THE STATUS OF CERTAIN MYRMICINE ANTS IN WESTERN NORTH AMERICA WITH A CONSIDERATION OF THE GENUS *PARAMYRMICA* COLE (HYMENOPTERA: FORMICIDAE)

BY ROBERT E. GREGG

DEPARTMENT OF BIOLOGY, UNIVERSITY OF COLORADO

In January, 1957, Dr. A. C. Cole published the description of *Paramyrmica,* a new genus of ants, and of *Paramyrmica colax,* a new species which was designated as the genotype. As Dr. Cole showed, the new genus is closely related to *Myrmica,* from which we may infer it has evolved, and to *Manica.* He also observed that *P. colax* is a social parasite on *Myrmica striolagaster,* or at least an inquiline of some sort, since the two species had formed a mixed colony. The former existed in a much larger proportion than the numbers of its host. I am fortunate to have available several worker paratypes of *colax,* and a study of these specimens with their very unusual structural features, together with their peculiar relationship to a presumed host species as already indicated, lends strong support to the recognition of a distinct genus. The fact that no males of *colax* were found by Cole, however, and that no additional workers (with or without males) have been found since, has raised some doubt about the validity of *Paramyrmica.*

During one past summer, I collected specimens from a colony of ants in far western Colorado near the Utah line, and upon subsequent examination they appeared to represent a new species in the genus *Paramyrmica.* The site from which they were obtained is a pinyon-cedar woodland on a steep hillside, 20 miles north of Loma, Colorado, on the road to Douglas Pass. The elevation is 5700 feet, and the colony was located under a large rock in clay soil. The specimens were taken on August 22, 1960.

After submitting these ants to Dr. W. S. Creighton, it became apparent that they probably represented new samples of a species previously described by M. R. Smith as *Tetramorium rugiventris.* In 1943, Dr. Smith discussed the presence of the genus *Tetramo-*

rium in America, reached the conclusion that the several species of this group now known in the United States are introduced forms, and included among them the newly discovered species, *rugiventris,* which had been collected at Prescott, Arizona. The theory that all our species of *Tetramorium* are tramp species introduced by commerce is ingeniously supported by Dr. Smith, but Creighton (1950, pp. 286–290) presents more cogent reasons for believing that only certain of these ants conform to that explanation, and that *T. caespitum* behaves strikingly as a native insect. On the other hand, Brown (1957) presents a detailed argument in line with Smith's views. He gives very good reasons for removing *rugiventris* from *Tetramorium,* and following this he placed it in the genus *Myrmica,* relating it to *M. striolagaster* and the *M. punctiventris* group.

Workers and a male ant from the Loma colony were sent to Dr. Smith for comparison to the types of his *rugiventris,* and in reply he said that except for a few minor differences in sculpture my specimens may be regarded as belonging to the same species. Through his cooperation, I have also been able to examine three worker paratypes of *rugiventris* in the collection of the U. S. National Museum, and as a result fully confirm Smith's opinion. Smith agrees (in litt.) with Brown, who had seen only the worker, that *rugiventris* belongs in *Myrmica,* and he is even more convinced after studying the male in my sample. With this latter conclusion, however, I am unable to concur as will be shown presently.

In view of the possibility that *rugiventris* may properly be a member of the genus *Myrmica,* I have compared my specimens of the workers to the corresponding caste of certain species of that genus with which they might be allied, and also careful comparisons have been made with Smith's types of *rugiventris.* The results of these studies are as follows, and in each case the structural differences indicate how the compared species departs from the specimens collected in the cited Colorado locality.

T. rugiventris M. R. Smith (paratypes)

1. epinotal spines longer and less triangular
2. thoracic depth (dorso-ventral dimension) deeper
3. gastric rugae finer
4. slightly larger in size
5. color brown, somewhat lighter

The degree of difference in each of these characters, however, is such as one may reasonably expect to find within the limits of specific variability.

M. striolagaster Cole (paratypes)

1. epinotal spines long, sharp, and narrow
2. petiole and postpetiole different in shape
3. frontal lobes turn up
4. prominent lamina at bend of scape
5. clypeal rugae very coarse
6. gastric rugae very fine and striate
7. lateral clypeal lobes lack cariniform ridges
8. size much larger
9. color red brown

It should be stated, nevertheless, that the sculpture of the head, thorax, pedicel, and scapes is in general quite similar.

