GENERAL NOTES

Journal of the Lepidopterists' Society
46(1), 1992, 70–72

BIOLOGY OF *OPOSTEGOIDES SCIOTERMA* (OPOSTEGIDAE) IN OREGON

Additional key words: *Ribes hurtellum,* gooseberry, cambium miner, *Spizella passerina,* dung mimicry.

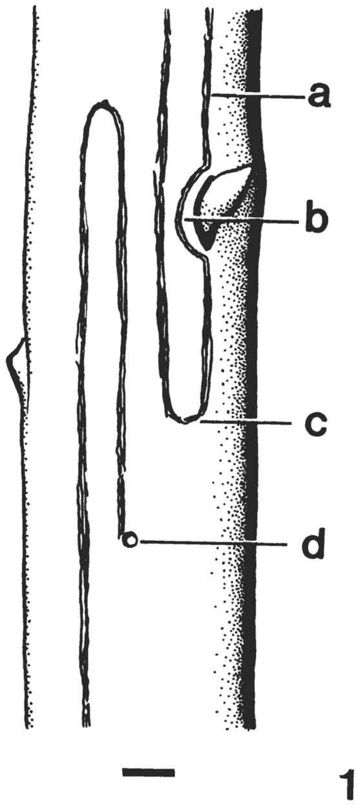
Although the Opostegidae are nearly world-wide in distribution (absent only in Arctic regions), the biology of the family is poorly known (Davis 1989). From 1956 to 1975 I had the opportunity to study *Opostegoides scioterma* (Meyrick) (Opostegidae) in the Willamette Valley of Oregon, where larvae of this species were found mining in the branch cambium of *Ribes hurtellum* (Michaux) (Gossulariaceae), a commercially grown gooseberry. Gooseberry cambium injury in Oregon has been reported previously by Rosenstiel (1960) and Eyer (1963).

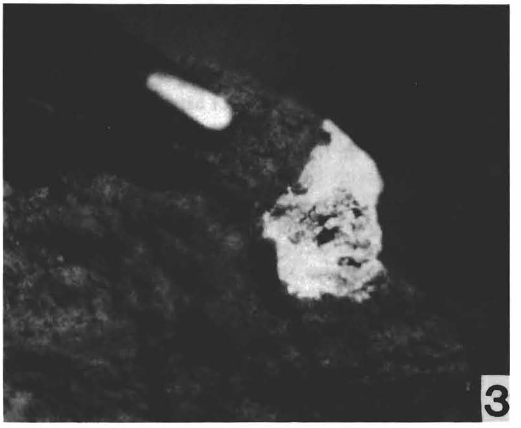
Injury to gooseberry by opostegid larvae was first reported from New York by Grossenbacher (1910), who concluded that the cambium miner (*Opostegoides nonstrigella* Chambers = *O. scioterma*; D. R. Davis pers. comm.) "afforded entrance" to fungi which in turn "kill gooseberry shoots." Secondary invasion by fungi has not been observed in Oregon. Grossenbacher (1910) reported that *O. scioterma* also attacked red or garden currant (*Ribes vulgare* Lam.), as well as other species of *Ribes*, including European gooseberry (*Ribes grossularia* L.).

During my studies in Oregon, I never observed larvae of *O. scioterma* until mid-September because the minute size and translucent body color of early instars combine to make them virtually undetectable. By August, however, the thread-like prognathous larvae could be observed with a dissecting microscope by peeling away the bark of infested host branches (Fig. 1). The location of larvae within an infested branch was indicated by a line of darker green tissue above the mine, which contrasted with the light apple-green inner bark layer. By October, the larvae were half grown—0.5 mm wide and 3 mm long. Their thorax and abdomen were translucent; their mouthparts and cranial endoskeleton were pale tan. Each larva overwintered within its mine and resumed feeding in the spring. By late May larvae were full grown— approximately 0.6 mm wide and 11 mm long. Last instar larvae were similar in color and shape to early instar larvae. In early June, each larva made an enlargement 1.25 mm wide and 7 mm long at the terminus of its mine, which usually was located in the lower third of the branch. After forming this chamber, in which no frass was ever observed, larvae shed their penultimate skin. Next they cut a circular exit hole 1.25 mm wide in the bark of the host, emerged through the hole, and descended to the ground. Each larva penetrated the ground and formed a gray, roughly oval-shaped cocoon, 3–5 mm long. The cocoon was loosely covered with strands of silk and entangled with bits of debris so that it was highly cryptic. Pupae were tan, 1.5 mm wide, 2.5 mm long, oval in outline, and elliptical in cross section; they resembled flax seeds. The pupal stage lasted from late May until late June, which roughly corresponds with observations by Grossenbacher (1910).

Uniform soil samples (40 cm^2) were taken on 10 June 1958 from beneath 12 infested plants to determine the depth of pupation. Samples from three successive depths (i.e., 0–2.5 cm, 2.5–5.0 cm, and 5.0–7.5 cm) were held in cloth cages in a greenhouse at summer temperatures. Emerging moths were counted at daily intervals. Of the 20 moths recovered during the period 18 June to 5 July, 60% came from the 0–2.5 cm soil depth, 19% from the 2.5–5.0 cm depth, and 14% from 5.0–7.5 cm depth. Wild moths emerged in the field from mid-June to the first week of July.

