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NOTES ON FORMICA (NEOFORMICA) MOKI WHEELER,
WITH DESCRIPTION OF A NEW SUBSPECIES

(Hymenoptera: Formicidae)

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Recently I received for determination three workers and four callows of an undescribed ant closely related to *Formica moki* Wheeler. These specimens were collected by Falconer Smith at Leavenworth, Wash., in an arid region somewhat similar to the regions in which live our honey ants, *Myrmecocystus* spp. The similarity of appearance is indeed very striking between certain species of *Myrmecocystus*, *Formica moki*, and the new subspecies. Wheeler was so puzzled as to the proper subgeneric assignment of *moki* that he at first placed the species in the *rufa* group of the typical subgenus, and later transferred it to the subgenus *Neoformica* Wheeler. The cotypes of *moki* were collected in the Grand Canyon of Arizona at an altitude of 5,000 to 7,000 feet (Bull. Amer. Mus. Nat. Hist. 22: 343-344, 1906). The uncertainty regarding the correct systematic position of *moki* is shown in the following quotation from Wheeler: "This species seems to belong to the *Formica rufa* group although certain characters ally it with *F. fusca*. At first sight it resembles rather deeply colored specimens of the variety *neoclara* Emery of the latter species, but differs from this and all the other North American *Formicae* known to me in the very low and flat thorax and the length of the mesoepinotal constriction. In these respects it approaches the forms of the *pallide-fulva* group, but the surface of the body is subopaque as in the smaller species allied to *F. rufa*. It will be impossible to assign *moki* to a precise position until the female is discovered."

Later, in his "A Revision of the genus *Formica* (Linn.) Mayr" (Bull. Mus. Comp. Zool. 53: 560, 1913), he wrote as follows: "This species seems to belong in the *pallide-fulva* group (subgenus *Neoformica*—author), although the sculpture of the body is very unlike that of the preceding species (species of *Neoformica*—author). Superficially it resembles *F. rufibarbis*, but the head, thorax, and antennae are much more like those of *pallide-fulva*. There is, however, much that recalls *Myrmeco-*

cystus in the structure of the thorax seen in profile." After a study of cotypes of *moki* and specimens of the new subspecies described below, I believe the species best fit the characters of *Neoformica*. That they are related to *Neoformica* is shown by the following characters of the worker: Large eyes, slender thorax with weak mesoepinotal constriction, and long appendages. The worker differs, however, from the other forms of *Neoformica* in its distinctly shagreened, subopaque body, which in certain lights has a somewhat metallic luster. The body pubescence is also denser. There is no other species of *Neoformica* that approaches *moki* in coloration; furthermore, the forms of this subgenus are confined, almost without exception, to the southern and more eastern sections of the United States, in habitats very different from those of *moki* and the new subspecies. It may be necessary later to erect a new subgenus for these ants but I would hesitate to do so until a larger collection is available, and especially until the male and queen are known.

After an examination of three of Wheeler's cotypes I find they differ in several respects from his original description. The differences are as follows: Maxillary palpi, 6-segmented instead of 5-segmented, mandibles 7- or 8-toothed instead of always 8-toothed, epinotum having base and declivity nearly subequal instead of base nearly twice as long as declivity.

A redescription of *moki* is given below. Characters are also furnished for distinguishing the new subspecies from *moki*.

***Formica* (*Neoformica*) *moki* Wheeler**

Formica moki Wheeler, Bull. Amer. Mus. Nat. Hist. 22: 343-344 (1906), *worker*;
Bull. Mus. Comp. Zool. 53: 558-560 (1913), *worker*.

Worker—Length 4-5.5 mm.

Head, exclusive of mandibles, one-seventh to one-ninth longer than broad, narrower in front than behind, with entire and gently rounded posterior border, rounded posterior angles, and weakly convex sides. Eye large, convex, oblong, little more than its greatest diameter from base of mandible. Antenna long and slender, scape approximately as long as the combined lengths of the first 7 or 8 funicular segments; middle funicular segments about twice as long as wide. Clypeus sharply carinate, anterior border entire, projecting medianly. Frontal and ocellar triangles almost equilateral. Frontal carinae slightly diverging behind. A faint frontal furrow often extending as far backward as anterior ocellus. Mandible 7- or 8-toothed. Maxillary palpus long, slender, 6-segmented. Thorax long, narrow; mesoepinotal constriction shallow; base and declivity of epinotum subequal, the base sloping to meet the declivity in an obtuse angle. Pronotum viewed from above almost as long as broad; mesonotum approximately one and-half times as long as broad. Petiole with a moderately convex anterior surface, and

flat posterior surface, the two meeting above to form a sharp, straight or sometimes feebly rounded superior border. Gaster small. Legs long and slender.

Subopaque, finely and densely shagreened; mandibles, sides of clypeus, and frontal area slightly shining in certain lights. Mandibles densely striate, and also coarsely punctate. Posterior dorsal surface of head and the gaster with a metallic or bronzy luster in certain lights.

Hairs grayish, sparse, erect, present on clypeus, dorsal surface of head, coxa, trochanter, and flexor surfaces of femora and tibiae, and on gaster; hairs on mandibles suberect; hairs on gaster shorter than on venter and at apex. Pubescence grayish, fine and dense, covering all parts of body, but densest on gaster.