M. mexicana Wheeler (cotypes)

1. epinotal spines very long and sharp
2. petiole and postpetiole shape and sculpture different
3. frontal lobes turn up; lateral clypeal ridges absent
4. scapes with slight keel at the bend
5. gaster smooth, no rugulae
6. larger in size
7. color red brown

Despite these differences, the dorsal thoracic profile seems to be similar.

M. punctiventris Roger

1. epinotal spines very long and sharp
2. petiole and postpetiole different in shape
3. gaster has coarse piligerous punctures; lacks striation and rugulation
4. clypeus different; antennal scapes slender
5. body sculpture totally different
6. dorsal thoracic profile different
7. larger in size
8. color red brown

M. brevispinosa Wheeler

1. epinotal spines narrow and spine-like though short
2. petiole and postpetiole shape and sculpture different
3. clypeus without lateral lobe ridges
4. scapes slender and narrowed at the base
5. gaster smooth, without striations or rugulae
6. color orange red

Body size in the two ants is about the same.

The preceding comparisons seem to show that *rugiventris* is

not actually a member of the genus *Myrmica,* and that the similarities it shares with several species can be interpreted as convergent. This applies especially to the general rugose sculpture of the head and thorax.

In addition to the preceding comparisons, I have placed males of the Loma colony beside males of the following species of *Myrmica: brevisponsa, punctiventris, lobicornis lobifrons, brevinodis sulcinodoides, spatulata,* and *schencki emeryana.* In all cases the similarities with undoubted species of *Myrmica* were striking, the only differences being those of specific magnitude, such as would appear among the several species listed above. Furthermore, the Loma males run easily through Smith's key (1943) to the genus *Myrmica,* and fit closely his figure of the wing of *Myrmica punctiventris* (p. 285). It would appear from these considerations that we are obliged to regard *rugiventris* as a *Myrmica,* and as both Brown (1957) and Smith (in litt.) state, an aberrant form in that genus. But I do not believe this is necessarily correct. It is established, however, that *rugiventris* must be removed from *Tetramorium,* for the male in that genus is sharply distinguished by its 10-segmented antennae with the second funicular segment extremely long, whereas *Myrmica* males possess 13-segmented antennae with the second funicular segment no larger than its neighbors. The *rugiventris* males conform to the conditions in *Myrmica.*

It is well known that the male sex in ants is notoriously conservative with respect to morphological differentiation. It is frequently impossible to distinguish between closely related species on the basis of the male as they seem identical in outward appearances. For this reason, and also because of the relative infrequency of males in collections, the taxonomy of ants is based mostly upon the worker caste which is constant in ant nests and easily collected, and to some extent upon the female (queen) caste when it is available. The males may be used whenever they happen to present truly distinctive features. Very strong indications of male conservatism can be seen in Smith's key as he found it necessary to combine all the dolichoderine and the formicine genera in one table owing to the extreme difficulty of separating these ants at the subfamily level! Thus it is possible that males of closely related genera in the myrmicines may be structurally undifferentiated at the generic level.

When Cole set up the genus *Paramyrmica* he commented upon various structual features of the worker that seem to be generically distinct, and stressed the fact that the ants gave evidence of being parasites or inquilines, further strengthening his conclusion. Other inquilinous genera are known, of course, in which the parasitic nature of their behavior lends support to their recogition as separate genera, but this is not an absolute requirement as we know for example from the many species of social parasites among species of *Formica,* a group in which most forms are free-living. Hence, it is entirely possible on this score for *Myrmica* to possess an unusual, parasitic species, and *Paramyrmica colax* might conceivably be transferred to *Myrmica,* with *Paramyrmica* possibly reduced to the rank of a subgenus. In the absence of the male of *P. colax,* however, we cannot say whether that sex is identical or even similar to the males of *Myrmica,* and also whether it is in any way similar to the now known males of *rugiventris.* We can only wait until the males of *colax* are discovered, and in the meantime there is ample evidence to defend *colax* as the type of a separate genus, though one closely related to *Myrmica.*

