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Parasites, Predators, and Other Arthropods Associated with *Choristoneura houstonana* (Lepidoptera: Tortricidae) on *Juniperus* Species in Kansas

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Parasites, Predators, and Other Arthropods Associated with *Choristoneura houstonana* (Lepidoptera: Tortricidae) on *Juniperus* Species in Kansas[1]

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Abstract

One parasitic dipterous species and 27 parasitic hymenopterous species were collected. Parasites were primarily collected by mass-rearing host larvae on cut host plant foliage in the laboratory or by rearing larvae on artificial diet. The tachinid *Nemorilla pyste* (Walk.) and five hymenopterous species, *Glypta* n. sp. (Ichneumonidae), *Campoplex* sp. (Ichneumonidae), *Agathis acrobasidis* (Cushman) (Braconidae), *Elasmus atratus* How. (Eulophidae), and *Catolaccus aeneoviridis* Girault (Pteromalidae), were definite parasites, and biological notes are given. Collection data are also given for the other 22 species.

One reduviid predator, *Zelus socius* Uhler, and six spiders were observed feeding on *C. houstonana*.

Introduction

While the biology of *Choristoneura houstonana* (Grote), a pest of juniper in windbreak and ornamental plantings in western Kansas, was being studied, a number of parasites, predators, and associated arthropods were collected. Some were definite parasites and predators, while the relationship between *C. houstonana* and the others, termed "associates," was not determined.

Powell (1962) listed four parasites of *C. houstonana* in California: one eulophid, *Tetrastichus coerulescens* Ashm., and three ichneumonids, *Glypta* sp., *Campoplex* sp. nr. *hyalinus* (Prov.), and *Pristomerus* sp.

Materials and Methods

Foliage infested with larvae and pupae of *C. houstonana* was collected periodically in the summer of 1965 and placed in a screen wire cage, and parasites were collected when they emerged. More intensive parasite collecting began in March 1966. Overwintering larvae were collected, removed from hibernacula within mined juniper leaves, and reared on artificial diet in plastic jelly cups.[2] When parasitic larvae were observed, notes on their biology were taken daily. Foliage infested with late instar larvae and eggs was collected in May, June, July, and August, 1966, and placed in 20-gal garbage cans or cardboard boxes with a glass jar attached near the top, into which newly emerged parasites were attracted by light.

In July 1966, parasites hovering over juniper trees heavily infested with *C. houstonana* pupae were collected with an insect net.

Parasites were identified by specialists of the Insect Identification and Parasite Introduction Research Division, Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture. Ichneumonidae were identified by L. M. Walkley; Chalcidoidea by B. D. Burks; Scelionidae, Braconidae, and Platygasteridae by P. M. Marsh; and Tachinidae by C. W. Sabrosky.

Insect predators feeding on *C. houstonana* larvae on foliage in the laboratory were collected. The Reduviidae were identified by R. C. Froeschner of the Smithsonian Institution. Spiders were collected from infested foliage brought to the laboratory for *C. houstonana* and parasite rearing or were shaken into a white cloth placed around the base of an infested tree and placed in ethanol. They were identified by Harriet Exline of Rolla, Mo.

Results

One dipterous and 27 hymenopterous parasite species were collected. Six were observed parasitizing *C. houstonana*. One insect and 22 spider predators were collected. The insect and six species of spiders were seen preying upon *C. houstonana*.

Parasites

Diptera, Tachinidae

Nemorilla pyste (Walk.): 1,000+ males and females ex mass rearing material, and larvae reared on artificial diet, collected in Smith, Phillips, Rooks, Pawnee, Barton, and Pratt counties, 3 June–7 July 1966; emerged June–August 1966. As many as eight white, macrotype eggs were deposited on one larva. Host larvae with one to eight eggs each were reared in the laboratory to determine how many adults would emerge per host larva. Two adults emerging from one larva was the only instance of more than a single parasite per host. Parasite eggs were deposited mostly on late instar larvae, present in early June. Eggs were first observed in Pawnee County in 1966 on 3 June when 3.85% of the larvae were infested. On 8 June, 22.8% were infested and by 16 June, 54% of the larvae had parasite eggs.

