

INSECTS ASSOCIATED WITH THE SITKA SPRUCE WEEVIL, *PISSODES STROBI* [COL. : CURCULIONIDAE] ON SITKA SPRUCE, *PICEA SITCHENSIS* IN BRITISH COLUMBIA, CANADA

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Insects associated with the Sitka spruce weevil, *Pissodes strobi* (Peck), on Sitka spruce, *Picea sitchensis* (Bong.) Carr. were sampled at 9 locations in British Columbia. Fourteen species of hymenoptera, 3 diptera, and 1 psocopteran were found associated with the weevil. Samples were dominated by the lonchaeid predator, *Lonchaea corticis* Taylor, and to a lesser extent by the braconid parasitoid, *Allodorus crassigaster* (Prov.).

KEY WORDS : natural enemies, *Pissodes strobi*, *Picea sitchensis*, Canada.

The Sitka spruce weevil (= white pine weevil = Engelmann spruce weevil), *Pissodes strobi* (Peck), is an important pest of Sitka spruce, *Picea sitchensis* (Bong.) Carr., Engelmann spruce, *Picea engelmannii* Parry ex. Engelm., and white spruce, *Picea glauca* (Moench) Voss, in British Columbia, Canada. This insect is also present in eastern Canada and the United States where the main host is eastern white pine, *Pinus strobus* L. (MacAloney, 1930). On the basis of morphological and serological characteristics, *P. strobi* populations from eastern and western North America are considered a single species (Manna & Smith, 1959; Smith, 1962; Smith & Sudgen, 1969). The damage is caused by the larvae mining under the bark of the previous year's terminal leader, killing it as well as the current growth. Damaged trees suffer loss in height growth and develop stem deformities that reduce timber quality (Silver, 1968; Alfaro, 1982).

The lack of effective methods of weevil control has prompted renewed interest in possible biological methods of control. However, little is known about the identity and biology of the parasitoids and predators of *P. strobi* in British Columbia, particularly those that inhabit Sitka spruce. Taylor (1929), MacAloney (1930), Harman & Kulman (1968) and Harman & Wallace (1971) described the taxonomy, life cycle, and habits of some parasitoids and predators of *P. strobi* feeding on white pine, *Pinus strobus* L., in eastern North America. In British Columbia, Stevenson (1967) and VanderSar (1978) described aspects of the biology, habits, and emergence patterns of some of the spring emerging parasitoids and predators of *P. strobi* reared from Engelmann spruce in the Rocky Mountains. At 1 site on Vancouver Island, Silver (1968) reared and identified 5 hymenopteran parasitoids, and 1 dipteran predator of the

weevil, *Lonchaea corticis* Taylor, from Sitka spruce ; Alfaro & Borden (1980) conducted detailed research on the biology and habits of *L. corticis*. We report here additional information gathered recently in the province of British Columbia on the identity and distribution of insects associated with *P. strobi* on Sitka spruce.

MATERIALS AND METHODS

Sitka spruce terminal leaders attacked by *P. strobi* were collected between 1975 and 1983 at the locations of coastal British Columbia listed in table 1. Some leaders were dissected immediately while others were placed in screened cages and maintained at room temperature until emergence of weevils and associated insects was complete. The Agriculture Canada Biosystematic Research Institute in Ottawa identified the specimens.

Two collections of leaders were usually made each year. One, in early spring (May), was of leaders attacked in the spring of the previous year, to obtain the overwintered parasitoids and predators. A second collection, in late summer (late August), was to obtain insects of the current infestation that emerged in late summer and fall of the same year.

RESULTS AND DISCUSSION

The identification, locality of collection, and season of adult emergence from the leaders are given in table 1. The collection of pinned specimens is maintained at the Pacific Forest Research Centre.

The ichneumonid, *Dolichomitus terebrans* (Ratzeburg), was a parasitoid of *P. strobi* at most of our sampling locations. It emerged in the spring and mated readily in captivity. It laid oblong whitish eggs attached by a pedicel to the exterior of the weevil larvae ; the eggs hatched in a few days and the larvae developed as ectoparasitoids. Other common parasitoids recovered from *P. strobi* that emerged in the spring were the chalcidoids *Rhopalicus pulchripennis* (Crawford), *Eurytoma pissodis* Girault, and *E. picea* Bugbee ; and the braconid *Bracon pini* (Muesebeck). Like *D. terebrans* they have been collected from *P. strobi* throughout North America (Taylor, 1929 ; MacAloney, 1930 ; VanderSar, 1978). We also recovered the pteromalid, *Rhopalicus pulchripennis*, from lodgepole pine (*Pinus contorta* Dougl. ex Loud.) terminals infected with *Pissodes terminalis* Hopping.

