboygan County and Ogeman Game Refuge in Roscommon County, M. T. ILLINOIS: Rockford, W. M. W. IOWA: Backbone State Park, W. F. B. KANSAS: Riley County, collector? MISSISSIPPI: Abbeville, J. W. J., Jr. (this record is questionable, as a few straggling workers were collected near a railroad track and they may have been brought in by the railroad). COLORADO: Garden of the Gods, H. McC. (this may be *lucidus* in the broad sense).

Cotypes presumably in Naturhistorisches Museum, Vienna, Austria. A worker presumably from the original nest series in the Peabody Museum of Natural History. (For more definite information see discussion elsewhere under *lucidus*.)

*Slaves*.—*Formica pallidefulva nitidiventris* Emery, *F. pallidefulva schaufussi* Mayr, *F. pallidefulva schaufussi incerta* Emery.

***Polyergus lucidus longicornis*, new subspecies**

*Worker*.—Length 7 mm.

Head 1.06 times as long as broad, cheeks slightly concave, sides of head converging behind the eyes, posterior border weakly emarginate. Eye rather strongly convex, prominent, longer than broad, placed more than its greatest diameter from the base of the mandible. Antennal scape unusually long, 1.51 times the length of the interocular distance, gradually enlarging toward the apex but not forming a suddenly dilated, prominent club as with *breviceps*. Frontal carinae short. Frontal area subtriangular, not strongly defined. Ocelli extremely small. Clypeus at least twice as broad as long, subcarinate, the anterior border with a broad but shallow median emargination. Thorax with distinct promesonotal suture. In profile, dorsal surface of mesonotum extending from the promesonotal suture to the prominent mesoepinotal impression in a descending, almost unbroken line. A large and protuberant spiracle on each side of the mesoepinotal impression and also one on each side of the epinotum. Base of epinotum meeting the declivity in a bluntly rounded angle which is greater than a right angle. Petiole erect, thick antero-posteriorly, more convex anteriorly than posteriorly, with a blunt, subtruncate, superior border. Gaster oblong, rounded at the base.

Head and thorax subopaque, with a grayish sheen in most lights.

Erect, yellowish hairs on mandibles, clypeus, gula, occipital lobes, pronotum, prosternum, epinotum, coxae, trochanters, flexor surface of each leg, petiole, and gaster. Pubescence on body so fine, appressed, and sparse as to be scarcely noticeable; on appendages denser and more apparent; on gaster sparse and not concealing the surface in any light.

Body dull reddish brown, with the third, fourth, and fifth gastric segments distinctly infuscated. Legs scarcely darker than the body.

Described from a holotype and nine paratype workers collected by the author on May 3, 1941, at Florence, S. C. These have been placed in the United States National Museum collection and are recorded under U.S.N.M. No. 57661. They were collected from a shallow nest in the light loamy soil of open woods. The colony was apparently very small, containing only a few dozen individuals.

Some of the paratypes differ from the holotype in having more extensive infuscation of the gaster, this sometimes embracing the posterior border of each of the four apical segments. The legs are also slightly darker in some specimens. The length ranges from approximately 6 to 7 mm. The scape varies in length from 1.45 to 1.56 times the interocular distance.

This new subspecies can be distinguished from the other forms of *Polyergus* by the unusually long antennal scape which gradually enlarges toward the apex without forming a suddenly dilated club; erect hairs on the occipital lobes; the grayish sheen of the subopaque head and thorax; the weakly concave cheeks; dull reddish-brown color. Apparently Florence is the most southern point in the Southeastern States where a colony of *lucidus* or any of its forms has been observed. However, the author has seen a single winged female of *lucidus*, either subspecies *longicornis* or a closely allied form, that was collected at Waycross, Ga., on October 5, 1938, by Paul W. Oman.

*Slave*.—*Formica pallidefulva schaufussi* Mayr.

