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THE OCCURRENCE OF FORMICA CINEREA
MAYR AND FORMICA RUFIBARBIS
FABRICIUS IN AMERICA.¹

WILLIAM MORTON WHEELER.

IN a valuable paper published in 1886² Dr. Gustav Mayr recorded both *Formica cinerea* and *F. rufibarbis*, two well-known European ants, as occurring in the United States. The former was cited from California and New Mexico, the latter from Colorado, Nebraska, California, and Montana. Seven years later, when Professor Emery published his important revision of the North American Formicidæ,³ he was so doubtful of the occurrence of these forms in the United States that he did not include them in his synoptic table. Concerning the former species he wrote : "*F. cinerea* does not occur in North America ; the form identified as such by Mayr will be described below as *F. pilicornis* n. sp." In regard to *F. rufibarbis* his statements are less positive : "For the present I am inclined to doubt whether forms belonging to the true *fusco-rufibarbis* series are actually indigenous to America. I am really unable to distinguish from rather pale and very pilose European *fusca* (*fusco-rufibarbis*) only three workers which were received from Colorado through Mr. Pergande. The precise locality of these specimens is not given."

More than a year ago Dr. Harold Heath of the Leland Stanford University sent me numerous specimens both of *F. cinerea* and *F. rufibarbis* which he had kindly collected for me near San Jose, California. The *F. rufibarbis* was compared with

¹ *Contributions from the Zoölogical Laboratory of the University of Texas*, No. 38.

² Die Formiciden der Vereinigten Staaten von Nordamerika, *Verhand. Zool.-Bot. Ges. Wien.*, Bd. xxxvi (1886), pp. 419-464.

³ Beiträge zur Kenntniss der nordamerikanischen Ameisenfauna, *Zool. Jahrb.*, Abth. f. Syst., Bd. vii (1893), pp. 633-682, Taf. XXII, and Bd. viii (1894), pp. 257-360, Taf. VIII.

European specimens by Professor Emery, who reported as follows (*in litteris*): "It is the true European form, differing from our common type only in the total absence of erect hairs on the thorax. In this respect it approaches var. *glauca* Kusgky from Oriental Russia." It is possible that Dr. Mayr may have seen specimens of this same ant, but it is more probable that he had specimens of *neo-rufibarbis* Emery, a common form throughout the more western and southwestern states as far as the Pacific coast. The specimens of *cinerea* received from Dr. Heath were compared with European *cinerea* given me by Professor Emery, Professor Forel, and Dr. Mayr. The specimens from Professor Emery were collected near Bologna, Italy. They are decidedly smaller and have a darker ground color than the Californian specimens. These, however, agree very closely in their larger size and somewhat reddish coloration with the Austrian and Swiss specimens from Dr. Mayr and Professor Forel. I believe, therefore, that there can be no doubt concerning the occurrence in California of two species of *Formica* almost or quite identical with the European *cinerea* and *rufibarbis*. It is not so easy to decide whether one or both of these species are imported or indigenous to the American continent, but I know of no cogent reasons for accepting the former alternative. Certainly the occurrence of these species on the Pacific coast and their apparent absence from the eastern states of our Union are extremely suggestive in connection with the like geographical distribution of many other Pacific coast arthropods (*Astacus*, *e.g.*, many *Diptera*, and other insects) which are known to be more closely related to European genera and species than to those of the Atlantic states.¹

After accustoming myself to view the distribution of the two species of *Formica* in this light, I was much surprised during August of the past summer to find *cinerea* very abundant in the vicinity of Rockford, Winnebago County, Ill. For several weeks of three successive summers I had collected very diligently without finding any such species in this locality. It

¹ See, *e.g.*, Osten Sacken's "Western *Diptera*." Cases in point are also the Californian ants of the subgenus *Messor*, and *Myrmica mutica* Emery, which is hardly more than a subspecies of the European *M. rubida*.

occurs most commonly, however, in such peculiar situations that there is little difficulty in understanding why it has been so long overlooked. The formicaries are so large and populous that it can hardly be regarded as an imported species unless it resembles some of the European weeds which have found the American soil so very favorable to their growth and expansion.

