

A review of the tachinid parasitoids (Diptera: Tachinidae) of Nearctic *Choristoneura* species (Lepidoptera: Tortricidae), with keys to adults and puparia

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Abstract

The genus *Choristoneura* (Lepidoptera: Tortricidae) comprises about 16 species in the Nearctic Region and includes several destructive pests of importance to forestry and agriculture. The following 15 species of Tachinidae (Diptera) are recognized as occasional or common parasitoids of *Choristoneura* species in this region: *Actia diffidens* Curran, *Actia interrupta* Curran, *Ceromasia auricaudata* Townsend, *Compsilura concinnata* (Meigen), *Cyzenis incrassata* (Smith), *Eumea caesar* (Aldrich), *Hemisturmia parva* (Bigot), *Hyphantrophaga blanda* (Osten Sacken), *Hyphantrophaga virilis* (Aldrich and Webber), *Lypha fumipennis* Brooks, *Madremyia saundersii* (Williston), *Nemorilla pyste* (Walker), *Nilea erecta* (Coquillett), *Phryxe pecosensis* (Townsend), and *Smidtia fumiferanae* (Tothill). Keys to the adults and puparia of these tachinid species are provided. The known distribution, biology, and rates of parasitism are reviewed for each species and published host records from *Choristoneura* species are listed. Colour habitus images of adults, illustrations of all puparia, and illustrations of features mentioned in the adult key are included. Thirteen other species of Tachinidae recorded from *Choristoneura* species but excluded from the main text as highly dubious, rare, or accidental records are briefly discussed.

Key words: Tachinidae, *Choristoneura*, Nearctic, keys

Introduction

The genus *Choristoneura* (Lepidoptera: Tortricidae) comprises about 16 species of defoliators in the Nearctic Region (Dang 1992). These species include such destructive forestry pests as the spruce budworm (*C. fumiferana* (Clemens)), western spruce budworm (*C. occidentalis* Freeman), two-year cycle spruce budworm (*C. biennis* Freeman), jack pine budworm (*C. pinus* Freeman) and large aspen tortrix (*C. conflictana* (Walker)), as well as the agriculturally important obliquebanded leafroller (*C. rosaceana* (Harris)). Conifer-feeding *Choristoneura* species periodically attain outbreak status in the forests of Canada and the United States, causing considerable economic losses to the forestry industry and attracting great research interest in their biology and control. The developing resistance of the obliquebanded leafroller to certain chemical insecticides in apple orchards and other agricultural crops (Pree *et al.* 2001) has heightened research interest in this species. The destructiveness of these species has made *Choristoneura* one of the most studied genera in the Lepidoptera (Otvos 1991; Sanders 1991).

There have been many studies on the natural control factors that help to keep populations of *Choristoneura* species in check. Among the most important control factors are endoparasitoids, which attack all life stages of *Choristoneura* species. The best studied species, *C. fumiferana*, has a primary parasitoid complement of more than 90 species (Huber *et al.* 1996). Most endoparasitoids of *Choristoneura* species are Hymenoptera in the families Braconidae and Ichneumonidae or Diptera in the family Tachinidae.

This paper focuses on the tachinid parasitoids of Nearctic *Choristoneura* species. Fifteen species are recognized as occasional or common parasitoids of nine Nearctic *Choris-*