NOTES ON THREE PSEUDOSCORPIONS FROM ILLINOIS

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The present study, in which are given distribution records, ecological notes, and characteristics for species recognition relative to three very common species of Illinois pseudoscorpions, is the first of a contemplated series of papers based on material in the collections of the Illinois State Natural History Survey, the Chicago Museum, the Illinois State Museum, the American Museum of Natural History, and the writer's personal collection.

The pseudoscorpions, perhaps as a result of their small size and their seclusive habits, have long been a neglected group, those of Illinois being very poorly known. A single paper (Ewing, 1911) reports the presence of six species of pseudoscorpions from the state. Of the three species given in the present paper, only one, *Chelifer cancroides,* was reported by Ewing from Illinois. In the instance of this species, some of Ewing's records are in doubt since he used the species in a very wide sense and did not differentiate between it and some closely related species (Chamberlin, 1932).

Figures 1A and 1B

Chelifer cancroides (Linnaeus, 1761) L. Geoffroy, 1762

This nearly cosmopolitan species is the form commonly found in dwelling houses where it is said to prey upon bedbugs. The species is also found abundantly in granaries, stables, in beehives, and in the nests of swallows, sparrows, starlings, and pigeons. Out of the more than 125 collections of Illinois pseudoscorpions examined so far by the writer, *C. cancroides* has been found in only seven. This seemingly infrequent occurrence is easily explained by the fact that the majority of the writer's specimens have been taken from material in natural habitats of the state, and collections of *C. cancroides* are, as a result, more or less incidental. In six of the seven collections, habitat records are available. These include: grain in a barn, chicken house (individuals numerous), clothes on outdoor line, dwelling house, packing box, and an office. The distribution of the seven collections by counties follows: Adams Co. (2), Sangamon Co. (2), Cook Co. (1), St. Clair Co. (1), Champaign Co. (1).

Chelifer cancroides is noticed frequently as a result of its association with man and its relative large size, the male being 2.5 to 3.5 mm. long, the female 3.0 to 4.5 mm. This species can be separated from other pseudoscorpions so far observed in collections from the state by the very long pedipalps whose femur is about 5.3 times as long as wide and whose tibia is about 4.1 times as long as wide (fig. 1A). In addition, the tarsal claws (except those of the first pair of legs in the male) have split points (fig. 1B), a condition separating *C. cancroides* from other species with the same general body appearance.

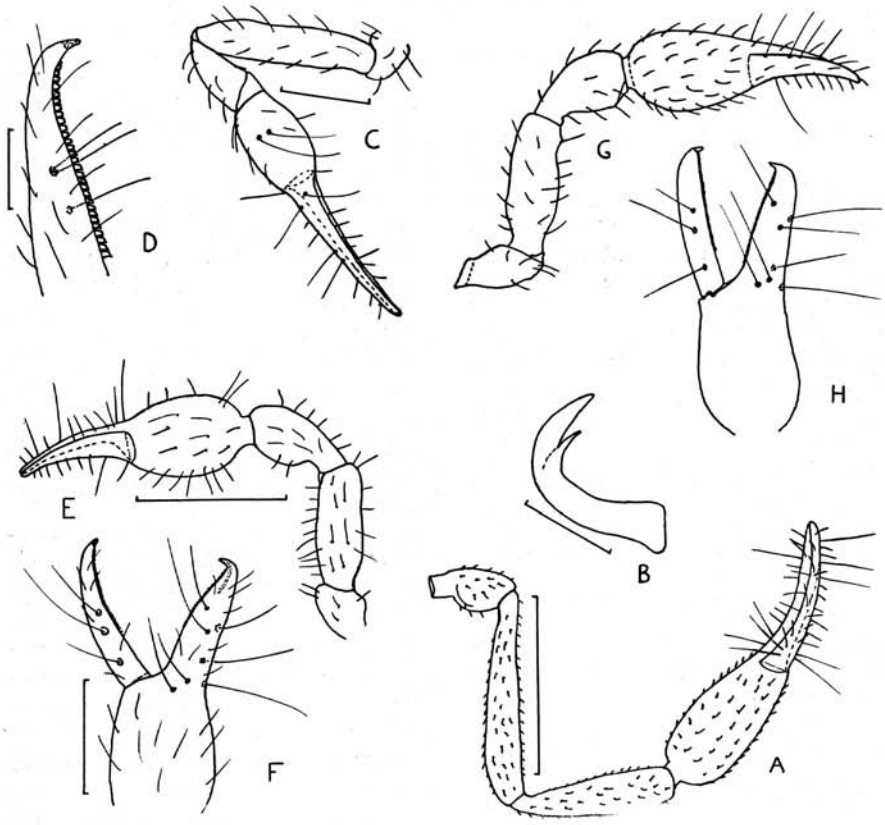

FIG. 1.—Drawings were made from material cleared in beechwood creosote and mounted in Canada balsam, except figures G and H which are redrawn from Chamberlin (1931). A camera lucida was used.

Chelifer cancroides, male. A.—Ventral view of right palp. Scale equals 1.0 mm. B.—One claw from fourth tarsus. Scale equals 0.05 mm.