Larvae of *O. scioterma* injure gooseberry plants by destroying xylem cells during their cambium mining activities. Each bilateral mine is made by a single larva tunneling up and then back down a branch of the host (Fig. 1a). The parallel tunnels of each bilateral mine are uniformly 4–5 mm apart and joined at the top and bottom in an elliptical half





FIGS. 1–3. *Opostegoides scioterma* (Meyrick). **1,** Sketch of larval mines in cambium; scale line = 10 mm (see text for explanation); **2,** Adult with wings spread, dorsal aspect; **3,** Bird dung deposit on dirt clod.

circle (Fig. 1c). An exception is observed occasionally when larvae mine partly around the base of a branch (Fig. 1b). In two-year-old infested plants, the injury causes leaves to wilt on the terminal 150–200 cm of the branches. By that time (usually May), 3–6 bilateral mines may be present in each branch.

In December 1958, the mean length of mine injury in two-year-old plants was 25 cm (n = 70) in branches 360 cm long. In that sample, 2–3 larvae were found per branch. Infested branches of four-year-old plants had 8–12 mines and branches were half their normal size. In two- to four-year-old infested plants, the old black frass in the mines was replaced in 10–20% of the mines by adventitious white cell tissue. About 10% of observed larvae mined in such tissue for 5–10 cm and then moved into normal cambium. This phenomenon also was noted by Grossenbacher (1910). Interruption of nutrient conduction due to mining activities curtailed fruit production, forcing growers to remove infested three-year-old plants just when the plants were reaching fruit-bearing stage. Following the infestation of older plants, gooseberry fields usually continued production for about 20 years.

The adult of *Opostegoides scioterma* is a small moth, with a wing span of about 8 mm and a large, white, feathery eyecap (Fig. 2). The forewing is white, with black dorsal spots, smaller dark costal spots, and a diffuse dark apical patch. The apex, termen, and dorsum of the forewing, and both margins of the hindwing have fringes of long white scales (Fig. 2).

During June and July when ambient temperatures are high, the moths remained sedentary on the tops of dirt clods in the gooseberry fields, with their wings spread flat against the substrate. Only physical disturbance caused them to move. For example, when a moth's abdomen was pushed with a pencil, the moth would run quickly 2–5 cm into a dark crevice in the soil or between clods and stop abruptly. After 5–10 seconds, it would return to its original position and resume its stationary posture.

Adults of *Opostegoides scioterma* exhibited a crepuscular activity pattern. At about 1800 h, 5–10% of the moths began their evening activities by making darting flights of 10–20 cm in many directions, moving from clod to clod, with 1–2-minute stops between flights. As daylight decreased, moths increased the frequency and distance of their flights. By 1900 h, 50–70% of the moths were flying, 30–60 cm at a time, with short rests between quick flights; most flights were toward gooseberry bushes. By 1930 h, flights were longer and generally ended in shaded central parts of the bushes where the moths alternated running and resting for 5–10 seconds among the inner branches. At about 2000 h, activity decreased, and by 2015 h, it had ceased for the night. Neither mating nor oviposition were observed.

During the day the small white moths were fairly conspicuous as they rested on dirt clods. However, they were not attacked by chipping sparrows [*Spizzela passerina* (Beckstein); Fringillidae], which foraged in flocks for unharvested gooseberries in the same fields used by the moths. The sparrows habitually defecated on the tops of the same dirt clods upon which the moths rested during the day (Fig. 3). Resting moths, with their wings spread, were about the same size (8 mm diameter) and color (white with black dots) as the splashed bird droppings. The moths were present on about 20% of the clods where the sparrows defecated. Other species of birds were uncommon in the infested fields. The sparrows seemed oblivious to the resting moths, which may be avoiding detection by potential predators such as birds through "dung mimicry" (Endler 1981).

This is Technical Paper No. 8971 of the Oregon State University of Agricultural Experiment Station, Corvallis, Oregon, 97331.

LITERATURE CITED

DAVIS, D. R. 1989. Generic revision of the Opostegidae, with a synoptic catalog of the world's species (Lepidoptera: Nepticuloidea). Smithsonian Contr. Zool. 478:1–97.

ENDLER, J. A. 1981. An overview of relationships between mimicry and crypsis. Biol. J. Linn. Soc. 16:25–32.

EYER, J. R. 1963. A pictorial key to the North American moths of the family Opostegidae. J. Lepid. Soc. 17:237–242.

GROSSENBACHER, J. G. 1910. Medullary spots: A contribution to the life history of some cambium miners. Tech. Bull. No. 15, New York State Agric. Exp. Sta., Geneva, New York.

ROSENSTIEL, R. G. 1960. A gooseberry cambium miner. Pan-Pacif. Entomol. 36:170.

R. G. ROSENSTIEL, *Department of Entomology, Oregon State University, Corvallis, Oregon 97331-2907.*

Received for publication 3 August 1989; revised 22 April 1991; revised and accepted 23 September 1991.