Eggs were deposited mostly on the head (12.6%), prothorax (42.4%), and mesothorax (33.6%) (Table I). Eggs were laid on the ventral, lateral, and dorsal areas in approximately

equal numbers. Eggs were attached to the larval cuticle with the long axis parallel to the surface of the host skin. An *N. pyste* larva, upon hatching, emerged from a break at one end of the egg just above the area where it was attached. Infested host larvae had dark spots in the epidermal area, which appeared to be damaged tissue. Apparently these were areas where the parasite larvae entered the body of the host. The fully grown *N. pyste* larva left the host pupa through a break which it made between two abdominal segments on the host dorsum. It then moved to a location between the host pupa and the cocoon wall and pupated. Pupation lasted about 1 week. Occasionally a parasite destroyed the last larval stage in the laboratory and then pupated, but usually it emerged from the host pupa. The life cycle on *C. houstonana* requires about 1 month.

Table I. Per cent of *Nenzorilla pyste* eggs on the head, thoracic and abdominal segments 1–10 of *C. houstonana* larvae, collected in Kansas, 1966

		Location of eggs								
			Thorax			Abdomen				
Date	County	Head	Pro-	Meso-	Meta-	1	2	3	4	5–10
June 8	Pawnee	29.7	46.0	18.9	5.4	0.0	0.0	0.0	0.0	0.0
June 16	Pawnee	18.3	25.1	45.9	8.9	0.8	0.0	0.8	0.0	0.0
June 23	Pawnee	10.0	71.0	13.0	6.0	0.0	0.0	0.0	0.0	0.0
June 23	Smith	5.0	20.0	40.0	15.0	15.0	0.0	0.0	5.0	0.0
June 23	Pratt	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
Average		12.6	42.4	33.6	7.1	3.1	0.0	0.2	1.0	0.0

Hymenoptera, Ichneumonidae

Glypta n. sp.: 14 ex mass rearing material and host larvae reared on artificial diet collected in Pawnee and Pratt counties, 25 March–15 July 1966; emerged 1 June–2 July (host on artificial diet) and 7 July–1 August 1966 (mass rearing). Parasite larvae emerged from either eighth or ninth instar host larvae. The parasite in preparation for pupation spun a few strands of silk and attached the posterior end of the abdomen to it. It pupated 4 days after leaving the body of the host larva. Four days after molting to the pupal stage, the pupa darkened in color. The pupal stage lasted 8 days. This may be the same *Glypta* sp. Powell (1962) reared from *C. houstonana* in California.

Campoplex sp.: 2 ex mass rearing material and larva reared on artificial diet collected in Smith and Pawnee counties, 11 April and 23 June 1966; emerged 8 July 1966. The parasite reared from the host on artificial diet died in the pupal stage. It emerged from a seventh instar host larva and pupated in a two-layered silken cocoon. A *Campoplex* sp. nr. *hyalinus* (Prov.) was reared from a penultimate instar *C. houstonana* by Powell (1962).

Braconidae

Agathis acrobasidis (Cushman): 64 ex mass rearing material larvae on artificial diet and larvae reared on seedling juniper collected in Rooks, Pawnee, and Pratt counties, 25 March–15 July 1966; emerged 17 May 1966 (host on artificial diet) and 1 July–2 August 1966 (mass rearing). This parasite apparently overwinters in *C. houstonana*. The two parasites reared

from hosts feeding on diet and a seedling juniper in the laboratory destroyed seventh instar larvae. The pupal stage lasted about 10 days.

Eulophidae

Elasmus atratus How.: 9 males and 8 females ex mass rearing material and larvae reared on artificial diet, collected in Pawnee and Pratt counties, 16 May–8 June 1966; emerged 3 June (host on artificial diet)–16 June 1966 (mass rearing). One parasite emerged from a fifth and another from a seventh instar larva. Pupal stage lasted 7 days.

Pteromalidae

Catolaccus aeneoviridis Girault: 11 males and 3 females ex mass rearing material and host larvae reared on artificial diet, collected in Pawnee and Pratt counties, 16 May–15 July 1966; emerged 24 June–15 July 1966. This species was considered a secondary parasite of *C. houstonana* because one adult parasite emerged from what appeared to be a dipterous pupa, probably *N. pyste*, which was located within a *C. houstonana* pupa. The adult emergence hole measured 0.87 × 0.68 mm and was located in the center of the *C. houstonana* pupa and nearest to the posterior end of the primary parasite pupa.

Associated Parasites

Ichneumonidae

Itoplectis conquisitor (Say): 32 ex mass rearing material collected in Rooks and(or) Pawnee County, June–July 1965; emerged June–July 1965. *I. conquisitor* was a very common parasite in 1965, but no specimens were collected in 1966. It is parasitic on many lepidopterous larvae.

Pimpla aequalis (Prov.): 2 females ex mass rearing material collected in Rooks County, 15 July 1966; emerged prior to 10 August 1966.