The worker and female of *colax* are decidedly different from any *Myrmicas* I have examined, even *striolagaster,* for the gastric striation of these two ants is not very much alike. The gastric sculpture of *colax* is very coarse by comparison, and in addition the epinotal spines, shape of the petiole and postpetiole, and the form of the scapes in *colax* are notably different from those structures in species of *Myrmica.* It should be emphasized that a fundamental feature of thoracic structure also distinguishes *Paramyrmica (P. colax)* from *Myrmica.* A pro-mesonotal suture is quite obvious in the former, though the joint is not movable, but it is absent in the latter. The significance of the articulation between the pro- and the mesothorax has been discussed elsewhere (Gregg, 1953). Cole mentions this fact in his treatment of *colax,* but does not stress the importance of the pro-mesonotal suture. He also points out that *Manica,* though lacking epinotal spines, does have a well-developed pro-mesonotal suture. *Manica* was *formerly* regarded as a subgenus of *Myrmica.* The entire facies of *colax,* in my opinion, is so striking that I am confident it should be retained in a separate genus even on the basis of the female castes alone. In reference to what has been said above

about males, it is perhaps doubtful whether the male of *colax,* when found, will be of much help in settling the issue in this particular case, unless, of course, it turns out to be distinguished by peculiar traits. That is to say, if the male showed up the same as *Myrmica* males, this fact by itself could hardly outweigh the evidence derived from the singular worker and queen.

It has been necessary to review these details of *P. colax,* for until the generic status of Cole's ant is agreed upon it is impossible to settle the generic status of Smith's *rugiventris* and my Loma specimens which appear to be identical with the latter. I have already compared the Loma ants to paratypes of *rugiventris* and have shown that except for relatively minor differences that might be bridged if a larger series were available for study, the two groups of specimens should be placed in the same taxon. As I have tried to demonstrate, the Loma specimens and the *rugiventris* paratypes are structurally much closer to *colax* than to any *Myrmica,* but at the same time it will be seen that they are specifically distinct. Therefore, I believe they must be referred to the same genus, and as *Paramyrmica* is here recognized as valid for *colax,* it is proposed that *rugiventris* Smith plus my additional sample from Colorado be transferred to *Paramyrmica* as the second known species in that group. The generic characters adduced for the group are shown by *rugiventris* with some deviations to be attributed to species differences. The pro-mesonotal suture is obscured somewhat by the heavy sculpture of *rugiventris,* but it is nevertheless present.

Dr. Smith has called my attention to the fact that a peculiar, angular gibbosity occurs on the clypeus of both *colax* and *rugiventris.* This feature has been checked on paratypes of *colax* and on the Loma specimens of *rugiventris* and has indeed been found to hold true. The character is accentuated by the coarse rugae of the clypeus, and is located where the median lobe joins the lateral lobes of the clypeus on each side and just above the antennal fossa. Such a structural trait is absent in *Myrmica.* Its presence in *Paramyrmica* serves further to strengthen the validity of this genus, and its occurrence on *rugiventris* strongly confirms the placement of that species in the same genus with *colax.*

Dr. and Mrs. G. C. Wheeler (1959) have studied and described the larva of *Paramyrmica colax,* and found it to be closely related

to that of *Myrmica*. However, they showed that the former is generically different from *Myrmica* because it lacks the anchor-tipped hairs and by the similarity of head and body hairs.

In view of the uncertainties and divergent opinions surrounding *rugiventris*, and its current association with the genus *Paramyrmica* recently described, I have chosen to describe all three castes (redescribing the worker) from the specimens collected at Loma, Colorado, with nomenclatural synonymy, and have included the critical characters for differentiating between *rugiventris* and *colax*.

Paramyrmica rugiventris (M. R. Smith) new combination

Tetramorium rugiventris M. R. Smith, Proc. Ent. Soc. Wash., 1943, 45, p. 4, ♀ ; Creighton, Bull. Mus. Comp. Zool., 1950, 104, p. 292.

Myrmica rugiventris Brown, Breviora, 1957, No. 72, p. 6, ♀.

