



4-30-1987

**Observations on natural enemies of western spruce budworm
(*Choristoneura occidentalis* Freeman) (Lepidoptera, Tortricidae) in
the Rocky Mountain area**

Howard E. Evans
Colorado State University, Fort Collins

Follow this and additional works at: <https://scholarsarchive.byu.edu/gbn>

Recommended Citation

Evans, Howard E. (1987) "Observations on natural enemies of western spruce budworm (*Choristoneura occidentalis* Freeman) (Lepidoptera, Tortricidae) in the Rocky Mountain area," *Great Basin Naturalist*. Vol. 47 : No. 2 , Article 19.

Available at: <https://scholarsarchive.byu.edu/gbn/vol47/iss2/19>

This Article is brought to you for free and open access by the Western North American Naturalist Publications at BYU ScholarsArchive. It has been accepted for inclusion in Great Basin Naturalist by an authorized editor of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.

OBSERVATIONS ON NATURAL ENEMIES OF WESTERN SPRUCE BUDWORM
(*CHORISTONEURA OCCIDENTALIS* FREEMAN) (LEPIDOPTERA,
TORTRICIDAE) IN THE ROCKY MOUNTAIN AREA

Howard E. Evans¹

ABSTRACT.—Three species of predators and parasites were found associated with western spruce budworm (*Choristoneura occidentalis* Freeman) (Lepidoptera, Tortricidae) in Larimer Co., Colorado. These were: *Ancistrocerus antilope* (Panzer) (Hymenoptera, Vespidae), *Goniozus gracilicornis* (Kieffer) (Hymenoptera, Bethyridae), and *Ceromasia auricaudata* Townsend (Diptera, Tachinidae). The first two species stored caterpillars in wooden trap nests, while the third was reared from final instar budworms.

Over the past several years I have had an opportunity to observe several predators and parasites of the western spruce budworm (*Choristoneura occidentalis* Freeman) near my home, 23 km west of Livermore, Larimer Co., Colorado. This is an area of open ponderosa pine–Douglas-fir forest at 2,300 m elevation. Spruce budworms occur here regularly on Douglas-fir, in some years causing extensive damage and sometimes tree mortality. Infestations were, however, moderate to low during the period of study (1985–1986). Budworms attain final instar during June and pupate in early July.

METHODS

Some records were obtained by collecting and rearing last instar larvae, but more were obtained from trap nests. Trap nests consisted of pieces of pine 15 cm long and 2 cm square, with a groove (6 or 9 mm in diameter) on one side to which a strip of Plexiglas was taped. A wooden strip was then placed over the Plexiglas; the strip could easily be removed for examination of trap nest contents. Traps were placed 0.3 to 2.5 m above the ground in wood piles or in living or dead trees or attached to my house. They were accepted by several species of bees and wasps, the most abundant of which were two species of *Ancistrocerus*, *adiabatus* (Saussure) and *antilope* (Panzer) (Vespidae, Eumeninae). Both are well-studied species that make a series of cells separated by mud partitions and provisioned with

larvae of Microlepidoptera (references in Krombein 1979). Only *A. antilope* used spruce budworms as prey.

RESULTS

Ancistrocerus antilope (Panzer) (Vespidae). Eleven trap nests with a total of 49 cells were provisioned by females of this species in 1985 (none in 1986). Nests with bores of 6 to 9 mm were accepted, cell lengths varying from 8 to 18 mm (mean 11.8, N = 30) in bores of 8 to 9 mm and from 13 to 22 mm (mean 18.0, N = 19) in bores of 6-mm diameter. Each nest had an outer, empty vestibular cell measuring from 8 to 31 mm in length, as well as an outer closure. No accurate count of prey was made in all cells, but of 8 counted the mean was 5.5 per cell. Thus, the total prey in the 11 nests approximated 270 Microlepidoptera. Of these, 20 (7.4%) were *Choristoneura occidentalis*, the remainder several other species of Microlepidoptera. However, 7 of the 11 nests were provisioned after most of the budworms had pupated. Of 4 nests provisioned prior to 3 July, 8 of the 15 cells contained spruce budworms; 24% of the prey consisted of that species. One nest of 4 cells contained 16 budworms (4 per cell), while another of 3 cells contained 3 budworms and 15 other larvae. After 3 July, no spruce budworms were found in any of the nests.

