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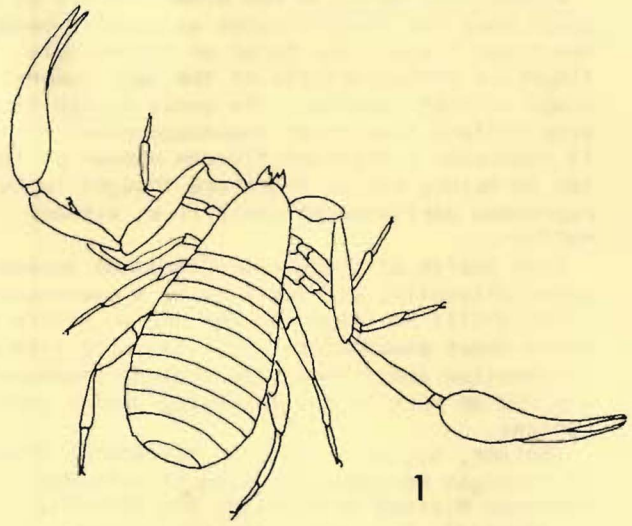
Pseudoscorpions

Have you ever seen a pseudoscorpion, living or dead? These tiny arachnids--the average body length of the adult ranges from 2 to 4 mm--often generate little interest because they are difficult to keep alive for prolonged periods and their economic importance is confined to the role they play in the food web. They superficially resemble true scorpions except for the absence of a post-abdomen and accompanying sting (Fig. 1). However, they do have poison glands in their pedipalps which are used to capture small arthropods such as Collembola and mites. Because of their size as well as their secretive behavior, they usually go unobserved. Nevertheless, they are widespread in their distribution and diverse in their habits.



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Distribution and Habitat Preference

More than 2,000 pseudoscorpion species have been described, placing them among the major orders of Arachnida in number of species. Only spiders, mites, and harvestmen have more species.

As an order they are cosmopolitan in distribution, reaching their greatest densities and diversity in the tropics and subtropics. However, the fact that 29 species have been reported from Michigan proves that many are present in temperate regions as well. Many species are also widely distributed; for example, Microbisium parvulum (Banks) occurs throughout North and Central America. It can be collected in large numbers in litter and soil throughout the entire year, even under heavy snow cover. On the other hand, some species may be rare and consequently are more localized; the species Dendrochernes morosus (Banks), for instance, is known only to be from two locations in Michigan so far.

The dispersal of pseudoscorpions resulting in their widespread distribution is fascinating. As terrestrial arthropods lacking a flight mechanism, their ability to travel would appear limited. However, they do have effective dispersal mechanisms. Pseudoscorpions are known to be phoretic (use another species for transportation) on insects (especially flies, beetles, and wasps) and harvestmen, and occasionally they are found on the bodies of birds and mammals. They also rely on human activities to take them from place to place. One researcher reported finding many species of pseudoscorpions on incoming merchandise at coastal quarantine stations. Also, they have been found during routine inspections of ships in various harbors.

Chelifer cancroides (L.) is a cosmopolitan species collected only in domestic situations. This species is the one most people observe when it crawls along porcelain surfaces in their bathrooms. While most observers may believe that this animal is present because the bathroom isn't clean, the truth is that the pseduscorpion is attracted by the bathroom's high humidity.

Pseudoscorpions are reported to live in a wide variety of habitats, often in large numbers. For example, one researcher extracted 47 individuals of Microbisium parvulum from 10 square cm of pine litter of unknown depth. In another study, scientists hand-picked 55 individuals of Idiochelifer nigripalpus (Ewing) from the bark of black cherry. Other species live in leaf litter and soil, in tree hollows, under stones, and within rock crevices. Still other species are found in caves, marine intertidal zones, and in the nests of insects, birds, and mammals.

Collecting and Identifying

You can collect pseudoscorpions, especially large species, by hand-picking them from under

bark, boards, or stones. Or, using a wire-mesh screen, you can sift rotten wood and collect them once they fall through the screen. While it is difficult to keep pseudoscorpions alive for extended periods, they can be kept for a short time by feeding them small arthropods such as Collembola. Individuals should be kept in small plastic or glass containers about 30 mm high and 50 mm wide, with sealed lids. Place about 10 mm of wet plaster of Paris mixed with activated charcoal in the bottom of the container and let it harden. Then moisten the plaster of Paris to keep up the humidity.