WORKER Length, 4.28 mm.; head length, 1.07 mm. (excluding mandibles); head width, 0.90 mm. (excluding eyes); scape length, 0.95 mm.; thorax length, 1.35 mm. (excluding pronotal collar); pronotum width, 0.62 mm.; petiole length, 0.45 mm.; petiole width, 0.26 mm.; postpetiole length, 0.40 mm.; postpetiole width, 0.45 mm.; gaster length, 1.13 mm.

Head distinctly longer than broad, sides subparallel and weakly convex, occipital border flat (not concave or excised), and occipital corners well rounded. Clypeus broadly and evenly convex along the anterior border; median lobe about as long as broad, and meeting the frontal area in a deep impression; lateral lobes forming high ridges that border the antennal insertions. Eyes very convex, and protruding beyond the margins of the head, placed approximately midway between the anterior and posterior borders of the head. Frontal area broader than long, and while depressed in front, is not notably set off from the rest of the head posteriorly. Frontal carinae prominent, rectangular, and projecting well over the antennal depressions; merge rapidly with cephalic sculpture posterad. Antennae 12-segmented and stout, especially the scapes, which arise from deep, circular, pit-like insertions. Scape strongly bent at the base, but without tooth or flange surmounting the bend, and narrowed before the condyle; scape surpasses the occipital corner by an amount about equal to its greatest width. Funiculus about ⅓ longer than scape, club indistinctly 4-segmented and merging wtih the remaining funicular segments, which, except for the basal two, are nearly quadrate. Mandibles stout, triangular, somewhat abruptly bent at the base, and furnished with eight teeth. Apical tooth sharp and long, subapical prominent, remainder more or less denticular. Maxillary palpi 6-segmented; labial palpi 4-segmented.

Pronotum moderately convex, broadest through the humeral angles which are rounded; pronotal collar distinct. Mesonotum flat to faintly concave, posterior portion noticeably raised above the metanotum. Pro-mesonotal suture indistinct; meso-epinotal suture clearly marked. Epinotum with a long, sloping base set off from the declivity by a distinct angle, which is crowned

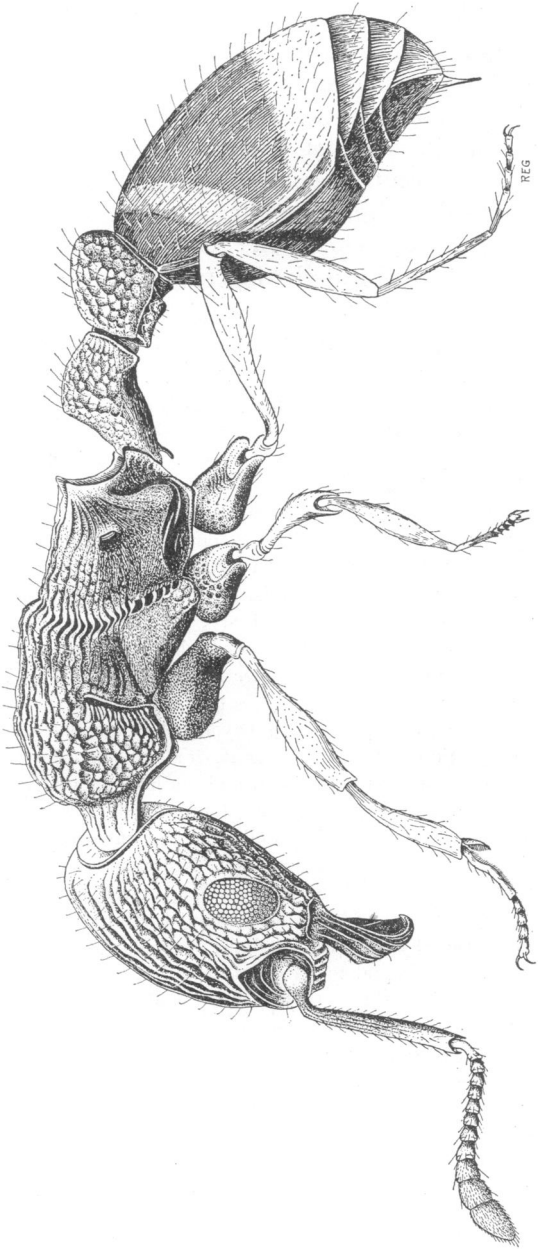

Fig. 1. Worker of *Paramyrmica rugiventris* (M. R. Smith), drawn from a specimen collected at Loma, Colorado. (Magnification, × 58.)