Apochthonius moestus, female. C.—Dorsal view of palp. Scale equals 0.25 mm. D.—Interior view of tip of fixed finger. Scale equals 0.05 mm.

Microbisium brunneum. E.—Ventral view of palp. Scale equals 0.5 mm. F.—Exterior view of chela. Scale equals 0.25 mm.

Microbisium parvulum. G.—Palp from ventral side (redrawn from Chamberlin). H.—Chela from exterior to show shape of finger (redrawn from Chamberlin).

Apochthonius moestus (Banks, 1891) Chamberlin, 1929

Figures 1C and 1D

This frequently occurring species is found typically in the leaves and loam on the ground in the deciduous woods, as indicated by the fact that 17 out of 23 collections of this species were taken from this habitat. In some instances, individuals were found under the bark on logs or dead trees or in moss and lichens on trees or ground in the deciduous woods. One collection was taken from a mammal nest in the woods. While the species was found in numerous collections from the deciduous woods, it was not found in collections from the sphagnum of the tamarack swamps of the Chicago area. One individual of this species was found in a collection from leaf mold in Indiana Dunes State Park, Porter Co., Indiana (Chicago Museum collection).

Apochthonius moestus may be recognized by the small size, the light color, and the characteristics of palp and chela (fig. 1C). Of special significance in recognition of this species are the two tactile setae on the middorsal surface of the hand of the palp. As far as noticed, there is only one other Illinois species whose palp resembles that of *A. moestus*. In this instance, however, *A. moestus* may be recognized by examination of the teeth of the finger of the chela (fig. 1D). These teeth are contiguous and uniform in size and shape while the related species has teeth which are neither contiguous nor uniform.

The 23 collections of this species are distributed by counties as follows: Adams Co. (8), Pope Co. (1), Vermilion Co. (2), Jackson Co. (1), Clark Co. (7), Champaign Co. (1), Union Co. (1), Sangamon Co. (1), Menard Co. (1).

Microbisium brunneum (Hagen, 1869) Chamberlain, 1930

Figures 1E and 1F

This is by far the most common of all Illinois pseudoscorpions. It has been identified from 58 of the 126 collections so far examined from the state. Not only does the form appear in more collections than any other species but the number of individuals in each collection is greater. *M. brunneum* occurs in practically every kind of natural habitat from which collections have been made. The data indicate that the form has been collected more often from decaying leaves and loam in the deciduous woods than elsewhere, but this observation is probably more apparent than real as a high percentage of the present samples have been from the floor of the deciduous forest. Besides being found frequently in the loam and mold of the deciduous forest, the species occurs under and in partly decomposed logs, in rotten stumps, in mammal nests, and in moss. The form was also found in collections from grass sod, from rock ledges, and from rocky soil along railway tracks. The most interesting aspect of its ecological distribution, however, is an association with conifers especially in swamp and bog habitats. It was reported from the humus and soil in cypress bottoms in southern Illinois, from leaves beneath a juniper tree, and from a rotten pine stump. It is the common species of the sphagnum moss in the tamarack swamps or bogs of the Chicago area. The species appears well adapted to this last habitat since the number of individuals in many collections is much larger than the number of individuals in collections

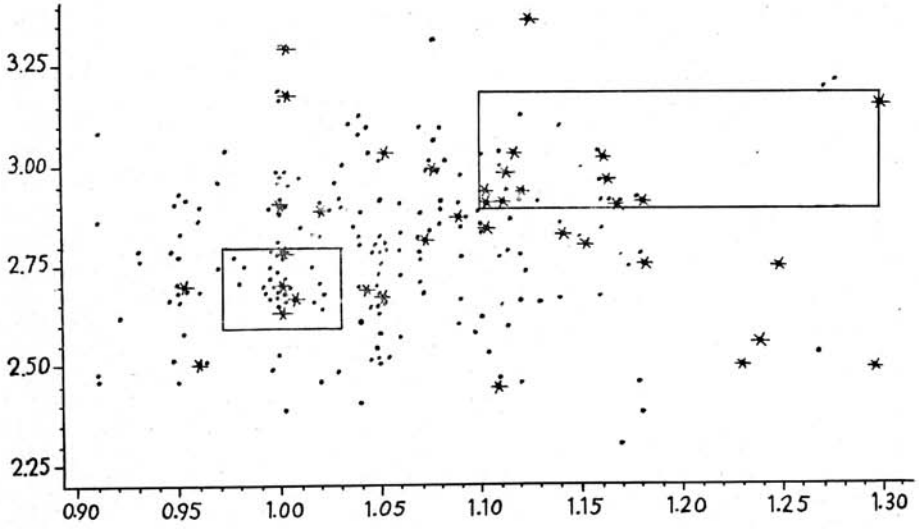

FIG. 2.—Scatter diagram showing the distribution of the palpal femur length/width ratio (along the vertical axis) and the finger-length/hand-length ratio (along the horizontal axis) of the chela of about two hundred individuals of *Microbisium brunneum* from Illinois. Individuals designated by asterisks are from a single Natural History Survey collection taken from sphagnum moss in a tamarack bog at Volo, Illinois. Other individuals are designated by dots and were selected at random from collections taken in all parts of the state. The small rectangle at the lower left indicates the limits of palpal femur length/width ratio and the limits of the finger-length/hand-length ratio as given in the literature for *M. parvulum*. The larger rectangle at the upper right shows the limits of the ratios as given in the literature for *M. brunneum*.

from the deciduous woods. In one collection from a tamarack bog, there were over 125 individuals; in another collection, over 35 individuals.