POLYERGUS LUCIDUS MONTIVAGUS Wheeler

*Polyergus lucidus montivagus* Wheeler, 1915, Amer. Mus. Nat. Hist. Bul. 34:419, worker, female, male; 1917, Amer. Acad. Arts and Sci. Proc. 52:555.

The worker of *montivagus* is approximately the same length as that of *lucidus*. The scape is from 1.3 to 1.4 times the length of the interocular distance. The worker is distinguished from that of *lucidus* by its paler, more yellowish-red color; the dull, or at least less shining, surface of the head and thorax; the lack or weakness of infuscation at the apex of the gaster; and the sparsity of the pilosity. The occipital lobes are without hairs or have only one or two each. A cotype worker examined by the author has erect hairs on the mandibles, clypeus, gula, occipital lobes, epinotum, coxae, trochanters, flexor surface of each leg, petiole and gaster; there is one hair on one occipital lobe and two on the other; the epinotum bears a single hair. In his original description Wheeler mentions "the complete or nearly complete absence of erect hairs on the posterior corners of the head, the smaller number of hairs on the gula" but he does not remark on the amount of pilosity on other parts of the body and appendages.

*Type locality*.—Canyons about Colorado City and Manitou, Colo., W. M. Wheeler.

*Other localities*.—None.

Cotypes in the Museum of Comparative Zoology, Cambridge, Mass., and the United States National Museum, Washington, D. C.

*Slave*.—*Formica pallidefulva schaufussi* near var. *incerta* Emery.

## POLYERGUS RUFESCENS BREVICEPS Emery

*Polyergus rufescens breviceps* Emery, 1893, Zool. Jahrb., Abt. f. System. 7:666, worker; Wheeler, 1916, N. Y. Ent. Soc. Jour. 24:107-118 (slave raids); 1917, Amer. Acad. Arts and Sci. Proc. 52:555; 1926, Ants, 2d ed., pp. 475-477; Smith, 1928, N. Y. Ent. Soc. Jour. 36:329-333 (slave raids); Cole, 1936, Canad. Ent. 68:38; 1942, Amer. Midl. Nat. 28:385; Mallis, 1941, South. Calif. Acad. Sci. Bul. 40:82; Morris, 1943, Ind. Acad. Sci. Proc. 52:220; Buren, 1944, Iowa State Col. Jour. Sci. 18:310 (key to workers); Gregg, 1944, Ent. Soc. Amer. Ann. 37:476 (key to workers).

*Worker*.—Length 6 mm.

Head measured through its greatest breadth as wide as long, sides convergent anteriorly before the eyes and posteriorly behind the eyes, posterior border almost imperceptibly emarginate. Ocelli extremely small, arranged in a triangle with the anterior ocellus almost situated on an imaginary line connecting the posterior borders of the eyes. Frontal carinae short, posteriorly divergent. Antennal scape short, slightly shorter than the interocular distance, with a rather abrupt, strong, clublike enlargement toward the apex. Eye prominent but not strongly convex, longer than wide, situated more than its greatest diameter from the base of the mandible. Frontal area triangular. Clypeus more than twice as broad as long, convex posteriorly but not carinate. Mandible falcate, depressed, with the inner border minutely serrate. Thorax short, stout. In profile, pronotum highest in its posterior half. Promesonotal suture distinct. Mesonotum not strongly convex, its outline forming a gentle arch from the promesonotal suture to the mesoe-pinotal impression. A conspicuous spiracle in the impression and one also on the side of the epinotum. Base of epinotum convex, the base and declivity meeting to form a broadly rounded angle. Petiole erect, more convex anteriorly than posteriorly, thick anteroposteriorly, with a transversely rounded, blunt, superior border. Gaster oblong, rounded at the base.

Erect, yellowish hairs on mandibles, clypeus, flexor surface of each tibia and tarsus, petiole and gaster. Pubescence extremely fine and appressed, most noticeable on legs and gaster, where in certain lights at least, it gives the surface a subopaque effect. Mandibles smooth and shining. Head and thorax with sculpturing so delicate and granular that it cannot be seen very clearly with the low power of a binocular.