Because pseudoscorpions are not only very small but also secretive, you might wish to use a Tullgren funnel to collect them (Fig. 2). Place samples of bark, litter, soil, etc. that you think contain pseudoscorpions in the funnel and provide a light source above to create a temperature-moisture gradient. As time passes, the uppermost portion of the sample will become progressively warmer and drier, which will drive the pseudoscorpions downward into a collecting jar. Approximately one-half inch of ethylene glycol on the bottom of the jar will entrap and kill the specimens.

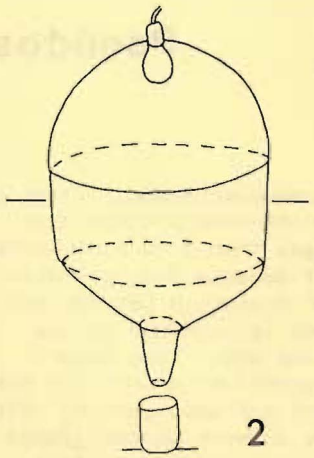
Still interested? Ambitious? Once you have collected and sorted the pseudoscorpions, you can prepare them for identification. You should know, however, that experts can spend up to a week on such tedious and time-consuming preparation tasks as those described below. You will need such equipment as a dissecting microscope, minuten needles, and Syracuse watch glasses.

First you must dissect and clear the individuals. The dissection should be made in 70 percent alcohol. Begin by removing the chelicerae and pedipalps from the body along with one of the first and fourth walking legs. Then separate the chela from the tibia of one pedipalp and spread the palpal fingers apart. (Chelicerae are paired appendages in front of the mouth. The pedipalps are the large, clawed grasping legs. Chela are the claws at the end of the pedipalps. See figures 1 and 3). Rinse all parts of the pseudoscorpion in distilled water. Next, treat the body with potassium hydroxide (KOH) in order to dissolve internal parts. Finally, place all parts in a clearing agent such as beechwood creosote or clove oil.

After clearing, the pseudoscorpion parts should be put through a four-stage alcohol dehydration series. Using Syracuse watch glasses, first place the parts in a 75 percent alcohol solution. The second solution should be 85 percent alcohol. Use 95 percent alcohol for the third solution, and finally, use 100 percent (absolute) alcohol as the fourth part of the series. Keep the specimens in each solution for several minutes.

Mount the individual parts with Canada balsam (available from biological supply houses) on a single slide using two cover glasses. The body and palps should be placed under one raised glass to prevent crushing the more robust parts. The legs and chelicerae can be placed under the other cover glass that is not elevated.

Even with having used professional dissection methods, identification at this point is difficult--especially identification of nymphs. (Keys for identification of adult Michigan pseudoscorpions can be obtained by writing the author). Adult pseudoscorpions usually have a



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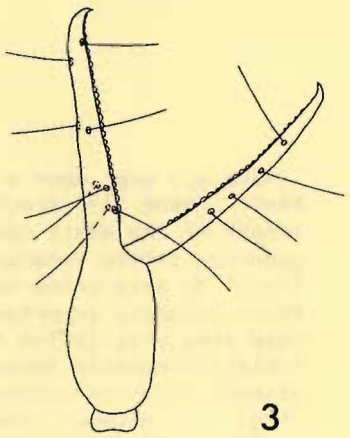

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fixed number of sensory setae on their palpal chelal fingers. The normal number of sensory setae on the adult pedipalp is twelve, eight on the fixed finger, and four on the movable finger (Fig. 3).

Microbisium parvulum and other members of this genus have ten tactile setae as adults, seven on the fixed finger, and three on the movable finger--a characteristic of the last nymphal stage of most species. The genus Microbisium also differs from other pseudoscorpions in that it possesses a disproportionate number of females to males, and is therefore thought to be reproduce parthenogentically (i.e. without mating).

Once you've attempted--or witnessed someone else--dissecting and identifying a pseudoscorpion, you'll no longer wonder why so little is known about pseudoscorpions. If you'd like more information about these fascinating creatures see one or more of the following useful publications:

Nelson, S., Jr. 1975. A Systematic Study of Michigan Pseudoscorpionida (Arachnida). American Midland Naturalist. 93: 257-301.

Weygoldt, P. 1969. The Biology of Pseudoscorpions. Harvard University Press, Cambridge, MA 145 p.

Hoff, C. C. 1949. The Pseudoscorpions of Illinois. Illinois Natural History Survey Bulletin. 24: 413-498.

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