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Article XV.—NEW SPECIES OF FORMICA.

By WILLIAM MORTON WHEELER.

1. **Formica munda** sp. nov.

Worker. — Length, 5–7 mm.

Allied to *F. pergandei* Emery. Mandibles 8-toothed. Head, excluding mandibles, usually somewhat longer than broad, with straight posterior border and long cheeks converging anteriorly and slightly convex or flattened, but not concave as in *pergandei*. Clypeus carinate, with a rather deep median notch in its anterior border. Antennæ like those of *pergandei*. Thorax rather narrow and low, pro- and mesonotum not very convex, mesoëpinotal constriction shallow, epinotum long and low, its basal surface rather flat and somewhat longer than the very sloping declivity into which it passes through a rounded angle. Petiole thick and low, convex in front, flattened behind, with very obtuse upper border. Seen from behind the border is transverse, broadly rounded but passing rather abruptly into the straight sides which converge below Gaster small; legs slender.

Head and thorax subopaque, very finely shagreened. Mandibles, anterior portion of the head, and especially the frontal area and sides of the clypeus more shining. Mandibles sharply striatopunctate.

Pubescence grayish, very sparse, except on the gaster where, it is long and dense and conceals the shining surface except at the segmental incisures. Hairs on the body white, sparse, suberect and rather long, conspicuous on the upper and lower surfaces of the head, thorax, and gaster. On the gaster they are robust, obtuse, and very regularly distributed. The edge of the petiole is also fringed with hairs, and there is a row of oblique tapering hairs on the flexor surface of each tibia.

Head, thorax, and antennæ red; petiole and gaster black, the former with a reddish tinge. Mandibular teeth black. Lower pleuræ, and in many specimens also the vertex of the head, infuscated. Legs red, coxæ, femora, and tibiæ more or less blackened except at the articulations.

Female (deälated). — Length, 7.5–8 mm.

Resembling the worker except in the following characters: The hairs are of a yellowish cast, and on the gaster tapering and of the same thickness as on the head and thorax, although they are long and in certain lights conspicuous, especially toward the tip of the body. Pleuræ clouded with fuscous; posterior portion of head, posterior edge of pronotum and anteromedian and parapsidal blotches on mesonotum, fuscous. Metanotum and all except the anterior border of the scutellum, black. Petiole varying from dark red to blackish, of the same shape as in the worker except that in profile the superior border is much more acute in some specimens.

Described from seven females and numerous workers collected in the following localities: Cañon City, Breckenridge, and West Cliff,

Colo., by the late P. J. Schmitt, O. S. B.; at Broadmoor and Roswell near Colorado Springs, Colo., by myself, and at Glorieta and Old Pecos Pueblo, New Mexico, by Professor T. D. A. Cockerell. This seems to be the form designated by Professor Emery as a variety of *F. pergandei* from Colorado (Zool. Jahrb. Abth. f. Syst. VII, 1893, p. 647). It is closely allied to this species but may be readily distinguished by the dense gray pubescence and obtuse white hairs on the gaster of the worker, and the less elongated head and more convex cheeks, especially in larger specimens. According to Emery's description of *pergandei*, it would differ also in having erect hairs on the lower surface of the head, but two cotypes of Emery's species in my collection—one received from Professor Emery and the other from Mr. Pergande — each have a few such hairs.

While collecting in the vicinity of Colorado Springs, during the summer of 1903, I found many colonies of *F. munda*. They were always in grassy places and most abundant in the irrigated plains about Broadmoor and in the pastures near the racing stables at Roswell. The species did not occur in the higher mountainous regions about Cheyenne Cañon and Manitou. The colonies were rather small, comprising only a few hundred workers, and made rather obscure mound-nests much like those of *F. schaufussi* and its varieties. I never found these colonies nesting under stones and in no case did they contain slaves, although a single colony of the allied *pergandei*, found in the very same locality (Broadmoor), contained workers of *F. subpolita*. It would seem, therefore, that although *F. munda* has a notched clypeus, it does not have the dulotic instincts of the allied *F. pergandei* and *sanguinea*.

2. **Formica dryas** sp. nov.

Worker. — Length, 5–7 mm.

With the habitus of *F. rufa*. Mandibles 8-toothed. Head, excluding mandibles, as broad as long, posterior border straight, sides rather flat, converging anteriorly. Clypeus sharply carinate, not produced in front, with nearly straight anterior border. Thorax rather robust, epinotal declivity much flattened, distinctly longer than the slightly convex basal surface. Petiole somewhat convex in front and very flat behind, with sharp superior border; seen from behind it is broad above in large workers and much produced in the middle, with straight sides rapidly converging below. Gaster and legs of the usual shape.