The braconid, *Allodorus crassigaster* (Provancher), was abundant in samples taken throughout Vancouver Island. The parasitoid was also found frequently at Terrace, British Columbia. It emerged in late summer and also was reared directly from weevil larvae dissected out of infested leaders. This species was also reared by us from lodgepole pine terminals infested with *P. terminalis*. Unlike the other parasitoids cited, *A. crassigaster* is not recorded as a common parasitoid of *P. strobi* ; there are no records of it in eastern North America and only occasional records in the western part of the continent (e.g., Silver, 1968).

The dipteran predator, *Lonchaea corticis* Taylor, was frequently encountered at all sampling locations ; the adult emerged from leaders in the spring. It is distributed throughout North America. This insect is an important pupal predator, but can also feed on weevil larvae especially those diseased or parasitized. Also, a eucoilid parasitoid, *Trybliographa* sp. was occasionally recovered from *L. corticis* puparia.

The list of table 1 includes most of the common predators and parasitoids found associated with *P. strobi* in eastern North America. However, 1 additional parasitoid frequently found in British Columbia is *A. crassigaster* ; indeed it ranked 2nd in abundance in our samples behind the predator *L. corticis*. Three species of *Eurytoma* are also found in this Province but none approached the abundance reported for *E. pissodis* in eastern North America.

Clearly, *P. strobi* has an extensive complex of natural enemies in British Columbia. It remains to be seen how these predators and parasitoids help regulate weevil populations and if such regulation can be enhanced by manipulation.

TABLE 1

Insects associated with the Sitka spruce weevil, *Pissodes strobi*, in British Columbia, Canada

Order	Family	Genus and species	Locality ^a of collection	Relationship to <i>P. strobi</i>	Time of emergence from leader
Hymenoptera	Ichneumonidae	<i>Dolichomitus terebrans</i> (Ratzeburg)	Maple Ridge Flora Lake Long Beach Terrace, Tahsis	Ectoparasitoid	spring
		Braconidae	<i>Bracon pini</i> (Muesebeck)	Maple Ridge Flora Lake Tahsis	Ectoparasitoid
	<i>Bracon</i> sp.		Mission Tahsis	Unknown	spring
	<i>Allodorius crassigaster</i> (Provancher)		Throughout Vancouver Island Terrace	Endoparasitoid	late summer
	Pteromalidae	<i>Allodorius</i> sp. n. <i>crassigaster</i> (Provancher)	Flora Lake	Endoparasitoid	late summer
		<i>Rhopalicus pulchripennis</i> (Crawford)	Maple Ridge Mission Terrace Tahsis	Ectoparasitoid	spring
	Eurytomidae	<i>Mesopolobus</i> sp.	Gold River	Unknown	late summer
		<i>Eurytoma pissodis</i> Girault	Harrison Lake Flora Lake Mission Terrace Long Beach	Ectoparasitoid	spring
		<i>Eurytoma cleri</i> Ashmead	Flora Lake Mission	Unknown	spring
		<i>Eurytoma picea</i> Bugbee	Long Beach Tahsis Terrace	Ectoparasitoid	spring
		<i>Eurytoma</i> sp.	Maple Ridge	Unknown	spring
	Eucoilidae	<i>Mercetencyrtus</i> sp.	Gold River	Unknown	spring
		<i>Trybliographa</i> sp.	Port Renfrew Maple Ridge Long Beach	Endoparasitoid of <i>Lonchaea corticis</i>	late summer
Crabronidae	<i>Rhopalum</i> sp.	Maple Ridge	Predator of small Hymenoptera in weevil infested leaders	does not enter leader	
Diptera	Lonchaeidae	<i>Lonchaea corticis</i> Taylor	Present at all localities sampled	Predator	spring
	Drosophilidae	<i>Drosophila</i> sp.	Maple Ridge	Possibly feeding on decaying frass	late summer
	Sciaridae	<i>Bradysia</i> sp.	Long Beach	Possibly feeding on decaying frass	spring
Psocoptera	?	?	Gold River	Possibly feeding on decaying frass	late summer

^a Geographic coordinates for all localities of collection, with the exception of Flora Lake, can be found in *Gazetteer of Canada: British Columbia* (Anonymous, 1966). Flora Lake is located about 2 km northwest of Nitinat Lake, on Vancouver Island.

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RÉSUMÉ

Insectes associés au charançon du pin blanc *Pissodes strobi*, [Col. : Curculionidae] sur l'épinette de Sitka (*Picea sitchensis*) en Colombie Britannique.

Des récoltes d'insectes associés au charançon du pin blanc (*Pissodes strobi* [Peck]) sur l'épinette de Sitka (*Picea sitchensis* [Bong.] Carr.) ont été réalisées dans 9 localités de Colombie Britannique. Quatorze espèces d'hyménoptères, 3 de diptères et 1 de psooptère ont été retrouvées associées au charançon au cours de ces récoltes. Le prédateur de la famille des Lonchaeidés, *Lonchaea corticis* Taylor dominait, suivi du parasitoïde de la famille des Braconides : *Allodorus crassigaster* (Prov.).

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