

**NEW RECORDS OF RIPIPHORIDAE (COLEOPTERA) FROM THE MARITIME
PROVINCES OF CANADA**

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Abstract

New records establish the presence of the Ripiphoridae in the Maritime Provinces of Canada. *Ripiphorus fasciatus* (Say) is newly recorded from both New Brunswick and Nova Scotia. The bionomics of the genus, species of host bees, developmental history, and the status of the group in the region are all briefly discussed.

The Ripiphoridae are a remarkable family of beetles which are endo- and ectoparasites of insects. Falin (2002) provided a comprehensive account of the family in North America. Knowledge of ripiphorid biology is derived primarily from the studies of three species: *Ripidius quadriceps* Abeille, 1872, *Pelecotoma fennica* (Paykull 1799), and *Ripiphorus smithi* Linsley & MacSwain, 1950 (Falin 2002). Species in the genus *Ripidius* Thunberg are parasitic on roaches (Orthoptera: Blattellidae) (Besuchet 1956); those in the genus *Pelecotoma* Fischer are parasites on beetles of the genus *Ptilinus* Mueller (Anobiidae) (Svácha 1994); and species in the genus *Macrosiagon* Hentz parasitize a wide variety of aculeate Hymenoptera in the families Vespidae, Crabronidae, Sphecidae, Scoliididae, Tiphiidae, Apidae, and Halictidae (Falin 2002). Svácha (1994) speculates that the ancestral mode of life of ripiphorids was as xylophilous species predaceous on larval Coleoptera.

Linsley *et al.* (1952) examined the biology of *Ripiphorus smithi*, a pattern presumed to be representative of the genus. Females emerge in the summer and after mating deposit between 6 and 15 eggs into the bud of an unopened flower (dissected females have 850+ eggs). Hatching is synchronized with the opening of the flowers and the visitation of bees. The first instar larva (triungulin) is very

active and holds itself erect on the apex of its abdomen in the presence of insect activity. When a suitable host is encountered the larva attaches itself and is transported to the host's nest. Once there it enters a cell and waits on the pollen mass for a host egg to be laid and hatch. It then penetrates the host's first instar larva and lives as an endoparasite, growing progressively more distended but not moulting. It overwinters in the mature bee larva and when the bee enters its prepupal stage it grows quickly and emerges from the mesothorax of the bee, moulting into a second instar. This second unsclerotized instar, now an ectoparasite, curls around the host and begins to consume it, undergoing four subsequent moults (six instars) until the host is consumed. It then pupates and emerges as an adult after about 12 days. After waiting in the bee natal cell for an additional day it exits the nest and mates, usually living as an adult for only one or two days (Linsley *et al.* 1952).

Seven genera of Ripiphoridae are known in North America and of these three, *Pelecotoma* Fischer von Waldheim (one species), *Macrosiagon* Hentz (two species), and *Ripiphorus* Bosc d'Antic (seven species) have been recorded in Canada (Campbell 1991). No Ripiphoridae have hitherto been recorded in Atlantic Canada. Several records have now established the presence of the family in this region.

Methods and Conventions

In the course of research on the biodiversity of Coleoptera in the Maritime Provinces, 89,600 specimens from most of the collections in the region were examined. Additionally published records and on-line databases were consulted. Specimens of Ripiphoridae were noted. Abbreviations of collections referred to in this study are:

ACNS	Agriculture and Agri-food Canada, Kentville, Nova Scotia
MFS	Maine Forest Service, Department of Conservation, Augusta, Maine
NBM	New Brunswick Museum, Saint John, New Brunswick
RPWC	Reginald P. Webster Collection, Charter's Settlement, New Brunswick
UNH	University of New Hampshire, Durham, New Hampshire

Following Falin (2002) we employ the family-group spelling of Ripiphoridae rather than Rhipiphoridae.

Results

A specimen of *Ripiphorus fasciatus* (Say 1823) was collected by D.S. Chandler on 2 August 1991, 2 miles southwest of Marion Bridge, Cape Breton County, Nova Scotia (UNH). A second specimen was collected by Reginald Webster on 18 July 1998, 3.5 km southwest of the junction of Highway 101 and the Charter's Settlement Road, York County, New Brunswick (RPWC). A third specimen was collected by Cory Sheffield on 24 July 2004 in Middleton, Kings County, Nova Scotia (ACNS). Packer *et al.* (1989b) found an unidentified ripiphorid larvae in an *Augochlorella striata* (Provancher 1888) (Hymenoptera: Halictidae) nest at Irish Cove, Richmond County, Nova Scotia, and L. Packer (pers. comm.) commonly found high frequencies of ripiphorid triungulins on *Lassioglossum* (*Dialictus*) sp. bees near Sydney, on Cape Breton Island, Nova Scotia.