Head, thorax, petiole and appendages subopaque, finely but distinctly shagreened. Mandibles densely striatopunctate; clypeus and especially the frontal area smooth and shining. Gaster shining, very finely and transversely shagreened, with the appearance of "watered" silk.

Body clothed with short, erect or suberect, subobtuse, yellowish hairs,

which are very conspicuous on the upper, lateral, and lower surfaces of the head, upper surface of thorax, and on the edge of the petiole; sparse and inconspicuous on the gaster, especially on its upper surface, and almost entirely absent on the antennal scapes. Eyes distinctly hairy. Pubescence yellowish, almost absent, except on the antennæ.

Head, thorax, petiole, and appendages red; gaster black or very dark brown, with red anal region. Small workers usually have darker legs and in some specimens the upper surface of the thorax is more or less infuscated.

Female (deälated). — Length, 7.5–8 mm.

Resembling the worker in coloration and sculpture, with the following differences. The red coloration of the head, thorax, petiole and appendages is somewhat duller, the posterior border of the pronotum, a large median mesonotal and two lateral parapsidal blotches, the greater portion of the scutellum and metanotum, dark brown. The gaster is smoother and more shining than in the worker. Hairs longer, tapering; somewhat flexuous on the head, thorax, and legs, conspicuous and erect on the antennal scapes and median portions of the eyes. Pubescence of head and thorax more distinct. Petiole very high with a sharp compressed edge.

Described from three females and numerous workers.

I have taken this species on three different occasions in the vicinity of Milwaukee, Wisconsin, and Rockford, Illinois. In a piece of woodland at Cudahy, south of Milwaukee, I found a flourishing colony, comprising three small mound-nests, strung along a well-worn path that had been made by the ants. This path was nearly an inch broad and in some places had been roofed over with dead grass and leaves for distances varying from several inches to two or three feet. Another colony was found at White Fish Bay, north of Milwaukee. It inhabited a single large mound-nest, possibly a natural hummock that had been enlarged by the ants, in shady woods. This colony, which seemed to be moribund or evanescent, comprised a few hundred workers and seven old deälated females. A third colony found near Rockford, Ill., was very similar but yielded no female specimens.

F. dryas is certainly very closely related to *F. rufa* and its various subspecies and varieties. This is especially true of the female *dryas* which has a highly glabrous gaster like that of the pure European type of *rufa*. The worker *dryas*, however, differs from the workers of all the American and European forms of *rufa* and resembles such species as *F. dakotensis*, *montigena*, *exsectoides*, and the next species to be described, in the peculiar shining "watered" silk surface of the gaster.

Var. **gymnomma** var. nov.

To this variety I would assign some workers that I have taken at Cold Spring Harbor, Long Island, N. Y., and in two localities near

Rockford, Ill. They differ from the typical form in having naked eyes and less hairy bodies. Some of the larger workers from the latter locality are almost as naked as *F. rufa* subsp. *integra*. The smallest workers from one of the Rockford colonies have the head and thorax very deeply infuscated.

3. **Formica nepticula** sp. nov.

Worker. — Length, 4–6 mm.

With the habitus of a small *F. rufa*. Mandibles 8-toothed. Palpi rather long. Head, excluding mandibles, a little longer than broad, cheeks slightly flattened, somewhat converging in front; posterior border straight, posterior angles rounded. Clypeus strongly carinate, its anterior border angularly produced in the middle. Antennæ of the *rufa* type. Thorax in profile with deep mesoëpinotal constriction; pro- and mesonotum rounded, hemispherical; epinotum evenly rounded, without any angle. Petiole large, as high as the epinotum, convex in front, more flattened behind, border rather sharp; seen from behind the upper border is transverse in the middle and obliquely truncated on either side, the lateral surfaces are straight and converge below. Gaster and legs as usual.

Head, thorax, and petiole subopaque, very finely shagreened; mandibles, clypeus, and frontal portion of head, but especially the frontal area, more shining. Mandibles densely striated and coarsely punctate. Legs and gaster shining, the latter finely and transversely shagreened, with the lustre of "watered" silk.

Hairs golden yellow, obtuse, suberect, and very sparse, on the upper and lower surfaces of the head, upper surface of thorax, and on the gaster. There are also a few scattered hairs on the flexor surfaces of the coxæ, femora, and tibiæ. Eyes naked. Pubescence whitish, very short and sparse, but visible on the antennæ, sides of the thorax, and on the gaster where it fails to conceal the shining surface.