Two nests had cells parasitized by cuckoo wasps, *Chrysis coeruleans* Fabricius, and two had cells parasitized by flies of the genus *Amo-*

¹Department of Entomology, Colorado State University, Fort Collins, Colorado 80523.

bia (Sarcophagidae). Both have been reared from *Ancistrocerus antilope* previously (Krombein 1967). Three ichneumon wasps, *Pimpla spatulata* Townes, also emerged from one nest. This species was reared by Krombein (1967) from members of two other genera of Vespidae (Eumeninae) in New York.

In eastern North America, spruce budworms (*Choristoneura fumiferana* [Clemens]) have been found to serve as prey of eumenine wasps on several occasions. Fye (1962, 1965) recorded *Ancistrocerus adiabatus* (Saussure), *A. catskill* (Saussure), and *Eudolynerus leucomelas* (Saussure) preying on budworms in Ontario. He felt that it might be possible to take advantage of the wasp's searching abilities to sample populations of this and other species of Microlepidoptera. Jennings and Houseweart (1984) found *A. catskill* and *E. leucomelas* provisioning trap nests with spruce budworms in Piscataquis Co., Maine. *Ancistrocerus antilope* also accepted their traps but provisioned only with *Nephoterix* sp. (Pyrilidae). Western spruce budworms have not previously been reported as prey of *A. antilope*.

Goniozus gracilicornis (Kieffer) (Bethyliidae). On 5 July 1986 I collected a trap nest (3-mm-diameter bore) that contained three cells of a species of *Trypoxylon* (Sphecidae). The cells were at the inner end of the bore, each containing paralyzed spiders and a wasp egg and closed off with a mud partition. Outside of the last partition but 60 mm from the bore opening (which had not been closed) was a paralyzed last instar larva of the western spruce budworm. The larva was 19 mm long and of a thickness such that it barely fit within the trap nest. It bore 20 elongate eggs, each about 0.8 mm long. They were attached longitudinally over much of the dorsal length of the thorax and abdomen. The eggs had not hatched on the following day. However, five days later the larvae had already completed their development, and the remains of the caterpillar were covered with white, silken cocoons. (I was away during these five days and did not observe the progress of the larvae.) Sixteen days later nine female *Goniozus gracilicornis* appeared in the rearing container. I suspect that several more of these minute, flattened wasps had escaped from the container.

It remains a puzzle as to how the budworm larva had been placed in a trap nest with a

bore this small. The trap nest had been attached to a ponderosa pine branch, about a meter above the ground. Pines usually are not hosts of spruce budworms; presumably the larva came from a nearby Douglas-fir. The bethylid wasps measure about 3 mm long, and it is difficult to conceive of a female wasp dragging a prey this large any distance. However, there are records of Bethyliidae of several genera dragging their prey into places of concealment, even though the prey was commonly much larger than the wasp (Yamada 1955, Rubink and Evans 1979). Gordh (1976) remarked that species of *Goniozus* have not been observed moving their prey, but he did note a female *G. gallicola* Fouts attempting to drag paralyzed prey to the side of a container. Also, the type specimen of *G. raptor* Evans was taken "carrying larva of pink bollworm by the head" (Evans 1978). The ability of bethylids to drag their paralyzed prey into a protected place may account for the fact that several species have been reared from stems and galls.

Goniozus gracilicornis has been reared from species of Gelechiidae and Tortricidae (Evans 1978), but from species attacking crop plants rather than trees. Another species of *Goniozus*, *floridanus* (Ashmead), has been reared from *Choristoneura rosaceana* Harris, which attacks broad-leafed trees. Most species of *Goniozus* not only parasitize a variety of Microlepidoptera but also occur in diverse habitats. *Goniozus gracilicornis* is not listed as a parasite of western spruce budworms in Oregon by Carolin and Coulter (1959).