Temelucha sp. (? or spp.): 12 ex mass rearing material collected in Smith, Rooks, Pawnee, and Pratt counties, 1 June–15 July 1966; emerged 6 June–4 August 1966.

Toxophoroides albomarginatus albomarginatus (Cress.): 5 ex mass rearing material collected in Smith, Rooks, Pawnee, and Pratt counties, 23 June–6 July 1966; emerged 12 July–30 July 1966.

Pristomerus sp.: 1 female ex mass rearing material collected in Smith County 23 June 1966; emerged prior to 10 August 1966. Powell (1962) reared one female from *C. houstonana*-infested juniper foliage.

Braconidae

Hypomicrogaster zonaria (Say): 1 ex mass rearing material, collection locality unknown, 16 May 1966; emerged 26 May 1966.

Apanteles canarsiae Ashm.: 1 ex mass rearing material collected in Pawnee County, 16 May 1966; emerged on an undetermined date during May or June 1966.

Apanteles griffini Vier.: 5 ex mass rearing material collected in Pawnee and Pratt counties, 16 May–16 June 1966; emerged 23 May–24 June 1966.

Chelonus (*Microchelonus*) sp.: 2 ex mass rearing material collected in Pawnee County, 1 June 1966; emerged 11 June 1966.

Chalcididae

Brachymeria hammri (Cwfd.): 4 males and 1 female ex mass rearing material and collected with an insect net in Rooks and Pawnee counties 15 July 1966; mass-reared insects emerged 23 July 1966.

Brachymeria ovata (Say): 18 males and 3 females ex mass rearing material and collected with an insect net in Smith, Pawnee, Rooks, and Pratt counties, 6 July–15 July 1966; emerged 11 July–15 July 1966. *B. ovata* was collected with an insect net over *J. virginiana* infested with *C. houstonana* pupae, 15 July 1966, at 2 p.m. in Rooks County.

Brachymeria compsilurae (Cwfd.): 1 male ex mass rearing material collected at either Rooks or Pawnee County, June 1965; emerged on an undetermined date during June or July 1965.

Spilochalcis flavopicta (Cress.): 2 males and 3 females ex mass rearing material collected in Smith and Rooks counties 7 July–15 July 1966; emerged 13 July–23 July 1966.

Encyrtidae

Chrysophagus compressicornis Ashm.: 1 female ex mass rearing material collected in Pawnee County, 16 May 1966; emerged 31 May 1966.

Copidosoma sp.: 1 ex mass rearing material collected in Smith County, 15 July 1966; emerged prior to 10 August 1966.

Eurytomidae

Eurytoma sp.: 4 males and 6 females ex mass rearing material collected in Smith, Rooks, and Pawnee counties, 15 July 1966; emerged 18 July–23 July 1966.

Eulophidae

Elachertus marylandicus Girault: 4 females ex mass rearing material collected in Pawnee County, 15 July 1966; emerged prior to 10 August 1966.

Dimmockia incongrua (Ashm.): 6 ex mass rearing material collected in Pawnee County, 10 May 1966; emerged on an undetermined date during May or June 1966.

Tetrastichus coerulescens Ashm.: 1 female ex mass rearing material collected in Pratt County, 1 June 1966; emerged 11 June 1966. Powell (1962) reared *T. coerulescens* from *C. houstonana* and he stated that according to Dr. B. D. Burks it probably was a secondary associate.

Tetrastichus sp.: 1 female ex mass rearing material collected in Pawnee County, 16 May 1966; emerged 31 May 1966.

Pteromalidae

Dibrachys cavus (Wlkr.): approximately 52 ex mass rearing material collected in Pawnee County, 23 June–15 July 1966; emerged 7 July–19 July 1966.

Torymidae
Torymus ebrius (O.S.): 2 females ex mass rearing material collected in Pawnee County, 16 May 1966; emerged 27 May 1966.

Torymus sp.: 4 males ex mass rearing material collected in Pawnee County, 16 May 1966; emerged 23 May–5 June 1966.

Eupelmidae
Eupelmus sp.: 1 male ex mass rearing material collected in Pratt County, 16 May 1966; emerged 19 June 1966.

Mymaridae
Acmopolynema bifasciatipennis (Girault): 1 male ex mass rearing material collected in Pratt County, 16 June 1966; emerged 19 June 1966.

Scelionidae
Telenomus sp.: 4 ex mass rearing material collected in Smith and Rooks counties, 7 July–17 July 1966; emerged 11 July–20 July 1966.