Mandibular teeth and gaster black; remainder of the body and appendages deep red; antennal funiculi, legs, especially the tibiæ, mandibles, and anterolateral corners of the head, darker and more brownish. Ocellar region and mesonotum slightly infuscated even in larger workers, but there is no increased tendency to infuscation in the smaller workers.

Female. — Length, 4–5 mm.

Mandibles and clypeus like those of the worker, except that the latter is more convex and less prominently keeled. Head slender, excluding the mandibles distinctly longer than broad, with long, anteriorly converging cheeks. Thorax distinctly narrower than the head. Petiole similar to that of the worker but with sharper superior border, often slightly notched in the middle. Gaster small. Legs slender. Wings somewhat longer than the body (5.3 mm.).

Body smooth and shining, very finely shagreened, back of head and mesonotum more opaque; gaster very glabrous, being much more delicately shagreened than in the worker.

Hairs golden yellow, suberect, slender and obtuse, much longer than in the worker and more abundant, especially on the upper surface of the head and

thorax and on all parts of the legs. There are a few conspicuous erect hairs along the anterior or flexor surfaces of the antennal scapes, on the lower surface of the head, and on the border of the petiole. On the gaster the long hairs are sparse and arranged in three regular rows on the first and second, in two rows on the succeeding segments.

Mandibular teeth and gaster black, remainder of body dull yellowish red. Antennæ, legs, posterior portion of head, mesonotum, scutellum, and metanotum decidedly darker. The anteromedian and parapsidal blotches are faintly indicated on the mesonotum. Wings rather opaque, grayish hyaline, with fuscous veins and black stigma.

Male. — Length, 6.5–7 mm.

Mandibles pointed, edentulous. Head short, broadest through the eyes; posterior corners broadly rounded; cheeks short, flattened, converging in front. Clypeus carinate in front, depressed behind. Thorax just in front of the wings hardly broader than the head through the eyes. There is a median longitudinal depression on the base of the epinotum, and the metanotum is concave. Petiole very thick and blunt above, anterior and posterior surfaces both convex, border with a faint median notch.

Head, thorax, legs, and antennæ subopaque, finely shagreened; mandibles, clypeus, vertex, and scutellum shining as are also the petiole and especially the gaster.

Hairs and pubescence grayish, the former short and erect on the clypeus, thorax, gaster, and legs; the latter sparse and indistinct except on the antennæ and legs. Eyes almost imperceptibly hairy.

Black; mouth-parts, legs, and genitalia fuscous. Wings like those of the female but of a slightly darker tint.

Described from numerous workers and females and two males from a single colony found near the summit of Mt. Pisgah (altitude about 1400 feet), at Colebrook, Litchfield County, Conn., and several workers taken at Black Hawk Spring, near Rockford, Ill.

F. nepticula is very closely related to the form I have called *F. microgyna* var. *nevadensis* (*vide infra*) and known only from a single female specimen from Ormsby County, Nevada. The female *nepticula* differs, however, in having much fewer erect hairs on the antennal scapes and body and, owing to the nearly complete absence of grayish pubescence, a more shining head and thorax. Moreover, the head, thorax and appendages are decidedly darker and less red than in *nevadensis*. The worker *nepticula* resembles that of *F. dryas* in coloration and the peculiar lustre of the gaster, but its average size is less, it has erect hairs on the antennal scapes, the border of the clypeus projects in the form of an angle instead of being transverse, and the epinotum is much rounder and without a flattened declivity.

The Colebrook colony of *nepticula* was first seen during August, 1904, and was mistaken for a colony of *F. dryas*, as only workers were

found in the nest. They were under a large flat stone, the edges of which they had banked with vegetable débris after the manner of *F. difficilis* and its var. *consocians*. During the past summer (June 30, 1905), on again visiting the colony, I found it to contain several of the minute females (mostly callow), and was thus able to satisfy myself that it represented a distinct and undescribed species. Numerous workers, together with many cocoons, were kept for several weeks in an artificial nest. Dozens of the tiny females but only two males hatched during the first week in July. No workers hatched till July 9, when they appeared in great numbers. The small size of the female seems, therefore, to be correlated with more precocious development than in our common species of *Formica*. The movements of the workers are extremely active and petulant, contrasting with the movements of such forms as *F. integra*, *consocians*, etc., and resembling those of *F. sanguinea*. The females are more phlegmatic except when greatly excited. The approximate date of the nuptial flight is July 11. At any rate, during the early morning hours of that day most of the females managed to escape and ascended to the ceiling of the room in which I had placed their artificial nest. The diminutive size of the females strongly indicates reduced or belated fertility, so that this species, like *F. difficilis* and its var. *consocians*, *F. microgyna*, *nevadensis*, and *montigena*, very probably establishes its colony with the aid of workers belonging to some other species of *Formica*. I suspect that *F. subpolita* var. *neogagates* is the ant used for this purpose, as its workers so closely resemble the female *nepticula* both in size and coloration. I find, moreover, that a small colony of *neogagates* workers can be induced to adopt a deälated female *nepticula*.

