Notes on the Larval Habits and Parasitoids of Rhopobota dietziana (Kearfott, 1907) (Tortricidae: Olethreutinae)

Author: Eiseman, Charles S.

Source: The Journal of the Lepidopterists' Society, 68(3) : 218-220

Published By: The Lepidopterists' Society

URL: https://doi.org/10.18473/lepi.v68i3.a10

Journal of the Lepidopterists' Society
68(3), 2014, 218–220

NOTES ON THE LARVAL HABITS AND PARASITOIDS OF *RHOPOBOTA DIETZIANA* (KEARFOTT, 1907) (TORTRICIDAE: OLETHREUTINAE)

Additional key words: leafmining, leaf shelter, *Ilex*, *Zagrammosoma*, *Bassus annulipes* complex

Three species of *Rhopobota* Lederer are known to occur in North America, all of which feed on hollies (*Ilex* spp., Aquifoliaceae). *Rhopobota dietziana* (Kearfott) has been reared from winterberry (*I. verticillata* (L.) Gray), and *R. finitimana* (Heinrich) has been reared from both winterberry and mountain holly (*I. mucronata* (L.) M. Powell, Savol., & S. Andrews) (Ferguson 1975). Both of these moths occur throughout the eastern United States and adjacent Canada. *Rhopobota naevana* (Hübner), in addition to feeding on hollies, is recorded from Ericaceae, Rosaceae, and Rhamnaceae (Brown 1983). Its range in eastern North America only extends south to the Carolinas, but unlike the other species it also occurs in the Pacific Northwest, Europe, and Asia. Known as the holly budmoth or blackheaded fireworm, it is sometimes a pest of cranberry crops and ornamentals (Johnson & Lyon 1994). Whereas the habits of *R. naevana* are well documented, no descriptions of the other two species' larval feeding modes have been published.

On winterberry and mountain holly in northeastern North America, I have frequently encountered a leaf mine that is highly reminiscent of those of certain gnorimoschemine gelechiids. It is a full-depth, elongate blotch, with a conspicuous tube of excrement (bound together with silk) projecting from the leaf underside at the mine's origin, usually at the leaf midrib (Fig. 1). Chambers (1873) described a similar external frass tube in the mine of *Scrobipalpa scutellariaeella* (Chambers) on *Scutellaria lateriflora* L. (Lamiaceae), and *Scrobipalpula manierreorum* Priest forms mines on *Eurybia macrophylla* (L.) (Asteraceae) with the same feature (Adamski et al. 2014). Unlike these gnorimoschemines, the larva on *Ilex* does not remain a miner, instead exiting to crumple or tie leaves and then feeding within the shelter so formed. When mature, it cuts one or two small arcs in a leaf to form a flap in which it spins its cocoon. I have only seen this pupal case once in the field and it was in a fresh leaf (illustrated in Eiseman & Charney 2010, p. 372).

Apparently the only published reference to these mines is in Eiseman & Charney (2010, p. 163), where they are attributed to "a *Rhopobota* species" (Tortricidae). This was based on a suggestion by D. L. Wagner (pers. com.) ("I seem to recall at least one species forms small mines on *Ilex*, before forming [a] leaf shelter") combined with the fact that this was the only tortricid genus reported to have *I. mucronata* among its hosts (Robinson et al. 2014). Also, Kearfott (1907) had described a similar pupation shelter for *R. naevana* (as *Epinotia ilicifoliana* Kearfott): "Pupate in tight, dense cocoon spun in debris, or frequently in a small flap cut out of leaf and turned under." He reared this species "from larvae tying and crumpling the young leaves and terminal twigs of a species of *Ilex*, probably *verticillata* Linn."

In March 2013, I encountered similar leaf mines on American holly (*Ilex opaca* Ait.) in South Carolina and Georgia, and on both American holly and inkberry (*I. glabra* (L.) Gray) in Florida. In these evergreen leaves, the mines were narrower, frequently branching, and at least on inkberry did not so consistently begin at the midrib. Also, the excrement accumulated in an irregular pile rather than in a narrow, curved tube as on winterberry (the mountain holly mines are intermediate in this respect).

At St. Sebastian River Preserve State Park (Fellsmere, FL) on 28 March, some mines on inkberry were found to be occupied (Fig. 2). In two instances, larvae had abandoned their mines to tie together two overlapping leaves, but the stiffness of the leaves (as in American holly) precluded crumpling or rolling. Judging by apparent entrance holes and the size of some larvae relative to their mines, it seemed that these larvae were able to establish new mines after exiting their initial ones. Three plastic vials were filled with mined leaves in hopes of rearing adults.