Ceromasia auricaudata Townsend (Tachinidae). In 1985 and again in 1986 I collected 20 final instar larvae of western spruce budworm and reared adults from them. In each year two tachina flies also emerged; all four were *Ceromasia auricaudata*. This species was one of the more prevalent of 10 tachinid species reared from *Choristoneura occidentalis* in Oregon (Carolin and Coulter 1959). Despite the small sample size, it seems safe to categorize this species as one of the more important parasites of the western spruce budworm in the east central Rocky Mountain area.

DISCUSSION

Although these studies were made casually in the course of other research, they add a few

details to the extensive literature on the natural enemies of the western spruce budworm. Jennings and Crawford (1985) suggest several ways in which the effect of natural enemies can be enhanced, such as providing an abundance of flowering plants that serve as nectar sources and providing nest boxes for birds. In the Rocky Mountain area, mountain chickadees, which are major predators on larvae, readily accept nest boxes. Trap nests for wasps can also be made cheaply and, if placed in the field well before budworms pupate, can provide a means of assessing budworm abundance. Trap nests may also provide homeowners with an additional means of protecting their trees.

ACKNOWLEDGMENTS

I thank Mary Alice Evans for assistance with the field work and N. E. Woodley (Systematic Entomology Laboratory, USDA) for identifying the *Ceromasia*.

LITERATURE CITED

- CAROLIN, V. M., AND W. K. COULTER 1959. The occurrence of insect parasites of *Choristoneura fumiferana* (Clem.), in Oregon. *J. Econ. Entomol.* 52: 550-555.
- EVANS, H. E. 1978. The Bethyilidae of America north of Mexico. *Mem. Amer. Entomol. Soc.* 27: 1-332.
- FYE, R. E. 1962. Predation of lepidopterous larvae by solitary wasps. *Bimonthly Progress Rpt.*, Canada Dept. Forestry, Forest Entomol. Pathol. Branch 18: 2-3.
- . 1965. The biology of the Vespidae, Pompilidae, and Sphecidae (Hymenoptera) from trap nests in northwestern Ontario. *Canadian Entomol.* 97: 716-744.
- GORDH, G. 1976. *Goniozus gallicola* Fouts, a parasite of moth larvae, with notes on other bethylids (Hymenoptera: Bethyilidae; Lepidoptera: Gelechiidae). U.S. Dept. Agric., Agric. Res. Service, Tech. Bull. 1524. 27 pp.
- JENNINGS, D. T., AND H. S. CRAWFORD, JR. 1985. Predators of the spruce budworm. U.S. Dept. Agric., Forest Service, Agric. Handbook 644. 77 pp.
- JENNINGS, D. T., AND M. W. HOUSEWEART. 1984. Predation by eumenid wasps (Hymenoptera: Eumenidae) on spruce budworm (Lepidoptera: Tortricidae) and other lepidopterous larvae in spruce-fir forests of Maine. *Ann. Entomol. Soc. Amer.* 77: 39-45.
- KROMBEIN, K. V. 1967. Trap-nesting wasps and bees: life histories, nests, and associates. Smithsonian Press, Washington, D.C. 570 pp.
- . 1979. Superfamily Vespoidea. In K. V. Krombein et al., *Catalog of Hymenoptera in America north of Mexico*. Vol. 2. Aculeata. Smithsonian Press, Washington, D.C.
- RUBINK, W. L., AND H. E. EVANS. 1979. Notes on the nesting behavior of the bethylid wasp, *Epyris erigoni* Kieffer, in southern Texas. *Psyche* 86: 313-319.
- YAMADA, Y. 1955. Studies on the natural enemy of the woollen pest, *Anthrenus verbasci* L. (*Allepyris microneurus* Kieffer) (Hymenoptera, Bethyilidae). *Mushi* 28: 13-30.