4. **Formica nevadensis** Wheeler.

F. microgyna var. *nevadensis* Wheeler, Bull. Am. Mus. Nat. Hist., Vol. XX, Oct. 11, 1904, p. 373. ♀.

Since both the worker and female of *F. nepticula* are known, it is no longer probable that *nevadensis* should be attached as a variety to *microgyna*. The female *nevadensis* has a very smooth and shining gaster and this is probably also the case in the unknown worker, which would thus differ decidedly from the opaque-bodied worker of *microgyna*. I believe, therefore, that we are justified in raising *nevadensis* to specific rank. The discovery of the worker of this form will enable us to decide whether *nepticula* is to be regarded as an independent species or merely as an eastern subspecies of *nevadensis*.

5. **Formica impexa** sp. nov.

Worker. — Length, 3.3–6 mm.

With the habitus of *F. rufa.* Mandibles 8-toothed. Clypeus broadly rounded in front, not produced in the middle, carinate its entire length. Head, excluding the mandibles, distinctly longer than broad, even in the largest workers. Cheeks rather long, straight, subparallel. Posterior border of head straight, posterior corners rounded. Joints 1–4 of antennal funiculus decidedly longer and more slender than the remaining joints. Thorax of the *rufa* type but with the epinotum very low and rounded. Petiole rather thick anteroposteriorly, its anterior surface convex in profile, its posterior flattened, its edge, especially in smaller workers, very blunt; seen from behind it is produced upwards in the middle and of rather variable outline, being notched in the middle in some specimens, but oftener more or less rounded.

Mandibles lustrous, finely and sharply striated. Surface of clypeus uneven. Frontal area shining. Remainder of body opaque, distinctly but finely shagreened.

Whole body and all the appendages clothed with very minute white pubescence which is rather sparse on the head and thorax, but dense and concealing the ground surface on the gaster. Body, antennal scapes, and legs covered with coarse, obtuse, erect or suberect, whitish or yellowish hairs. On the gaster these are uniformly distributed and in certain lights very conspicuous. They are also very numerous and prominent on the upper surface of the thorax, clypeus, front, vertex, posterior corners, and lower surface of head, but absent or very sparse on the cheeks, pleuræ, and coxæ. On the legs they are prominent both on the flexor and extensor surfaces.

Head and thorax red. Gaster black. Even in the largest specimens, the mandibles, anterior border of clypeus, and apical half of funiculi are dark reddish brown; ocellar triangle, upper surface of pro- and mesonotum, much of the upper surface of the petiole, legs and coxæ, except their articulations, more or less blackened. Fore coxæ largely red. Anal region yellowish. In the smallest workers the infuscation is more extensive, involving the whole of the posterior portion of the head and the epinotum.

Described from twelve workers taken August 12, 1902, by Mr. O. McCreary from a colony nesting under a stone on the Porcupine Mountains in northern Michigan. Types in the American Museum of Natural History, cotypes in the University Museum, Ann Arbor, Michigan.

F. impexa is allied to *F. oreas* Wheeler and *F. microgyna* Wheeler, with both of which it agrees in having erect hairs on the antennal scapes. It differs from *oreas* in the much coarser and less abundant, erect and obtuse hairs on the head and thorax, the prominent hairs on the gaster, the longer head, more opaque surface of the head and thorax, etc. In most of these characters it also differs from the typical *microgyna.* The erect hairs on the gaster of *impexa* are much more robust and obtuse than in the latter species. The new species

also resembles *F. difficilis* Emery and notably its var. *consocians* Wheeler except in pilosity.

It is probable that the female of *F. impexa* is peculiar either in being very diminutive, like the females of *F. difficilis*, *microgyna*, *nepticula*, etc., or in having an unusual color like the female of *F. oreas*. Until this sex of *impexa* is discovered there may be some doubt as to whether the form should be regarded as a species distinct from *rufa*. It certainly differs very markedly in pilosity from all the subspecies and varieties of *rufa* hitherto described.