by stout epinotal spines. The spines are triangular, broad at the base, acute at the apex, no higher than long, and appear like prominent vertical teeth; viewed from above the spines are slightly divergent, and at the base continue into anteriorly and posteriorly directed carinae which grade into the sculpture. Flanges bordering the petiolar insertion broad and conspicuous. Meso-epinotal impression (which includes the metanotum) broad and deep, producing a marked gap in the dorsal profile of the thorax. Petiole longer than high, and longer than broad, the node indistinctly separated from the short peduncle; anterior face of the node fairly steep, meeting the summit in an obtuse angle, and posterior face descending at a low angle; from above, the general shape is rectangular. The petiole is armed with a small, narrow, blunt, antero-ventrally directed spine, attached at the anterior end on the venter of the segment. Postpetiole as high as long, and as long as broad; general shape from above, trapezoidal, and broadest near the posterior margin; postpetiole unarmed beneath. Tibial spur of the hind leg barbulate, and of the middle leg barbulate with only a few barbs, as seen under high power of the compound microscope (440 diameters).

Gaster somewhat depressed and only slightly convex dorsally; from above, oval in shape and not truncate basally. Sting well developed.

Sculpture Entire dorsum of the head crossed by coarse, longitudinal, though posteriorly divergent rugae, which become slightly reticulate toward the occipital region and around the eyes. The interspaces possess fine rugules and granules, but these are insufficient to dull the shining surfaces. Clypeal rugae more widely spaced, and the smooth interrugal surfaces shinier. Antennal insertions lined with rugae and granules, and their rims sharply delimited by rugae. Genal rugae reticulate with interspaces granular; subopaque. Gular rugae weaker than elsewhere on the head, and surface coarsely granulate though shining. Mandibles with coarse parallel rugae; interspaces smooth. Scapes covered with longitudinal rugulae and interspaces granular; surface dull; funicular segments granulate.

Thorax coarsely reticulate on most surfaces, though a longitudinal trend of the rugae is evident on the pronotal collar, in the meso-epinotal depression, and on the epinotum; interspaces granulate but shining. Pro-, meso- and epinotal pleurae rugulose-granulate, the granules on the latter two sclerites presenting a longitudinally striated surface which is subopaque. Epinotal declivity and inner aspects of the spines smooth (except for fine shagreening) and very shining. Petiole and postpetiole coarsely reticulate and granulose, the postpetiolar rugae somewhat more longitudinal; surfaces of both subopaque to opaque. Legs granular and coriaceous.

First gastric segment coarsely and longitudinally striated for about ⅔ of its length from the base, with a few very fine interstrial granules; remainder of gaster shagreened, and the whole tagma moderately shining; venter finely shagreened and shining.

Pilosity Hairs pale yellow to whitish, most of them sharply pointed, moderately long, and distinctly erect. Present on all surfaces of the head, funiculi, scapes, mandibles, thoracic dorsum (virtually absent on the pleurae), petiole (except venter), postpetiole, gaster, and all segments of the legs. Pubescence limited to the antennal club; reclinate hairs on the scapes and tarsi are too long and coarse to be considered pubescence.

Color Deep brown to blackish brown; antennal funiculi, scapes, mandibles anterior border of clypeus, pronotal collar, gula, leg articulations, tarsi, petiolar insertion, and tip of gaster, lighter brown to yellowish; protibial spurs and protarsal plantar brushes of hair yellow.

FEMALE Length, 5.63 mm.; head length, 1.13 mm. (excluding mandibles); head width, 1.01 mm. (excluding eyes); scape length, 1.01 mm.; thorax length, 1.80 mm. (excluding pronotal collar); mesonotal width, 0.90 mm.; petiole length, 0.45 mm.; petiole width, 0.34 mm.; postpetiole length, 0.45 mm.; postpetiole width, 0.54 mm.; gaster length, 2.03 mm. (distended); length of anterior wing, 4.61 mm.