Finally, in an unpublished manuscript of beetles collected by entomologist William McIntosh (former director of the New Brunswick Museum) and associates in Saint John, New Brunswick between 1898–1907, a specimen of

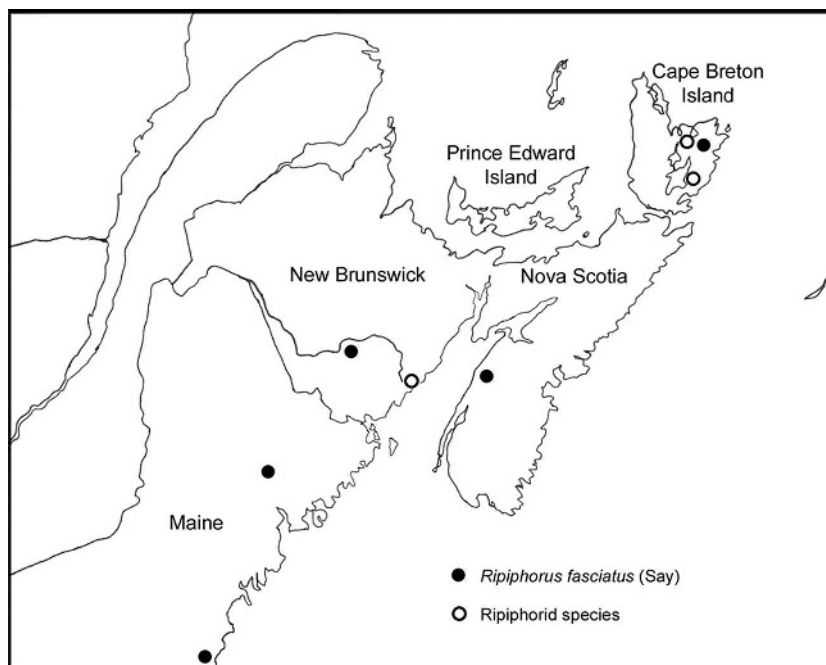


Fig. 1. Distribution of Ripiphoridae in the Maritime Provinces and Maine. Closed circles indicate records of *Ripiphorus fasciatus*. Open circles indicate records of a ripiphorid not determined to species.

Myodites zeschii LeConte [= *Ripiphorus zeschii* (LeConte 1880)] is reported (NBM). This specimen was determined by W. H. Harrington, an early member of the Canadian Entomological Society, a frequent contributor to the Canadian Entomologist, and the foremost Canadian coleopterist of his time. Although we have not been able to relocate the specimen to confirm the specific determination, it would have undoubtedly been correctly determined as *Ripiphorus* by as experienced an entomologist as Harrington. Collection localities in the Maritime Provinces and Maine are shown in Figure 1.

Discussion

These specimens represent the first records of the family Ripiphoridae from the Maritime Provinces of Canada. *Ripiphorus fasciatus* is widespread species in the eastern U.S.A. and has been recorded from Maine (Orono, August 1958, on *Spiraea?*, MFS, Dearborn and Donahue (1983); York, 9 July 1937, B.G. Markos, UNH), New Hampshire, and Vermont (Chandler 2001) in the U.S.A., and in Ontario in Canada (Campbell 1991). Other species known to occur in the region include *Ripiphorus stylopides* Newman, *R. luteipennis* LeConte, and *R. walshii* (LeConte) in Maine (Chandler 2001), and *Pelecotoma flavipes* Melsheimer in Québec, Maine, and New Hampshire (Campbell 1991; Dearborn and Donahue 1993; Chandler 2001). Although *Ripiphorus zeschii* was reported in Québec by

Campbell (1991), Y. Bousquet and S. Laplante (pers. comm.) indicate that there are no specimens determined as such in the Canadian National Collection and, given the current confused state of the genus *Rhipiphorus*, it would be premature or possibly erroneous to include it as part of the Québec fauna.

Species of *Rhipiphorus* are known to parasitize genera of bees of two families, Apidae (*Diadasia* Patton) and Halictidae (*Dieunomia* Cockerell, *Halictus* Latreille, *Lasioglossum* Curtis, *Augochlora* Smith, and *Augochorella* Sandhouse). Of these, the halictids, *Halictus* (three species), *Augochlora* (one species), *Augochorella* (one species), and *Lasioglossum* (32 species) occur in the region (Sheffield *et al.* 2003). At the Middleton collection site *Augochorella*, *Halictus*, and *Lasioglossum* are all found, the latter two genera being particularly common. Packer *et al.* (1989a) and Packer (pers. comm.) found rhipiphorid larvae parasitizing both *Augochorella* and *Lasioglossum* (*Dialictus*) in Nova Scotia.

The discovery of *Rhipiphorus* in the Maritime Provinces raises questions regarding the life history of the genus. At more southern latitudes most bees overwinter as mature larvae or pre-pupae. In the Maritime Provinces the halictid bees which are potential hosts of *Rhipiphorus*, overwinter in part as adult females, having emerged from the nest and mated the previous fall (Packer 1989; Packer *et al.* 1989b). How such a phenology might affect the developmental biology of *Rhipiphorus* is a topic deserving of further research.

On the basis of these limited collections, it is not possible to draw many conclusions about the status of this family in the Maritime Provinces, although it appears that the species is widely distributed (Fig. 1). The unusual and secretive bionomics of these species, the fact that adults are present for only a very short time period, and the lack of a systematic survey program to investigate them, may mean that their occurrence in the region is under-represented by the current small number of records. It would be worthwhile conducting further research to determine their status in the region and their relationship to, and impact on, species of bees found there.

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