

The Orders Protura and Diplura in Indiana¹

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Protura

Insofar as this writer is aware the order Protura has not been recorded previously from Indiana. Neither Mills (6) nor Ewing (4) gave Indiana collection records although several species have been recorded from Illinois by the latter author. Proturans, because of their small size and rather restricted habitats, have undoubtedly been overlooked by collectors since members of this order are widely distributed.

On December 13, 1954 samples of leaf litter and soil were collected northwest of West Lafayette in a small woodland known locally as McCormick's Woods. The collected material was placed in a Berlese funnel and about eight adult proturans were taken in this manner. Additional material taken from this same site on December 18, 1954 and January 2, 1955 yielded many additional specimens including adults (the females with large eggs in the oviducts), tritonymphs and deutonymphs. The species has been tentatively identified as *Eosentomon pallidum* Ewing but a series has been submitted to specialists in the U. S. National Museum for determination.

These collections are interesting from the standpoint of seasonal occurrence. Ewing (4) reported on the seasonal distribution of *E. pallidum* taken in Maryland, Virginia, Pennsylvania, Illinois and Arkansas and had no records of the species in December and January although his data gave evidence that adults were present all year. That author also stated "That reproduction in this species for the latitudes involved continues for much of the year . . . reproduction activities are greater during the spring months." The observations made here would confirm those of Ewing, and in addition, would indicate that the species overwinters in both the nymphal and imaginal stage.

Diplura

The order Diplura is represented in Indiana by two families, Campodeidae and Japygidae. The insects belonging to this order may be characterized by being primitively apterous and by having long multi-segmented antennae and conspicuous cerci which are segmented in the Campodeidae and forceps-like in the Japygidae. The mouthparts are of the chewing type and are entognathous. Their development is without metamorphosis.

Comparatively few records of their occurrence have been published although they are of wide distribution. Two species, one in each family, have been recorded from Indiana.

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Plusiocampa cookei (Packard).—Packard (7) reported the presence of this species in “the Wyandotte Caves.” Silvestri (8) apparently referred to this species when he wrote “Per ora si deve far notare la presenza delle due specie *Campodea fragilis* Mein. e *C. plusiochaeta* Silv., che sono molto diffuse anche in Europa, e nelle grotte del’ Indiana specie del genere *Plusiocampa* Silv., molto diffuso nelle grotte d’Europa.” Blatchley (1) referred to the record of Packard but stated that he was unable to find the species during his investigations of Wyandotte Cave. Wolf (10) cited Packard’s record but placed the species as *Campodea staphylinus* var *cookei*.

Campodea plusiochaeta Silvesti.—This species has been met with most frequently and has been taken in widely separated areas. The first specimen was taken December 13, 1954 in the litter and soil samples from McCormick’s Woods, the samples which also yielded the Protura. A second individual was captured May 12, 1955 in discarded plant material outside a greenhouse near West Lafayette. On September 9, 1956 ten individuals were taken (many more escaped) from a clump of soil dug from a barn lot on the W. S. Lemon property at Friendship (Ripley Co.). These were collected primarily in and about the nest tunnels of the bee, *Melissodes bimaculata* Lepeletier.

Campodea fragilis Meinert.—Seven individuals belonging to this species were taken two miles west of West Lafayette on August 17, 1956. These were taken during the excavation of a nest of *Melissodes bimaculata* from a culvert fill along a country road. The fill dirt contained small, loose clumps of grass clippings and it was within such clumps that all of the specimens were found.

Metajapyx subterraneus (Packard).—This large japygid was reported from Owen, Monroe and Lawrence counties by Young (11). That author has recorded the habitats in which it was found and has a figure of the species. On June 11, 1955, one specimen of *M. subterraneus* was taken from beneath a rock in a woodland bordered by Laughrey Creek. The woodland lies south of Friendship (Ripley Co.) on the W. S. Lemon Farm.

Parajapyx minimus (Swenk).—Originally described by Swenk (9) “from among the roots of wheat growing in damp soil” in southeastern Nebraska, this species has been frequently observed at both West Lafayette and Friendship. The first individuals were observed during the summer of 1953 at West Lafayette in the nest tunnels of *Halictus ligatus* Say, a social halictine bee which nests gregariously in the soil. Since at that time research was being conducted on the life history of the bee (2), few specimens of *P. minimus* were taken but observations were made on its habits which indicated that it was either a scavenger in the empty brood cells or possibly a predator on the smaller arthropods present, principally mites.

On April 20, 1954, two specimens were taken from a nest of the acrobat ant, *Crematogaster lineolata* Say. The ants were nesting in the soil of a railroad embankment about one half mile west of West Lafayette. During the excavation of a nest of *Melissodes bimaculata* at

Friendship on September 9, 1956, three additional specimens were taken along with *Campodea plusiochaeta*.

Japyx sp.—Macklin (5) has recorded a number of individuals as *Japyx* sp. during studies of the soil fauna in a red clover field located about five miles northwest of Lafayette. His records are as follows (all for 1953): April 6 (30 specimens); June 23 (13 specimens); July 7 (record of occurrence but no numbers); July 28 (21 specimens); August 13 (8 specimens); September 29 (7 specimens). Estimates of the number of individuals per cubic foot of soil ranged from 171 in September to 512 in July.

In determining his specimens to the genus *Japyx* he undoubtedly used the name in its broadest sense as given by Comstock (3). More than likely the species was *Parajapyx minimus* which would appear to be very common throughout the Lafayette area.

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