Very similar to the worker in color, sculpture, and pilosity, but differs in size and in the usual sclerites and proportions of the thorax in winged castes. Ocelli large but not prominent. Scutum concave on its dorsal surface, scutellum convex, and the suture separating them very distinct; pro-mesonotal suture deeply impressed, especially laterad; tegulae minute. Epinotal base and declivity subequal, the spines forming stout, triangular teeth, broader and less prominent than in the worker. Maxillary palpi 6-segmented; labial palpi 4-segmented; mandibles 8-toothed (2 sharp apical teeth and 6 denticles). Tibial spurs of the middle and hind legs barbulate, as seen under high magnification. Anterior wing with only one discoidal cell; the first and second submarginal cells united, and with them also the first marginal cell, by virtue of the disappearance of the basal part of the radial sector vein. The second marginal cell and the third submarginal cell open distally. Wing membrane very pale brown, hyaline; veins brown and stigma dark brown, opaque.

MALE Length, 4.28 mm.; head length, 0.79 mm. (excluding mandibiles); head width, 0.73 mm. (excluding eyes); scape length, 0.35 mm.; thorax length, 1.58 mm. (excluding pronotal collar); mesonotal width, 0.89 mm.; petiole length, 0.45 mm.; petiole width, 0.23 mm.; postpetiole length, 0.34 mm.; postpetiole width, 0.39 mm.; gaster length, 1.24 mm. (distended); length of anterior wing, 3.83 mm.

Head posterior to the eyes semi-circular, occipital angles very rounded; sides of head converging in front of the eyes to an obtuse angle with the clypeus, the free border of which is broadly convex. Median lobe of the clypeus convex, lateral lobes forming high ridges surrounding the deep antennal insertions. Eyes protuberant, semicircular in outline, and placed slightly anterior to the middle of the head. Ocelli prominent but not raised on a tubercle. Mandibles strong, triangular, similar in shape to those of the worker, and furnished with 5 sharp, subequal teeth. Maxillary palpi 6-segmented; labial palpi 4-segmented. Antennae 13-segmented; scape straight and not bent at the base, equal in length to the first two funicular segments; funiculus long and slender, its segments 1½ to 2½ times as long as broad, and the five terminal joints increasing in thickness but the antennal club very indistinct.

Mayrian furrow and parapsidal furrows of the thorax distinct. Scutum centrally depressed posterad; scutellum slightly raised and convex. Thorax broadest through the mesonotum at insertions of the anterior wings; anterior to this point, the sides flat but strongly converging to the neck-like pronotal collar. Tegulae minute. Epinotal base and declivity strongly inclined and

forming essentially a single continuous surface; declivity faintly concave, and the epinotal angles marked only by spines which are reduced to broad, blunt, triangular teeth. Petiole when viewed from above subrectangular, twice as long as broad, and slightly narrowed anteriorly; peduncle very short; node low and flat, with the anterior face abrupt and steep, posterior face sloping gradually downward. Postpetiole from above trapezoidal, narrowed in front; in profile rising gradually to the rear, highest near the posterior border, and with steep posterior face. Middle tibial spurs barbulate-pectinate (with strong broad barbs), and hind tibial spurs decidedly pectinate, as seen through high magnification.

Gaster slightly obovate, with narrow end at the base; somewhat flattened, and with sides faintly marginate. Genitalia well developed, largely concealed in repose but prominent when exserted; stipites long and convex; volsellae furnished with a C-shaped or hooked terminal lobe; sagittae blade-like.