Because of the great diversity of habitat, *M. brunneum* has been found in nearly every locality in which adequate investigation has been carried out. Counties from which the species is reported and the number of collections from each county are as follows: White Co. (1), Adams Co. (10), Jo Daviess Co. (1), Cook Co. (2), Piatt Co. (1), Pope Co. (4), Champaign Co. (8), Lake Co. (11), Stephenson Co. (1), Jackson Co. (1), Vermilion Co. (2), Alexander Co. (1), Kane Co. (1), Mason Co. (1), Peoria Co. (1), Pulaski Co. (2), Clark Co. (6), Sangamon Co. (1), Ogle Co. (2), Logan Co. (1).

M. brunneum may be recognized by the small size of the body (less than 2.0 mm.) and by the shape of the chela (fig. 1E) which has only three tactile setae on the movable finger and seven tactile setae on the fixed finger (fig. 1F). So far as known at present, no other Illinois species has the chela shape and the reduced number of tactile setae found in this form. *M. brunneum* is, however, easily confused with *M. parvulum* (Banks, 1895) Chamberlin, 1930, which eventually may be found in the state.

Difficulty experienced by the writer in the recognition of *M. brunneum* and its separation from the

closely related *M. parvulum* led to a detailed study of the Microbisium species in the Illinois material. The writer found that, while all Illinois specimens appear to belong to a single species, some of the specimens possess characteristics which according to the literature identify them with *M. brunneum,* other individuals are typically of the species *M. parvulum,* while still more of the pseudoscorpions possess some characteristics of each of the species. The basis of separation of the two forms as given in the literature has been that the fingers are clearly longer than the hand (1.1 to 1.3 times as long) and the femur is 2.9 to 3.2 times as long as broad in *M. brunneum* while the fingers are subequal in length to the hand (0.97 to 1.03 times as long) and the femur is 2.6 to 2.8 times as long as broad in *M. parvulum.* The scatter diagram (fig. 2) shows the distribution of about two hundred Illinois individuals with respect to the length/width ratio of the femur and the finger-length/hand-length ratio of the chela. The limits of the ratios of these structures for *M. brunneum* and *M. parvulum* are indicated as given in the literature. From this graph, it is obvious that a single species of Microbisium is represented in the Illinois fauna. A study of the diagram leads to one of two conclusions: either (1) the two species, *M. brunneum* and *M. parvulum,* are morphologically inseparable and therefore a single species, or (2) the characteristics used are not satisfactory for the separation of the two forms.

In an attempt to determine definitely the Microbisium species occurring in Illinois and to demonstrate the true relationship between *M. brunneum* and *M. parvulum,* the writer examined a paratype of *M. brunneum* and one of *M. parvulum* loaned him through the courtesy of Mr. Nathan Banks of the Museum of Comparative Zoology. The examination revealed that beyond all doubt the Illinois material is identical with *M. brunneum* as described by Hagen. Measurements of the paratype of *M. brunneum* fall well within the limits set in the literature for the femur length/width ratio and for the ratio of the finger-length/hand-length. At the same time, the specimen of *M. parvulum,* although stored in alcohol and in poor condition for examination, was measured and results indicate that the ratios of the paratype are just at the lower limits of the ratios given for *M. brunneum* and do not fall within the limits given in the literature for *M. parvulum.*

It becomes clear, then, that the characteristics given in the literature for separation of *M. brunneum* and *M. parvulum* are not satisfactory. That the two are separate and distinct species, however, is obvious when one considers the shape of the palpal tibia, the chela, and its movable finger. Pseudoscorpions with the chela and finger shape of typical *M. parvulum* have not been observed as yet in Illinois collections. The chela of *M. parvulum* has a shorter pedicle, the line of demarkation between the pedicle and the margin of the hand on the exterior side is not so abrupt, and the hand is basally less tumid than is that of *M. brunneum.* The movable finger in *M. parvulum* is much straighter and distally more wide than the finger of *M. brunneum.* These and other differences are indicated in the original description by Banks (1895).

As a result of the study, it is apparent that: (1) *M. brunneum* and *M. parvulum* are not synonymous although a close morphological rela-

tionship is indicated; (2) *M. brunneum* shows an extreme amount of variation as might be expected from a species which occurs abundantly over a wide territory and which apparently reproduces parthenogenetically since no males are known to occur; (3) the two species of Microbisium under consideration cannot be separated on the basis of the ratio of femur length/width and the ratio of finger-length/hand-length as given in the literature; and (4) the two species may be separated by differences in the shape of the chela and movable finger.

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