

## NATURAL ENEMIES OF BUDWORMS, *CHORISTONEURA* SPP. (LEPIDOPTERA: TORTRICIDAE), ON DOUGLAS FIR NEAR YALE, BRITISH COLUMBIA, IN 1977

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### ABSTRACT

Two species of *Choristoneura* were reared from an infestation on Douglas fir in the Yale-Spuzzum area in 1977: *occidentalis* Free. and an apparently undescribed species. Larvae with parasites averaged 47.6 percent and increased from 14.5 percent in larvae collected early in May to 74 percent in those collected early in July. Pupae with parasitism were 52 percent. Three well-known species of budworm parasites comprised 85 percent of the parasites reared. Eight other species of Lepidoptera were reared from the Douglas fir. One of these, *Dioryctria pseudotsugella* Munroe, becomes a predator on budworm prepupae and pupae when all the foodplant foliage has been consumed by budworms.

### INTRODUCTION

The controversial decision, subsequently revoked, to spray the infestation of budworm in the Fraser Canyon district with chemical pesticides in 1977 was made apparently without adequate evaluation of the importance of parasites and predators that might contribute to the collapse of the outbreak but could be harmed by the pesticides. Surveys were made in the Yale-Spuzzum area of the Canyon in the spring and early summer of 1977 to obtain some indications of the identities and importance of the parasitic insects.

### METHODS

Douglas fir was the only kind of tree seen to be regularly infested heavily; it comprises 0.4 to 68 percent of the trees per acre in that area (data from G. Williams). About 5,000 budworm larvae and pupae were obtained. Collections were made on 7 May, 13 June, and 7 July by taking infested branches from trees. A total of 15 Douglas fir, 20-50 cm in diameter, were felled and sampled but some collections were from small firs of about 5 cm diameter.

*Choristoneura* larvae were selected at random from the branches collected on 7 May and 13 June. Ten groups of 20 from each date were reared separately, for a total of 400. All of the 110 larvae and 603 pupae collected on 7 July were reared individually. Parasites that emerged were sent for identification to the Biosystematics Research Institute, Canada Agriculture, Ottawa. The remainder of the material collected was mass-reared to see if other species of Microlepidoptera were present.

### MICROLEPIDOPTERA REARED

The budworm infestation had been assumed to be of the Western budworm *Choristoneura occidentalis* Free. In fact it included a second species of *Choristoneura* that is probably new and unnamed. *C. occidentalis* was the more abundant of the two by a ratio of ten to one.

Eight other species of Microlepidoptera were reared from the Douglas fir, as follows: *Griselda radicana* Hein., was the most common; *Dioryctria pseudotsugella* Munroe, which is sometimes a predator on the budworms (see below); *Argyrotaenia provana* Kft., *A. dorsalana* Dyar, *Spilonota ocellana* D. & S., *Zeiraphera hesperiana* Mut. and Free.; and two as yet unidentified species of Gelechiidae. These species did not appear to be sufficiently abundant individually or collectively to be a significant pest problem.

### PARASITISM AND PARASITES

Totals of 472 individuals and nine species or species-groups of parasites emerged from the 1121 separately-reared *Choristoneura* larvae and pupae (Table I). An average of 47.6 percent of the larvae and 53.2 percent of the pupae produced parasites. Actual pupal parasitism may have been higher, since parasites had already emerged from some host pupae by the time the collections of 7 July were made. These were not included in the count. Three species, *Glypta fumiferanae*, *Apanteles fumiferanae*, and *Winthemia fumiferanae*, comprised 85 percent of all the parasites reared. They are well-known parasites of budworms, as their names indicate; the eastern spruce budworm is *C. fumiferana* and the species in B.C. was formerly classified under that name.

All the species listed in Table I and 14 additional species emerged from the mass-reared material that included the additional

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TABLE 1. Parasites that emerged from separately-reared *Choristoneura* spp. collected on different dates in 1977 near Yale, B.C.

7 May: 200 2nd and 3rd instar larvae, 29 parasites: 14.5 percent parasitism. Parasite species: <i>Apanteles fumiferanae</i> Vier., <i>Glypta fumiferana</i> (Vier.) and <i>Diadegma</i> sp.
13 June: 200 3rd and 4th instar larvae, 41 parasites: 20.5 percent parasitism. Parasite species: <i>A. fumiferanae</i> , <i>G. fumiferanae</i> , <i>Mesochorus tachypus</i> Holm., which was a secondary parasite on <i>A. fumiferanae</i> , and <i>Gelis tenellus</i> (Say), which was a secondary parasite on <i>M. tachypus</i> .
7 July: 117 4th and 5th instar larvae, 87 parasites: 74.4 percent parasitism. Parasite species: <i>A. fumiferanae</i> , <i>G. fumiferanae</i> , <i>Winthemia fumiferanae</i> Tot., and <i>Itoplectis quadricingulata</i> (Prov.), as a secondary parasite of <i>G. fumiferanae</i> .
7 July: 603 pupae, 315 parasites: 52.2 percent parasitism. Parasite species: <i>W. fumiferanae</i> , <i>Apechthis ontario</i> (Cres.), <i>I. quadricingulata</i> , as a primary parasite, and <i>Phaeogenes hariolus</i> (Cres.).

species of Lepidoptera. The additional species are: *Scambus* (S.) *transgressus* (Holm.), *Mesochorus tachypus* Holmg., *Apanteles renaulti* Mason, *Microchelonus*, n. sp. near *isolatus*, *Ascogaster argentifrons* Prov., *Elasmus atratus* (How.), *Di cladocerus nearcticus* Yshm., *Polynema* sp., *Chrysocharis thomsoni* (Crawf.), two unidentified species of *Habrocytus*, *Pseudencyrtus* sp., and *Dendrocercus* (*Macrostigmia*) sp.

#### DISEASES

Proportions of the larvae or pupae that died without producing either moths or insect parasites were: 7 May collection, 14 percent; 13 June, 8 percent; 6 July, 24 percent of larvae and 10 percent of pupae. The causes of deaths were not identified, although many of the dead larvae contained a fungus. The incidence of disease in the reared material is not a reliable indication of its incidence in the field as diseases were not surveyed in the field and many deaths in the laboratory may have been a consequence of rearing conditions.

#### PREDATION BY A PYRALID

Predation was not surveyed in the field. In the laboratory larvae of the pyralid moth *Diorcytria pseudotsugella* were observed feeding on budworm prepupae and pupae at a rate of one or two per larva per day. Tests showed that, when given the choice, the larva prefers

to feed on fresh foliage of Douglas fir and attacks budworms only if such foliage is not available. In the field *D. pseudotsugella* normally feeds on the new needle growth that is also eaten by the budworms but, as it appears about a month later than the budworms and develops more slowly, the budworms may consume all its potential food supply so that if it is to survive its only alternative is to feed on the budworms.

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