

## Biological Notes on Scolopendrellidae, Destructive to the Roots of Pineapple in Hawaii

BY J. F. ILLINGWORTH.

(Presented at the meeting of May 5, 1927)

Until recently little was known of the life history and habits of these primitive insects. All of the earlier writers dealt only with their systematic and morphological aspects. When I discovered these tiny creatures eating pineapple roots, I reviewed the literature and found that they were also an important pest in California, Oregon and Utah,\* where they attack truck crops. Hence several writers over there have made a study of life history and control measures. It is principally the early stages that I wish to deal with in this paper, adding some notes upon feeding habits and natural enemies.

While studying the root system of pineapple plants in root cages, I have had an excellent opportunity to observe the activities of a great number of tiny creatures that inhabit the soil under such conditions. The Scolopendrellidae are always present. They are large enough to be quite easily seen with the naked eye, since they are two or three millimeters in length. Their white color, too, makes them all the more noticeable, as they appear among the dark particles of the soil. They resemble minute centipedes, but may be easily distinguished from these creatures by the cerci, which terminate the body. The adults have twelve pairs of legs; the front pair very small. Differing again from the centipedes, the young have less legs than do adults. Immature individuals with nine, ten, and eleven pairs of legs were observed by the earlier writers. Some concluding that at the beginning there might be as few as three pairs, drawing the analogy from the millipedes. Packard\*\* says that "It is most probable that the young is hexapodous, since the first pair of limbs are 4-jointed, all the rest

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\* 1924—F. H. Wymore. "Biology and Control of the Garden Centipede." Pomona College Journ. Ent. and Zool., Vol. 16, pp. 73-88 (Good Bibliography).

\*\* 1898—A. S. Packard. A Text-book of Entomology, Symphyla pp. 18-25.

5-jointed." Williams † was the first to observe that the newly-hatched larva had seven pairs of legs. He says, "It is, therefore, a highly specialized young rather than a generalized, ancestral form such as the hexapod larva of other Diplopods. . . ."

In my own experience, I frequently found very small specimens among the roots with eight pairs of legs, and, again, several together in a soil cavity, six inches deep, with only seven pairs. These latter apparently were newly-hatched, for the mother was with them. Yet I could find no trace of the egg shells. The female was considerably disturbed during the observations, and this may have caused her to act abnormally. She seized one of the young by the head and devoured it before deserting them. This, I have observed, is a common practice with true centipedes, eating either the eggs or newly-hatched young when excited.

At another time, I was fortunate in finding a nest of eggs of the symphylids, placed in a cavity against the glass. These were in a splendid position for observation, and the mother was carefully guarding them. The female had gone to a depth of fourteen inches in the soil, to oviposit where the supply of moisture was rather constant. There she had formed a cavity about one-fourth inch in diameter. The eight eggs of the set were closely packed

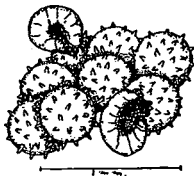


Fig. 1. Sketch of egg cluster, showing young escaping from egg shell, x 25.

together inside. The day following the discovery of the nest, I saw that the eggs were hatching. At that time they were sketched and several photographs made to show the character of the eggs and young accompanied by the guarding mother.

The eggs, as shown in the sketch are perfectly spherical in out-

† 1907—S. R. Williams. "Habits and Structure of *Scutigereilla immaculata* (Newport)." Proc. Boston Soc. Nat. Hist., Vol. 33, pp. 461-85, pl. 36-38.

line, with rather regularly projecting points. These give the surface of the shell a roughened appearance. When hatching, the shell is ruptured on one side, the larva backing out, so-to-speak, as shown in the sketch. At first no legs or other appendages are visible, and the larva looks very worm-like, with scarcely any motion. Soon, however, the legs begin to unfold, and it is seen that they tightly clasp over the antennae, which lie down along the median ventral line. These latter organs, at this stage, are comparatively short, each being made up of six bead-like segments. The antennae increase in length and number of segments with each moult.

Once out of the eggs, the young appear to be very gregarious, the mother watching over them like a hen with a brood of chicks. The only thing that I saw the tiny creatures eat was the empty egg shells—these disappeared the first day.