Within each vial, the leaves all became bound together in a frass-filled mass, preventing observation of the larvae. Two parasitoids (male and female) emerged on 23 April from a single leaf mine. C. Hansson examined them and reported that they belong to none of the known North American *Zagrammosoma* species, but appear to match the description of *Z. velerii* Yefremova (Eulophidae), described from Cuba in 1995. No host associations have previously been documented for *Z. velerii*. The genus *Zagrammosoma* has been reared from insects of all four leaf-mining orders (Coleoptera, Diptera, Hymenoptera, and Lepidoptera), but this is the first record of a tortricid host (Ubaidillah et al. 2000; Noyes 2014). Eighteen adult moths emerged from 4 to 29 May.

FIG. 1. Frass tube projecting from the underside of a mine of *Rhopobota dietziana* in a winterberry leaf.

FIG. 2. Mine of *Rhopobota dietziana* in an inkberry leaf, backlit to show the larva inside.

In August I collected winterberry leaf mines at two locations in Plymouth County, Massachusetts (Carver on 13 August; Bridgewater on 15 August), to determine whether they were made by the same species. From 17 September to 7 October, 17 parasitoids emerged from both rearing lots. M. J. Sharkey determined them as *Bassus annulipes* (Cresson) or *Bassus* n. sp. near *annulipes* (Braconidae); he is in the process of revising the genus, and when this species is described it will be transferred to *Therophilus* Wesmael or a new genus near *Therophilus* along with the rest of the *B. annulipes* complex. A single adult moth emerged on 24 September.

I sent the winterberry moth and one inkberry moth to J. Dombroskie, who confirmed by genitalia examination that both were females of *Rhopobota dietziana* (Kearfott). These specimens have been deposited in the Cornell University Insect Collection. Inkberry is a new host record for this species; it has been reared from winterberry previously (Ferguson 1975), but the larval habits were not described. The only other published rearing record for this species is a specimen labeled "holly berries" (MacKay 1959). This would seem to indicate that late instar *R. dietziana* larvae are somewhat versatile in their feeding mode.

The two other *Rhopobota* species have also been reared from *Ilex*, but neither is known to mine leaves. The habits of *R. naevana* are well documented, and on holly the larvae feed as leaftiers throughout their development (Bradley et al. 1979; Johnson and Lyon 1994). The few rearing records of *R. finitimana* (e.g. Ferguson 1975) have given no indication of larval habits.

Given that I reared *R. dietziana* from both a deciduous and an evergreen holly, it is certainly plausible that this species is also responsible for the similar leaf mines on *I. mucronata* and *I. opaca*. Further rearing efforts are desirable both to confirm this and to determine whether *R. finitimana* is also a leafminer initially. It would also be of interest to know whether evergreen hollies are only used when deciduous species (more conducive to constructing leaf shelters) are not available. On Nantucket Island, Massachusetts, where I have conducted intensive surveys for leafminers, I have found *Rhopobota* mines only on *I. verticillata* whereas examination of *I. opaca* and *I. glabra* has only yielded agromyzid fly mines.

ACKNOWLEDGMENTS

I thank David L. Wagner, Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, for initially suggesting the genus *Rhopobota*; Christer Hansson, Department of Zoology, Lund University, Lund, Sweden, for examining the eulophids; Michael J. Sharkey, Department of Entomology, University of Kentucky, Lexington, KY, for examining the braconids; Jason Dombroskie, Cornell University Insect Collection, Ithaca, NY, for examining the moths; Florida Department of Environmental Protection, Division of Recreation and Parks, for permission to collect unidentified leafminers; Julia A. Blyth, Northfield, MA, for assisting with collecting, rearing, and specimen mounting; Ronald J. Priest, Department of Entomology, Michigan State University, East Lansing, MI, for sharing information about the newly described gelechiid leafminers; and the reviewers, Richard L. Brown, Mississippi State University, Starkville, MS, and Jean-François Landry, Agriculture Canada, Ottawa, ON, for helpful comments.

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Submitted for publication 17 January 2014; revised and accepted 6 February 2014.

CHARLES S. EISEMAN, *276 Old Wendell Rd., Northfield, MA 01360, e-mail: ceiseman@gmail.com*