

A new parasitoid (Diptera: Tachinidae) of *Acanthocinus princeps* (Coleoptera: Cerambycidae) in North America

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ABSTRACT

An undescribed species of *Billaea* Robineau-Desvoidy was reared from field-collected larvae of *Acanthocinus princeps* (Walker) maintained on artificial diet in the laboratory. *Billaea* is a novel larval parasitoid for *A. princeps* with natural parasitism levels of ca. 28%.

Key words: *Acanthocinus*, *Billaea*, larval parasitoid, *Monochamus*

INTRODUCTION

Cerambycid beetles are host to many parasitoids in the orders Hymenoptera (Linsley 1961; Krombein *et al.* 1979; Woolwine *et al.* 1996) and Diptera (Linsley 1961; Arnaud 1978; Campadelli and Gardenghi 1991; Tsankov and Georgiev 1991). Twelve species of Tachinidae, including *Zelia vertebrata* (Say), *Lixophaga variabilis* (Coquillet), *Ptilodexia canescens* (Walker) and *Chetogena floridensis* (Townsend) and eight species of *Billaea* Robineau-Desvoidy (Table 1), have been confirmed as larval or pupal parasitoids of Cerambycidae (Arnaud 1978; Campadelli and Gardenghi 1991; Tsankov and Georgiev 1991). We report the occurrence of a ninth, undescribed, species of *Billaea* reared from cerambycid larvae from British Columbia.

MATERIALS AND METHODS

In October and November of 1998 a total of 539 cerambycid larvae of the genera *Acanthocinus* and *Monochamus* were collected from beneath the bark of burned ponderosa pine, *Pinus ponderosae* P. Laws. ex C. Laws., about 17 km north of Lytton, B.C. on the Izman Forest Service Road of the Lillooet Forest District. We did not differentiate between larvae of the two genera. Each larva was immediately placed in artificial media [diet number three in Payne *et al.* (1975)] in a separate 60 mL glass jar. Temperature was maintained at 30°C through 17 November 1998, and then at 10, 15 and 6°C from 17 November 1998 to 8 January 1999, 8 January – 28 February 1999, and 28 February – 28 March 1999, respectively, to simulate diapause conditions. The photoregime was 14:10 L:D and the relative humidity was ca. 55%. To ensure consistency in the quality of food, all larvae were transferred to clean jars containing fresh diet at monthly intervals.

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RESULTS AND DISCUSSION

When the rearing programme was terminated in May 1999, 176 larvae were still alive, and 104 adult beetles, mostly *Acanthocinus princeps* (Walker) with a few *Monochamus scutellatus* (Say) (exact counts not kept) had eclosed. Of the 259 larvae that died, 151 had been parasitized by an undescribed *Billaea* Robineau-Desvoidy species (D. M. Wood¹ and J. E. O'Hara¹ pers. comm.). The cause of mortality is unknown for the remaining 108 larvae. A total of 56 of the parasitoid larvae were reared to adulthood. Parasitism by *Billaea* n. sp. exceeded 28% of the larvae originally collected, indicating that this tachinid is a significant source of mortality. This level of parasitism is much higher than the 0.6-7.5% levels of parasitism of *M. scutellatus* by *B. monohammi* (Townsend) (Soper and Olsen 1963), but is similar to levels of parasitism of *Saperda scalaris* L. by *B. triangulifera* Zetterstedt (Campadelli and Gardenghi 1991) and *S. populnea* L. by *B. irrorata* (Meigen) (Tsankov and Georgiev 1991) (28% and 9-19%, respectively).

Table 1

Cerambycid host records for the genus *Billaea* Robineau-Desvoidy (Diptera: Tachinidae) in North America and Europe. Nine species are currently placed in *Billaea* in North America (Wood 1987).

Location	Parasitoid	Host	Reference
North America	<i>B. rutilans</i> (F.) ¹	<i>Enapholodes atomarius</i> (Drury)	Fattig 1949
	<i>B. monohammi</i> (Townsend) ^{1,2}	<i>Monochamus scutellatus</i> (Say)	Aldrich 1932
		<i>M. notatus</i> (Drury)	Soper and Olson 1963
		<i>M. titillator</i> (F.)	Savely 1939
	<i>B. nipigonensis</i> Curran? ³	<i>Rhagium inquisitor</i> (L.) ⁴	Thomas 1955
	<i>B. sp. prob. satisfacta</i> (West) ³	<i>R. inquisitor</i>	Soper and Olson 1963
	<i>B. trivittata</i> (Curran) ³	<i>M. notatus</i>	Thomas 1955
		<i>M. scutellatus</i>	Thomas 1955
		<i>M. titillator</i>	Savely 1939
		<i>R. inquisitor</i> ⁴	Thomas 1955
	<i>B. interrupta</i> (Curran) ⁵	<i>Acanthocinus obseletus</i> (Curran)	Linsley and Chemsak 1995
Europe	<i>B. triangulifera</i> Zetterstedt	<i>Saperda scalaris</i> L.	Campadelli and Gardenghi 1991
	<i>B. irrorata</i> (Meigen)	<i>Saperda populnea</i> (L.)	Tsankov and Georgiev 1991