Sculpture Much reduced as compared with that of the worker and female. Longitudinal cephalic rugulae few and faint on the frons and vertex, reticulate above the antennal insertions and on the genae; remainder of head, including the gula, heavily granulate, opaque. Mandibles delicately striate; scape faintly granulate. Pronotum granular, opaque; pronotal collar rugulose. Vertical face of mesonotum granular but shining; space in front of the wings of the Mayrian furrow smooth in the middle and strongly shining, behind the furrow granular, striate, and moderately shining. Scutellum punctate and subopaque. Metanotum granular, opaque. Epinotal base granular and longitudinally rugulose but shining; declivity granular and shining. Propleurae granulose, subopaque; mesopleurae and epinotal pleurae rugulose granulate and subopaque to weakly shining. Petiole entirely granulose and subopaque. Postpetiole rugulose granulate and subopaque; except posterodorsally where it is nearly smooth and moderately shining. Gaster shagreened, especially the first segment, but striations (as in worker and female) are absent save for a few at the extreme base. Gaster rather strongly shining.

Pilosity Hairs delicate, pointed, erect to suberect, and pale yellow to white. Present, as in the worker and female, on practically all surfaces of the body and appendages, except the pleurae, epinotal declivity, and the eyes.

Color Black, except for antennae, mandibles, and leg insertions which are brown, and tarsi and genitalia which are yellowish.

Wings Venation and cells identical with those of the female. Color pale brownish yellow, hyaline; stigma brown, translucent.

Material examined 25 workers, 6 alate females, and 26 males taken from a colony at the site described 20 miles north of Loma, Colorado. Three paratype workers of *Tetramorium rugiventris* Smith were also studied as explained previously.

The worker of *Paramyrmica rugiventris* differs from paratypes of that of *P. colax* Cole in the following particulars: overall size smaller (*colax* body length, 5.51 mm.) and also in the sizes of the various body parts measured; in color, *rugiventris* is dark brownish black (*colax* reddish brown); sculpture on all parts of the body coarser (rugae heavier and inter-reticular

spaces larger and deeper), gula granular (*colax* reticulate), petiole granulo-reticulo-rugose (*colax* granulo-rugose), postpetiole reticulo-rugose with faint granules (*colax* granulostriate), gastric striae coarse (*colax* finer); epinotal spines shorter, broader, and more tooth-like; erect hairs present on dorsum of pronotum, mesonotum, epinotum, petiole, postpetiole, and first segment of gaster (hairs appressed, a very few strongly reclinate, on these areas in *colax,* in other places erect to reclinate). The differences in pilosity should be seen to be fully appreciated, but they are very striking features of these two ants. The ventral petiolar spine is proportionately longer and more slender in *rugiventris* than in *colax.*

Though Cole described *Paramyrmica colax* as a social parasite of *Myrmica striolagaster* Cole, I did not find any of the latter species associated with *rugiventris,* nor any other form of host. Three suggestions are possible in this situation: (1) *P. rugiventris* is not a parasitic species but establishes its nests independently, or (2) the nest found, having male and female reproductives, may have been a mature colony from which all specimens of a supposed host had disappeared, or (3) my search may not have been adequate to uncover the host species. *M. striolagaster,* however, according to recent records we have obtained, does occur in western Colorado. It has been collected near Rifle, Grand Junction, and in Mesa Verde National Park, and presumably could serve as host to *rugiventris.* Also, other species of *Myrmica* might be the host, or even some other genus, but more search will be necessary to provide the answer to this question.

Literature Cited

Brown, W. L. 1957. Is the ant genus *Tetramorium* native in North America. Breviora, No. 72, 8 pp.

Cole, A. C. 1957. *Paramyrmica,* a new North American genus of ants allied to *Myrmica* Latreille. Jour. Tenn. Acad. Sci. 32: 37–42.

Creighton, W. S. 1950. The ants of North America. Bull. Mus. Comp. Zool. 104: 1–585.

Gregg, R. E. 1953. Morphological considerations affecting the taxonomy of certain genera of ants. Proc. Ent. Soc. Wash. 55: 324–330.

Smith, M. R. 1943. Ants of the genus *Tetramorium* in the United States with the description of a new species. Proc. Ent. Soc. Wash. 45: 1–5.

———— 1943. A generic and subgeneric synopsis of the male ants of the United States. Amer. Midl. Nat. 30: 273–321.

Wheeler, G. C. and J. Wheeler. 1959. The larva of *Paramyrmica.* Jour. Tenn. Acad. Sci. 34: 219–220, 1 fig.