Color reddish.

Described from a specimen bearing the labels, "Hill City, S. Dak., Jun. '90, No. 142, T. Pergande collection." This individual is believed to belong to the original series from which type specimens were described. The worker lacks the erect hairs which are present on the pronotum, mesonotum, coxae, and tibiae of other individuals from the same locality. In these specimens, also, the petiole has an emarginate or subtruncate superior border.

Specimens from different localities vary in size, shape, pilosity, and degree of sculpturing. Workers range from 5 to 7 mm. in length. The head is often slightly longer than wide. The eye weakly to moderately convex. In some specimens the mesonotum is weakly convex, in others more strongly



convex. The base of the epinotum may meet the declivity in a very broadly rounded angle or in nearly a right angle. The petiolar border is usually transversely rounded but it is sometimes subtruncate. Erect hairs are usually present on the mandibles, clypeus, pronotum, coxae, trochanters, flexor surface of femora, tibiae and tarsi, epinotum, petiole and gaster. Sometimes hairs occur on the gula and mesonotum, but they are only exceptionally found on the occipital lobes. The sculpturing of the head and thorax is so variable that in some specimens these parts are more or less shining, whereas on other specimens they are more subopaque. The head is often more shining than the thorax. The gaster is normally without any well-defined degree of infuscation such as is seen in *lucidus* and some of its forms.

The best characters for distinguishing *breviceps* are given in the key. The worker is superficially similar to that of *laeviceps* and *umbratus*. From *laeviceps* it may be distinguished by its less shining head and somewhat larger body, and from *umbratus* by its color.

*P. rufescens breviceps* is one of the most common and widely distributed forms of *Polyergus* in the United States. It ranges over the Western and Midwestern States and has been found as far east as Illinois and Indiana. In the Midwest its distribution is overlapped by that of *lucidus*, a distinct eastern form.

*Original localities*.—Hill City, S. Dak., Titus Ulke (?), and Breckenridge, Colo., P. J. Schmitt (?).

*Other localities*.—INDIANA: Crawford County, W. S. B.; Hammond, M. T. ILLINOIS: Harvey and Mokena, A. S. W. and R. E. G.; Urbana, M. R. S. and W. V. B.; Decatur, F. H. B.; Algonquin, W. A. N.; Galesburg, M. C. T.; Cook County, M. T. IOWA: Ames and Sioux City, C. N. A.; Clinton, Des Moines and Davenport, W. F. B. NEBRASKA: Schuyler, O. S. B. KANSAS: Osage City, A. C. B.; Lawrence, C. H. C.; Baldwin, J. C. B. MONTANA: Elkhorn Mountains, W. M. M. COLORADO: Cheyenne Canyon near Colorado Springs and Florissant Canyon west of Pikes Peak, W. M. W.; Estes Park, A. C. B.; Mesa S. Pedro in Castilla County, B. R.; Ute Pass, W. M. W.; Glamosa and Durango, R. E. G. and E. V. G. NEW MEXICO: Old Pecos Pueblo, T. D. A. C. IDAHO: Twin Falls, A. C. C., Jr. UTAH: Salt Lake County and Green Canyon in Cache County, G. F. K.; Logan, A. C. B. and E. S. G. T.; Ritchfield, J. A. R.; Chester, D. M. R. ARIZONA: Apache Camp, S. Catalina Mountains and Fort Grant, Pinaleno Mountains, W. M. W. WASHINGTON: Pullman and Wawawai, W. M. M.; Dayton, S. H. L. OREGON: Monroe, collector Finley. CALIFORNIA: Fallen Leaf Lake and Glen Alpine near Lake Tahoe, W. M. W.; Santa Cruz, H. H.; Kern Lake, J. C. B.; Soquel Road in Madera County, A. M.

Cotypes in the Emery collection of the Museo Civico, Genoa, Italy. Specimens presumably from the original nest series in the United States National Museum, Washington, D. C. (For more definite information see discussion elsewhere under *breviceps*.)