Idris sp.: 6 ex mass rearing material collected in Pawnee County, 30 July 1966; emerged prior to 10 August 1966.

Platygasteridae
Amblyaspis sp.: 2 ex mass rearing material collected in Smith County, 15 July 1966; emerged prior to 10 August 1966.

Predators

Insecta, Reduviidae
Zelus socius Uhler: 2 nymphs and 1 adult ex foliage returned to the laboratory from Pawnee County, 29 March and 7 July 1966. Nymphs were observed feeding on half-grown *C. houstonana* larvae. Adult was feeding on an adult *C. houstonana*.

Arachnida, Thomisidae
Xysticus ferox (Hentz.): 1 female, collection locality and date unknown. It was feeding on an adult in a parasite collection jar in the laboratory.

Dictynidae
Dictyna bellans Chamberlin: 3 males, 19 females, and 7 immatures collected in Smith, Pawnee, and Rooks counties ex trees and ex foliage returned to the laboratory, 14 April–23 June 1966. Two females and one immature were observed feeding on half-grown larvae in the laboratory.

Dictyna volucripes Keyserling: 6 females and 1 immature collected in Pawnee County ex trees and ex foliage returned to the laboratory, 16 May–23 June 1966. One immature was observed feeding on a half-grown larva in the laboratory.

Epeiridae
Eustala ? *anastera* (Walckenaer): 1 immature collected in Pawnee County ex tree, July 1966. It was feeding at night on an adult caught in a spider web.

Salticidae
Eris vitis (Cock.): 1 male, 1 female, and 3 immatures collected in Smith, Rooks, and Pawnee counties ex trees and ex foliage; returned to the laboratory, 8 June–23 June 1966. One immature was observed feeding on a half-grown larva in the laboratory.

Phidippus rimator (Walckenaer): 3 immatures ex foliage returned to the laboratory from Smith, Pawnee, and Pratt counties, collection date unknown. One specimen was observed feeding on a half-grown larva in the laboratory.

Associated Predators

Arachnida, Theridiidae
Theridion murarium Emerton: 6 males, 16 females, and 7 immatures collected in Pawnee County ex trees, 15 March–15 June 1966.

Theridion sp.: 1 immature collected in Pawnee County ex tree, 2 May 1966.

Thomisidae
Misumenops sp.: 3 immatures collected in Pawnee and Pratt counties ex trees, 16 May–16 June 1966.

Philodromus cespiticolis (Walckenaer): 1 female and 5 immatures collected in Rooks and Pawnee counties ex trees, 16 May–23 June 1966.

Philodromus keyserlingi Marx: 2 females and 1 immature collected in Smith and Pawnee counties ex trees, 2 May–23 June 1966.

Argiopidae
Argiopidae sp.: 1 immature collected in Pawnee County ex trees, 16 May 1966.

Clubionidae
Chiracanthium inclusum (Hentz): 1 immature ex foliage returned to the laboratory from Pratt County, 16 June 1966.

Dictynidae
Dictyna reticulata Gertsch and Ivie: 1 male, 1 female, and 1 immature collected in Rooks and Pawnee counties ex trees, 15 June–23 June 1966.

Gnaphosidae
Drasyllus ? sp.: 1 immature collected in Pawnee County ex trees, 2 May 1966.

Oxyopidae
Oxyopes scalaris Hentz: 3 males and 1 female collected in Pawnee County ex trees, 5 May–1 June 1966.

Salticidae

Gertschia noxiosa (Hentz): 1 male collected in Pawnee County ex trees, 16 May 1966.

Habrocestum pulex (Hentz): 1 male ex foliage returned to the laboratory from Pawnee County, 16 May 1966.

Metahidippus galathea (Walckenaer): 2 females collected in Pawnee County ex trees, 1 May–26 June 1966.

Phidippus audax (Hentz): 2 immatures ex foliage returned to the laboratory from Pawnee and Pratt counties, 23 June–25 June 1966.

Phidippus incertus Peckham: 1 immature ex foliage returned to the laboratory, collection locality unknown, 24 June 1966.

Linyphiidae

Frontinella communis (Hentz): 1 immature ex foliage returned to the laboratory from Rooks County, 14 April 1966.

Notes

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2. Premium Plastics Co., 2440 S. Indiana Ave., Chicago, Ill., No. 6916.

Reference

Powell, J. A. 1962. Host-parasite relationships of California Tortricinae (Lepidoptera: Tortricidae). *The Pan-Pacific Entomologist* 38: 131–140.