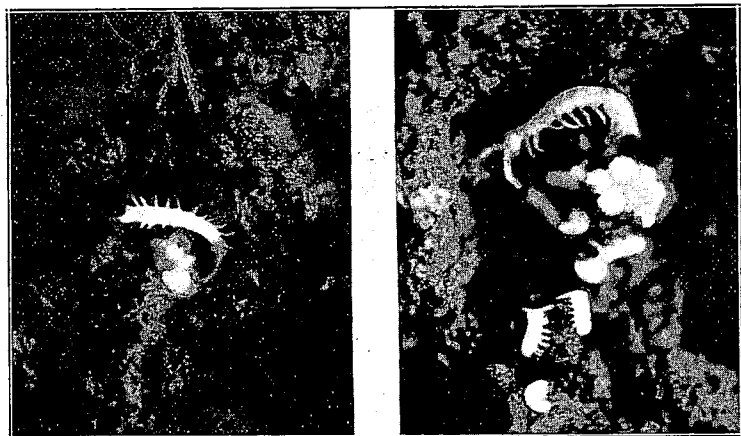


Fig. 2. Mother in soil guarding eggs, x 7.

Fig. 3. Mother in soil with hatching eggs and young, x 10.

Subsequently, I found three other sets of eggs, each deep in the soil as before, and eight in number. They were in good position, against the glass of the root cage, hence I was able to follow their development. A typical case: June 28th—I saw a female symphylid, deep in the soil, forming a nesting cavity.

June 29th—She had laid eight eggs and was guarding them. I made daily observations until:

July 4th—Eight young had hatched during the night. Hence the incubation period was about five days.

July 6th—The young moulted, and I counted eight pairs of legs, while the antennae had increased to twelve segments. The larvae were now very active, nervously waving their antennae about, as is the habit of adults. The mother remained, hovering over them, apparently eating nothing. However, the next morning, I found that they had all left the cavity,—scattering into the soil, so I was unable to follow their development further.

#### FEEDING HABITS OF THE ADULTS.

These centipede-like creatures do a vast amount of damage to the underground portion of the pineapple plant. In our fields where paper mulch is used, we have ideal conditions for the rapid multiplication of such delicate creatures. In nature they thrive under stones, logs, etc., where they are not subjected to sudden changes in moisture and temperature. In attacking the roots, they eat out the growing tips, and in this way open them up to the inroads of various organisms of disease, such as fungi, bacteria, etc. In one of our root cages, containing a pure colony of these depredators, not a single plant will establish itself. As fast as the new roots start out they are eaten back. Only the short stumps are there to tell the story, and these soon succumb to rots. Unfortunately, field observations show that this pest is widely distributed in our pineapple-growing districts.

The outlook for the artificial control of such a pest would look rather hopeless. But, fortunately nature has come to our assistance with valuable predators. I find constantly, at least two sorts of beetles, both the larvae and adults of which prey upon the symphylids. One of these is the staphylinid, *Philonthus discoideus* (Gravenhorst) and the other is our good cucujid, *Cryptamorpha desjardinsi* (Guer.). These are like miniature tigers, running about freely among the soil particles. When they come upon their prey the battle is furious for a few moments, the beetle larva holding the symphylid by the middle of the back in a bulldog grip. As soon as the struggling ceases, the remains are eaten on the spot.

I was greatly interested, on one occasion, when trying to breed out the staphylinid beetle larva for determination, to find that the symphylids retaliated by eating holes into the beetle's thorax after he had assumed the quiescent pupal stage. Further investigations all indicate that though the symphylids are omnivorous feeders, they are weak creatures and poor fighters—hence feed principally upon tender plant tissue. They appear to favor mostly the tender tips of living roots.

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### Lice Affecting Poultry in Hawaii

BY J. F. ILLINGWORTH.

(Presented at the meeting of November 4, 1927)

I wish to record a number of cosmopolitan species of lice taken from poultry in the vicinity of Honolulu during 1926. This collection was made by Dr. Marie Faus, who was working with me on an investigation of pests of man and domestic animals.

As far as I know, only one of the nine species of Mallophaga that we found has been recorded as occurring in Hawaii.

The common hen louse, *Menopon gallinae* (Linn.) (= *M. pallidum* Nitzsch\*), a general parasite infesting poultry. Specimens were taken: ex turkey, Honolulu, Nov. 23, 1926; ex Guinea hen, Honolulu, Dec. 9, 1926; ex chicken, Waipio, Dec. 14, 1926; and ex chicken, Honolulu, Dec. 16, 1926.

The body louse of the hen, *Menopon stamineum* Nitzsch (= *M. biseriatum* Paiget\*), which also has a wide range of hosts. It occurs on chickens, turkeys, pigeons, and peacocks. Our specimens are from chickens, Honolulu, November 23 and Dec. 16, 1926.

The common louse of peafowl and Guinea hen, *Menopon phaeastomum* Nitzsch. This species was taken from Guinea hen in Honolulu, Dec. 9, 1926, and from pea fowl on the same date.

The large turkey louse, *Goniodes stilifer* Nitzsch, was taken on chickens at Waipio, Dec. 19, 1926. This species has been previously recorded in Hawaii by Van Dine (Hawaii Agric. Exp. Sta-