The following account of the localities in which I have taken *F. cinerea*, together with some notes on the structure of its formicaries, may prove to be of interest to students of insect distribution in general and of our American Formicidæ in particular. There are three of these localities some ten miles apart, in different directions and at least three to five miles from the town of Rockford, and in each of these localities, which are all open and exposed to the full heat of the sun, the nests are of a different type. August 20, I found a single nest, the first I had seen, under a small log in a meadow. This nest was not very populous and contained neither larvæ nor pupæ. It consisted of several inosculating galleries of the type usually made by species of *Formica* and extended down at least to a distance of 20 cm. into the black, waxy soil. The ants were timid, like the inhabitants of all small nests of *Formica*, and made no attempt to attack me. August 22, I found two very large nests side by side at the edge of a turnpike not far from a meadow. Each of these covered an area of somewhat more than a square meter, and each consisted of a flat mound of earth about 10 cm. high, strewn with little straws and sticks brought together by the ants. This débris concealed numerous openings from which the ants rushed forth as soon as the nest was disturbed. Excavation was difficult on account of the hardness of the soil, but it was easy to make out that the formicary consisted of a honeycomb of galleries 1-2 cm. in diameter and extended down into the soil to a depth of more than 30 cm. It was filled with worker larvæ and pupæ, together with thousands of ants, which attacked me furiously, using their jaws and formic acid batteries to good purpose. August 25, I discovered a locality where there are hundreds of *cinerea* nests. This is a meadow about a mile and a half long

and a quarter of a mile wide, surrounded by woods and corn fields. It is traversed by a cool stream, the banks of which for some distance on either side are boggy and thickly studded with large grass-covered hummocks. The *F. cinerea* have constructed their formicaries in these hummocks, which range from 30 cm. to 60 cm. in diameter at the base and from 20 cm. to 30 cm. in height. There are nests in nearly all stages of growth, but for the most part well-established and extremely populous, being, with the exception of the two nests above described, the most populous nests of *Formica* I have seen during the entire summer. The formicary is started in the summit of the hummock, but ultimately invades its whole earthy substance and extends to a depth of at least 30 cm. to 60 cm. into the black soil from which the hummock arises. In small or moderately large nests all the grass which originally covered the hummock remains intact and in excellent condition, but in the largest formicaries the grass on the summit is partly cut away by the ants and partly buried under the earth brought up from the galleries and the little straws, bits of twigs, leaves, etc., collected by the insects in obedience to an instinct which appears to be shared to a greater or less extent by all the species of *Formica*. This makes the large nests very conspicuous, although the numerous openings, all in the flattened or somewhat convex summit of the hummock, are hidden under the outermost layer of vegetable débris. The living grass forming the sides of the hummock gives the nest great stability and very efficiently protects it from being injured by the feet of the pasturing cattle. Excavation of larger nests shows that the hummocks are honeycombed throughout with a network of inosculating galleries abruptly terminating at the level of the moist, black meadow soil, into which only a very few long and more or less perpendicular galleries and chambers penetrate to a depth of 60 cm. and possibly farther.¹

¹ During September, after this paper had been sent to the *Naturalist*, I happened on a fourth locality abounding in *cinerea* nests. This was a large meadow almost within the city limits of Rockford. It contained formicaries of all three types: under logs and stones, in the form of flat, irregular mounds and in modified hummocks.

