

CAPTURE OF *CHORISTONEURA PINUS MARITIMA* IN TRAPS
BAITED WITH *C. PINUS PINUS* PHEROMONE
COMPONENTS (TORTRICIDAE)

Additional key words: mating behavior, budworm, attractant, Massachusetts.

Species relations among conifer-feeding *Choristoneura* (Tortricidae) have received increased attention because many *Choristoneura* species are economic pests. The polymorphic nature and extensive overlap of morphological characters among species has made species identification within the genus difficult.

Choristoneura pinus maritima Freeman is rarely collected but has been recorded in northeastern North America from Nova Scotia south to Kentucky (Freeman, T. N. 1967, Can. Entomol. 99:449-455; Powell, J. A. 1980, Nomenclature of nearctic conifer-feeding *Choristoneura* (Lepidoptera: Tortricidae): Historical review and present status. U.S.D.A. For. Ser. Pac. NW For. Range Exp. Sta., Gen. Tech. Rep. PNW-100, 18 pp.; Harvey, G. T. 1985, pp. 16-48 in Sanders, C. J., R. W. Stark, E. J. Mullins & J. Murphy (eds.), Recent advances in spruce budworms research: Proceedings, CANUSA Spruce Budworms Research Symposium, Bangor, Maine, 527 pp.). It is differentiated from *C. pinus pinus* by morphological features and by its association with *Pinus rigida* Mill (*C. pinus pinus* feeds primarily on *P. banksiana* Lamb).

Sex-pheromone components have been documented for several *Choristoneura* species (Silk, P. J. & L. P. S. Kuenen. 1988, Ann. Rev. Entomol. 33:83-101). This information is useful for understanding species relations within the genus because reproductive isolation between sympatric species is mediated by sex-pheromone specificity. P. J. Silk, L. P. S. Kuenen, S. H. Tan, W. L. Roelofs, C. J. Sanders and A. R. Alford (1985, J. Chem. Ecol. 11:159-167) identified a mixture of (85:15) (E:Z)-11-tetradecenyl acetates (90%) and (85:15) (E:Z)-11-tetradecenyl alcohols (10%) from virgin female *C. pinus pinus*. This mixture was as attractive as virgin female *C. pinus pinus* in field tests. We conducted this study to determine if *C. pinus maritima* populations are attracted to traps baited with *C. pinus pinus* pheromone components.

All field tests were done in a mature stand of *Pinus rigida* at Bourne, Cape Cod, Massachusetts. Three component mixtures were compared: a 1:1 ratio of (85:15) (E:Z)-11-tetradecenyl acetates: (85:15) (E:Z)-11-tetradecenyl alcohols (0.3% by weight); a 1:1 ratio (0.003% by weight); and a 9:1 mixture (0.03% by weight). Mixtures were incorporated and dispensed from a polyvinyl chloride rod (Fitzgerald, T. D., A. D. St. Clair, G. E. Daterman & R. G. Smith 1973, Environ. Entomol. 2:607-610) placed in a Pherocon 1CP trap (Zoecon Corp., Palo Alto, California). Each mixture was replicated 12 times; control (unbaited) traps were replicated 10 times. Traps were deployed randomly in a grid (40 m between each trap point) on July 3, 1986; all trapped *Choristoneura* were counted August 10. A subset of 12 trapped males was degreased, curated, and identified as *C. pinus maritima*. All four treatments were compared using six pairwise Wilcoxon two-sample tests. The experiment-wide error rate was controlled by using a smaller pairwise alpha level (0.0085) calculated from Sidak's inequality (Sokal, R. P. & F. J. Rohlf 1981, Biometry. 2nd ed. Freeman and Company, San Francisco, California, 859 pp.).

The 1:1 AC:OH (0.3%) pheromone mixture and the 9:1 AC:OH (0.03%) mixture captured significantly more males than both the controls and the 1:1 AC:OH (0.003%) mixture (Table 1). However, there was no significant difference in trap captures between the 1:1 AC:OH (0.3%) and the 9:1 AC:OH mixtures.

These results indicate that male *C. pinus maritima* are attracted to the primary sex-pheromone components of *C. pinus pinus*. This finding indicates a behavioral similarity between *C. pinus maritima* and *C. pinus pinus*. However, potential hybridization between these subspecies can only be determined from cross-attraction experiments. Unfortunately, *C. pinus maritima* apparently exists at very low densities; thus collection of adequate experimental material for these tests may be impossible. Nevertheless, the attraction of *C. pinus maritima* to *C. pinus pinus* pheromone components should be useful in future studies of the geographic range of *C. pinus* populations and analyses of morphological variation among these populations.

TABLE 1. Numbers of *C. pinus maritima* captured in traps baited with *C. pinus pinus* sex pheromone components.

Ratio of (85:15) (E:Z)-11-14:Ac to (85:15) (E:Z)-11-14:OH	% concentration by weight	Mean number of males per trap ¹
1:1	0.3	3.75 a
9:1	0.03	4.08 a
1:1	0.003	0.50 b
control		0.00 b

¹ Means followed by different letters are significantly different ($P < 0.0085$), Wilcoxon two-sample test.

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PARASITOID AND LARVAL FOOD PLANT RECORDS FOR THREE PERUVIAN MOTHS (ARCTIIDAE, SATURNIIDAE)

Additional key words: *Dysschema*, *Carales*, *Automeris*, Braconidae, Tachinidae.

The following are parasitoid and larval food plant records for three moths: two species of Arctiidae and one species of Saturniidae, reared from larvae found in the field. The larvae were collected during August and September of 1987, 31 km NE of Villa Rica in the Pasco Department of Peru. Identifications of moths were based on adults reared from larvae presumed to be the same as those parasitized.

Dysschema sacrifica (Hubner) (Arctiidae: Pericopinae) larvae and adults were very common. Larvae were reared on *Bidens* sp. (Asteraceae). Two *D. sacrifica* larvae (J87-34(1) and J87-34(2)) were hosts to *Cotesia* (Hymenoptera: Braconidae), probably representing two species. The braconid larvae in both cases emerged from the larvae and spun cocoons on the cuticle of their live hosts (35 cocoons were spun on J87-34(2)). The adult *Cotesia* eclosed from the cocoons over a period of several days, during which time the larvae walked rapidly around the rearing containers. *Cotesia* is a large, ubiquitous genus (over 1500 species) that parasitizes macrolepidoptera. Arctiids have been known to serve as hosts in North America (Mason, W. R. M. 1981, Mem. Entomol. Soc. Canada, 115:1-147).

A larva (J87-79) of *Carales astur* (Cramer) (Arctiidae: Arctiinae: Phaegopterini), feeding on *Citrus* sp. (Rutaceae), also hosted a braconid parasite, *Parapanteles* sp. Species of *Parapanteles* previously have been recorded as using Notodontidae and Noctuidae as hosts (Mason 1981, *op. cit.*), so this record broadens the known host range. The *Parapanteles* larvae emerged from the body of their host (Fig. 1), then left it and spun their