¹ reported as *Theresia* (Savely 1939; Fattig 1949)

² reported as *Eutheresia* (Soper and Olson 1963)

³ reported as *Eutheresia* (Thomas 1955)

⁴ reported as *Stenocorus inquisitor* (Thomas 1955)

⁵ reported as *Eutheresia* (Linsley and Chemsak 1995)

The remains of two larvae from which *Billaea* n. sp. larvae had emerged were retained for identification. In both instances, the host larva was not completely consumed and the parasitoid larva had emerged from the posterior abdomen. The larval characteristics of both specimens were consistent with those of the genus *Acanthocinus* (Craighead 1923; and Duffy 1953), confirming *A. princeps* as a host of *Billaea* n. sp. This is not the first record of parasitism by a *Billaea* sp. of a host in the genus *Acanthocinus* (Table 1) although it is a novel host record for *A. princeps*. Voucher specimens of adult *Billaea* n. sp. have been

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deposited in the Canadian National Collection¹ ($n=6$) and at the Pacific Forestry Centre ($n=50$), Victoria, BC. The two specimens of *A. princeps* from which *Billaea* n. sp. emerged have also been deposited at the Pacific Forestry Centre.

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REFERENCES

- Aldrich, J.M. 1932. Records of Dipterous insects of the family Tachinidae reared by the late George Dimmock, with descriptions of one new species and notes on the genus *Anetia* Robineau-Desvoidy. *Proceedings of the United States National Museum* 80: 1-8.
- Arnaud, P.H. Jr. 1978. A Host-Parasite Catalog of North American Tachinidae (Diptera). Science and Education Administration: United States Department of Agriculture, Washington, D.C.
- Campadelli, G. and G. Gardenghi. 1991. Biological notes on *Billaea triangulifera* Zett. (Dipt. Tachinidae), a parasitoid of *Saperda scalaris* L. (Col. Cerambycidae) (abstr.). *Bolletino Dell'Istituto Di entomologia della Universitata Degli Studi Di Bologna* 45: 181-189.
- Craighead, F.C. 1923. North American cerambycid larvae. *Bulletin of the Department of Agriculture, Canada*. 27:1-239.
- Duffy, E.A.J. 1953. A Monograph of the Immature Stages of British and Imported Timber Beetles (Cerambycidae). *British Museum (Natural History)*, London.
- Fattig, P.W. 1949. The Larvaevoridae (Tachinidae) or parasitic flies of Georgia. *Bulletin of the Emory University of Georgia Museum* 8:1-40.
- Krombein, K.V., P.D. Hurd, Jr., D.R. Smith and B.D. Burks (Eds.). 1979. *Catalog of the Hymenoptera in America north of Mexico*. Vol. 1. Smithsonian Institution Press, Washington, D.C.
- Linsley, E.G. 1961. The Cerambycidae of North America. Part I: Introduction. University of California Press. Berkeley and Los Angeles. Publication Number 18.
- Linsley, E.G. and J.A. Chemsak. 1995. The Cerambycidae of North America, Part VII, No. 2: Taxonomy and Classification of the Subfamily Lamiinae, Tribes Acanthocini through Hemilophini. University of California Press. Berkeley, Los Angeles and London. Publication Number 114.
- Payne, J.A., H. Lowman and R.R. Pate. 1975. Artificial diets for rearing the tilehorned *Prionus*. *Annals of the Entomological Society of America* 68: 680-682.
- Savely, H.E. Jr. 1939. Ecological relations of certain animals in dead pine and oak logs. *Ecological Monographs* 9: 323-385.
- Soper, R.S. and R.E. Olson. 1963. Survey of biota associated with *Monochamus* (Coleoptera: Cerambycidae) in Maine. *The Canadian Entomologist* 95: 83-95.
- Thomas, J.B. 1955. Notes on insects and other arthropods in red and white pine logging slash. *The Canadian Entomologist* 87: 338-343.
- Tsankov, G. and G. Georgiev. 1991. Records on parasitoids of smaller poplar borer, *Saperda populnea* (Coleoptera: Cerambycidae) along the Danube in Bulgaria. *Entomophaga* 36: 493-498.
- Wood, D.M. 1987. Tachinidae. p. 1193-1269 In: J.F. McAlpine (Ed.), *Manual of the Nearctic Diptera* Vol. 2. Research Branch Agriculture Canada Monograph 28. Ottawa, Ontario.
- Woolwine, A.E., J.D. Culin and C.S. Gorsuch. 1996. Parasitoids of larval *Oberea myops* (Coleoptera: Cerambycidae). *Journal of Agricultural Entomology* 13: 227-229.