*Slaves*.—*Formica fusca* var. *argentea* Wheeler, *F. fusca* var. *subsericea* Say, *F. fusca* var. *neorufibarbis* Emery, *F. fusca* var. *subaenescens* Emery, *F. fusca* Linnaeus, var. *F. cinerea* var. *neocinerea* Wheeler.

## POLYERGUS RUFESCENS BICOLOR Wasmann

*Polyergus rufescens bicolor* Wasmann, 1901, Allg. Ztschr. f. Ent. 6:369, worker, female, male; 1915, Gesellschaftsleben d. Ameisen 1:278, pl. 3, figs. 3-8, worker, female, male; Wheeler, 1917, Amer. Acad. Arts and Sci. Proc. 52:556; 1926, Ants, 2d ed., pp. 477-482; Buren, 1944, Iowa State Col. Jour. Sci. 18:310 (key to workers).

*Worker*.—Length 5.7 mm.

Head almost exactly as wide as long. Antennal scape shorter than the interocular distance. Eye moderately convex but not so convex as in *lucidus*. This subspecies is characterized mainly by sculpture, color, and pilosity. The surface of the head and thorax is dull and subopaque in almost all lights. The head, however, is sometimes more shining than the thorax, and the mandibles are always smooth and shining. The gaster is subopaque in most lights. The head and thorax are concolorous, varying from reddish brown to very dark reddish brown. The antennal scapes, legs, petiole, and gaster appear blackish to black depending upon the nature of the light. The contrast in color between the head and thorax and the gaster gives the body a bicolored effect. Pilosity is sparse; erect hairs are apparently always present on the clypeus, mandibles, petiole, gaster, and flexor surface of each tibia and tarsus, but are absent from the gula, occipital lobes, and flexor surfaces of the femora. Erect hairs may be absent from the dorsal surface of the thorax, or there may be only one or two hairs on one, two, or all three of the thoracic segments. The pubescence is fine, dense, and appressed on the petiole, legs, and gaster, but more apparent in some lights than others; the pubescence on the head and thorax is scarcely perceptible under the low power of a binocular.

Old individuals have a tendency to fade to such an extent that the original colors are lost. Cotype specimens examined by the author have a reddish-brown instead of a blackish or black gaster, but the color of the gaster is still somewhat darker than that of the head and thorax. Most individuals, regardless of age, have the posterior border of each segment darker than the remainder of the segment. It is difficult to determine whether this is natural or is due to the effect produced by the overlapping of the gastric segments. With freshly collected individuals one has little difficulty in recognizing this subspecies.

The exact range of *bicolor* has not been definitely determined. Specimens have been collected from Michigan to Montana and southward to Iowa and Illinois. The ant appears to be strictly a northern form.

*Type locality*.—Prairie du Chien, Wis., H. Muckermann.

*Other localities*.—MICHIGAN: Crystal Falls, A. C. C., Jr. MINNESOTA: Akeley and Jenkins, W. F. B.; Saganaga Lake, R. E. G. ILLINOIS: Rockford, W. M. W. IOWA: Backbone State Park, W. F. B. MONTANA: Yellow Bay and Flathead Lake, C. C. A.

Cotypes in the Wasmann collection at Maastricht, Holland. Five workers and one male, labeled cotypes, in the Wm. M. Mann collection at the United States National Museum, Washington, D. C.

*Slave*.—*Formica fusca* var. *subaenescens* Emery.

## POLYERGUS RUFESCENS LAEVICEPS Wheeler

*Polyergus rufescens laeviceps* Wheeler, 1915, Amer. Mus. Nat. Hist. Bul. 34:420, worker; 1917, Amer. Acad. Arts and Sci. Proc. 52:556; Mallis, 1941, South. Calif. Acad. Sci. Bul. 40:82.

*Worker*.—Length 4.5-5 mm.