These peculiar hummock formicaries occupy a zone on either side of the stream midway between the dryer and more boggy portions of the meadow, although a few of them reach quite to the edge of the stream and are even perforated by the burrows of frogs. The nests are so numerous as to be often within a meter's distance of one another. Along the outer edges of these zones, and mingled with the dryer *cinerea* nests, there are occasional nests of *F. subsericea* of precisely the same structure. The main zone of this species, however, lies on higher ground, where the hummock nests are replaced by true mound nests entirely constructed by the ants.¹

There were some slight variations in size and coloration among the *F. cinerea* found in different nests in this locality, but these are all comparable to similar variations in European specimens. On the whole, the specimens from Illinois have the ground color of the head and thorax more or less reddish like the Californian and Austrian specimens. All the individuals examined have a number of hairs on the lower surface of the head. According to Emery this is the distinguishing trait of *cinerea* among all the European Formicidæ. In the United States *F. schaufussi* and *F. subpolita* and its varieties agree with *cinerea* in possessing such hairs, but they may be

¹ As Father Muckermann has shown in a recent paper (The Structure of the Nests of Some North American Species of Formica, *Psyche*, June, 1902, pp. 355-360), *F. subsericea* makes nests of at least four different styles: small flat moundlets in the grass with numerous apertures, nests in mounds capped with pieces of rock or wood, small nests beneath stones, and finally large mound nests. According to Father Muckermann the nests of the style last mentioned are neither as large nor of the same shape as those of *F. obscuripes* and *F. exsectoides*. This is true in general, but I have seen at the edges of fields in the environs of Milwaukee, whole colonies of grass-covered *subsericea* nests varying from 30 cm. to 1 m. in diameter and from 20 cm. to 30 cm. high, dimensions almost as great as those recorded by Father Muckermann for *obscuripes*. I may say in this connection that, like Father Muckermann, I do not altogether agree with Forel, who believes that the American are inferior to the European ants in mound building. As contradicting such a view, I would point to the large formicaries of *F. exsectoides* in the eastern states, to those of different varieties of *F. rufa* in different parts of the United States, to the species of *Pogonomyrmex* and *Ischnomyrmex* in the West and Southwest, and to the yellow species of *Lasius* (*L. aphidicola*, *claviger*, and *interjectus*) in Illinois. During the past summer I saw near Rockford a dome-shaped formicary of *L. interjectus* 1.5 meters in diameter at the base and 60 centimeters high, and I have seen many nests of this and the other yellow species of *Lasius* that were fully one-half to two-thirds as large.

readily distinguished by their coloration, which is never ashy or silvery gray. At first sight *F. subsericea* resembles *cinerea*, but the former never has hairs on the lower surface of the head. This character definitely separates the two forms, notwithstanding the fact that *subsericea* presents color variations in the direction of *cinerea*.¹

The *cinerea* nests were not seen till it was too late in the year to secure the winged sexes, which, like the males and females of our other species of *Formica*, probably make their appearance during June and July. Even the dealated mother queens were found in but one of the smaller nests. All the nests, however, were full of worker larvæ and pupæ. The latter were generally enclosed in cocoons, but quite a number of nude pupæ were also seen in many of the nests. In this respect *cinerea* resembles the Formicidæ of the *pallide-fulva*, *fusca*, and *subpolita* groups, the worker larvæ of all of which, in contradistinction to *F. rufa* and its varieties, have a very pronounced tendency to omit spinning a cocoon just before pupation. At Rockford during the past summer many of the nests of these species contained only nude pupæ. This may have been due to the great amount of moisture in the nests, as June and July were unusually rainy. At any rate, I observed that the cocoons were relatively much more abundant during the dry weather late in August.

In its habits *F. cinerea* is very similar to the ants of the *fusca* group. It was seen in great numbers visiting the flowers in the meadow and attending great droves of Aphidæ on the willows along the stream. The walls of the galleries in some of the formicaries were tenanted by teeming colonies of the minute lestopibiotic, or thief ant, *Solenopsis molesta* Say. In one *cinerea* nest I took a myrmecophilous histerid beetle (*Heterius brunneipennis* Randall).

ROCKFORD, ILL., September 1, 1902.

¹ At Rockford I discovered two rather large nests of a form which should, perhaps, rank as a distinct variety of *F. fusca* allied to *subsericea*. The ants from these nests are smaller and more graceful in stature than the common *subsericea*, the legs and antennæ are red like those of *cinerea*, and the body is so thickly overlaid with silvery white, appressed pubescence that the black ground color is hardly visible. This form may be called *Formica fusca* var. *argentata* var. nov.