Dull ferruginous; dorsal surface of head posteriorly, and the petiole, gaster, and legs dark brown; in some lights parts of the thorax may have a brownish or infuscated cast.

Type locality.—Bright Angel Trail, Grand Canyon, Ariz., 5,500–7,000 feet (W. M. Wheeler).

Other localities.—Prescott, Ariz. (W. M. Wheeler); Milford, Utah (J. C. Bradley).

The redescription is based on three cotype specimens lent me through the kindness of Nathan Banks, of the Museum of Comparative Zoology.

Wheeler says, "*F. moki* nests under stones and forms colonies about the size of those of *F. pallide-fulva* and its various subspecies and varieties. It probably represents this species in the dry deserts of the Southwest, but is certainly a much rarer ant."

***Formica (Neoformica) moki* subsp. *xerophila*, new subspecies**

Worker.—Length 5.3–5.6 mm.

Similar to *moki* except for the following differences: Mandible uniformly 8-toothed in all specimens examined; petiole thicker antero-posteriorly, and with blunter, more rounded, and feebly notched superior border; pubescence of body apparently denser, therefore more distinct; general color blackish with anterior part of head, and the antennae, tibiae, and tarsi reddish brown; body, especially the posterior dorsal portion of head, and the gaster, with a metallic luster in certain lights.

Type locality.—Leavenworth, Wash. (Falconer Smith).

Cotypes.—No. 53290, U. S. National Museum.

Described from three workers and four callows collected from the soil beneath a piece of cow dung at an elevation of 1,165 feet. This locality is in a rugged mountainous area of the arid Transition Zone. The dominant trees here are *Pinus ponderosa* with occasional shrubby trees, probably of the genus *Alnus*. The nest was fully exposed to the sun, except for the covering of cow dung.

The worker of this subspecies can be distinguished from that of *moki* by its color, also by the shape of the petiole, as well as by differences in pubescence and luster.

W. S. Creighton, who has also compared specimens of this ant with cotypes of *moki* agrees with me that the ant is a new form. Dr. Creighton would, however, assign it specific rather than sub-specific rank.

MEDICAL ENTOMOLOGY WITH SPECIAL REFERENCE TO THE HEALTH AND WELL-BEING OF MAN AND ANIMALS, by WILLIAM B. HERMS. Third edition, Pages i-xix and 1-582, 196 text figures, 9½x6, cloth. 1939. Published by THE MACMILLAN COMPANY, 60 Fifth Ave., New York, N. Y. Price \$5.50.

This is a complete revision of the second edition which was called *Medical and Veterinary Entomology*. The omission of "veterinary" from the present title does not mean that less attention is given to the arthropod vectors of diseases of animals. The title was changed only for the sake of brevity. Being the third edition of a book by a man who has had long experience in medical entomology, it should be good, and it looks good to this inexpert reviewer.

The student is introduced to the subject in the first 69 pages, learning something of the history, scope and method of medical entomology, the nature and kinds of parasites and parasitism, how insects and arachnids cause and carry disease, the structure, development and classification of insects and arachnids, and the various types of insect mouth parts, the last being clearly and completely illustrated. The next 352 pages deal with insects that may cause disease in man or animals, including identification and classification, life history, and control, as well as information on parasites and transmission and nature of diseases. The insects are arranged in the usual order of classification from cockroaches to fleas, though beetles are placed with cockroaches in chapter 7. It is interesting to note that Diptera require 70 per cent of the space on insects, with mosquitoes leading all other groups with 67 pages followed by houseflies with 52 pages. The general subject of myiasis is treated in a separate chapter within Diptera. A chapter on ticks and one on mites follow the insects. The next to the last chapter deals with venomous and urticarial arthropods and the last with arthropods in medical practice.

To take a fair sample of this book one should choose arthropods of the greatest medical importance to which Professor Herms has given the most attention. This reviewer's limited personal knowledge, however, required him to study the sections on cockroaches and bedbugs which are not particularly important from the medical point of view. Little fault is to be found with these sections, though they could have been made more informative. It might be pointed out that the ootheca of cockroaches is not chitinous; i. e., does not contain chitin. There is no experimental evidence that sodium fluoride acts as a stomach poison against cockroaches; on the contrary, Hockenyos as well as Siegler and Munger have shown that this compound probably acts as a contact poison, the powder ingested by the roach while cleaning its appendages being insufficient to kill. Under control of cockroaches trapping is discussed at some length, but the much more important use of liquid insecticides, phosphorus paste, pyrethrum powder and fumigants is not mentioned. Under fumigation with hydrocyanic acid gas for bedbug control, the author is to be commended for the following statement: "The work should be done only by persons well informed about the use of this fumigant, preferably by a licensed pest control operator." The reader, however, will not become "well informed" by reading the directions given by Professor Herms, who has not sufficiently stressed hazards involved or precautions to be taken. This reviewer does not know of a book in English that gives thorough and up-to-date information on chemical control of insects affecting man and animals.

In general appearance this book makes an excellent impression. The illustrations, particularly the line drawings, are clear and informative, a bibliography follows each chapter, and a long subject and author index completes the book.

—F. L. C.