This subspecies is characterized mainly by its size, sculpture, pilosity, and color. The worker is smaller than that of *rufescens breviceps*. The head especially is smooth and shining in all lights, and the thorax is rather shining, particularly the propleura. Erect hairs are present on the same positions of the body and legs as in *breviceps*, and in addition there are hairs on the occipital lobes and gula, and sometimes a few on the mesonotum. The color of the body is not materially different from that of *breviceps* except that gastric segments 2 through 5 are more or less infuscated. Wheeler indicates in the original description that the scape has a shorter and more abrupt clublike enlargement than that of *breviceps* and *bicolor*.

*Type locality*.—Mount Tamalpais, near San Francisco, Calif., W. M. Wheeler.

*Other locality*.—Laws, Calif., A. Wetmore.

Cotypes in the Museum of Comparative Zoology, Cambridge, Mass., and the United States National Museum, Washington, D. C.

*Slave*.—*Formica subpolita* Mayr.

## POLYERGUS RUFESCENS BREVICEPS UMBRATUS Wheeler

*Polyergus rufescens breviceps umbratus* Wheeler, 1915, Amer. Mus. Nat. Hist. Bul. 34:419, worker; 1917, Amer. Acad. Arts and Sci. Proc. 52:555; Mallis, 1941, South. Calif. Acad. Sci. Bul. 40:82.

*Worker*.—Length 5.7-6 mm.

This variety is characterized by size and color. The body of large workers is robust, especially the thorax. Color a sordid, reddish brown with the gaster apparently lacking infuscation. The antennal scape is shorter than the interocular distance. The eye, although moderately convex, is not so convex as in *lucidus* and its forms. Pubescence is rather dense on all parts of the body except the head, which is shining in some lights and subopaque in others. Hairs are present on the mandibles, clypeus, gula, pronotum, epinotum, coxae, trochanters, flexor surface of each tibia and tarsus, petiole, and gaster, but lacking on the occipital lobes and mesonotum.

Except for color this ant closely resembles large workers of *breviceps*.

*Type localiy*.—Brookdale, Calif., Harold Heath.

*Other localities*.—None.

Cotypes in the Museum of Comparative Zoology, Cambridge, Mass., and the United States National Museum, Washington, D. C.

*Slave*.—A small variety of *Formica fusca* Linnaeus near var. *argentea* Wheeler.

## POLYERGUS RUFESCENS BREVICEPS FUSCIVENTRIS Wheeler

*Polyergus rufescens breviceps fusciventris* Wheeler, 1917, Amer. Acad. Arts and Sci. Proc. 52:555, worker.

"Worker.—Length 4 mm.

"Differing from the typical *breviceps* in its smaller size, more opaque and more coarsely shagreened surface, in having the petiolar node distinctly shorter and more compressed anteroposteriorly and the posterior 2/5 of the first gastric segment and the whole of the succeeding segments except the anal region, fuscous."

Wheeler considers this variety transitional to the subspecies *bicolor*. The author has not been able to study the holotype.

*Type locality*.—Half Way House on Pikes Peak, Colo., T. D. A. Cockerell.

*Other locality*.—Treesbank, southern Manitoba, Canada, C. G. Hewitt.

Holotype in the Museum of Comparative Zoology, Cambridge, Mass.

*Slave*.—*Formica fusca* Linnaeus.

## POLYERGUS RUFESCENS BREVICEPS SILVESTRII Santschi

*Polyergus rufescens breviceps silvestrii* Santschi, 1909, Soc. Ent. Ital. Bol. 41:7, worker, male; Mallis, 1941, South. Calif. Acad. Sci. Bul. 40:82.

"Diffère du *breviceps* par la tête plus large et plus échancrée en arrière et la couleur plus foncée. Le ♂ entièrement noir a les ailes très enfumées de noirâtre. (Comparé avec un type de Mr. Pergande communiqué par Mr. Forel.)"

*Type locality*.—Yosemite, Calif., F. Silvestri.

*Other localities*.—None.

Location of cotypes not known.

*Slaves*.—Species not recorded.

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