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Understanding saproxylic beetles: new records of Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae from the Maritime Provinces of Canada (Coleoptera: Tenebrionoidea)

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Abstract

New species records for Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae from the Maritime Provinces of Canada are given. Known bionomics of these saproxylic species are summarized and new bionomic observations are provided. Twenty-five species are newly recorded from Nova Scotia, 10 from Prince Edward Island, and three from New Brunswick. Thirty-seven species are now known from the region, a substantial increase from the 23 species known hitherto. Range extensions for 19 species are noted. The composition of the region's fauna is briefly discussed, focusing on a disparity in the collection efforts between provinces, and also on island faunas. Finally the fauna is examined in the context of a developing knowledge of saproxylic beetles in Nova Scotia, along with potential concerns about the impact that forest management practices.

Key words: Coleoptera, Tetratomidae, Melandryidae, Synchroidae, Scraptiidae, Maritime Provinces, New Brunswick, Nova Scotia, Prince Edward Island, Canada, biodiversity, saproxylic, new records

Introduction

The Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae (all members of the Tenebrionoidea), are a diverse assemblage of saproxylic beetles found in many forested communities. Historically they have a complicated systematic history having, at times, all been considered within the family Melandryidae (e.g., Downie and Arnett 1996) although recent treatments (Nikitsky 1998; Pollock 2002a, 2002b; Young 2002; Young and Pollock 2002) have placed them in separate families. The classification presented below in the

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species treatments is derived from these references.

All are saproxylic beetles dependent during some portion of their life cycle upon the dead or dying wood of senescent or dead trees (standing or fallen), upon wood-inhabiting fungi, or on the presence of other saproxylics (Speight 1989). Saproxylic insects comprise a large proportion of forest species in addition to playing an important role in decomposition and nutrient cycling in forest ecosystems (Swift 1977, Edmonds and Eglitis 1989). Saproxylic beetles are important in the mechanical breakdown of wood (Hickin 1963). Early colonization by wood-boring species preconditions wood for succeeding species (Hammond *et al.* 2001).

Key factors in determining saproxylic insect diversity are the quantities and range of decay stages of wood available in forests. Different species are selective in terms of host type (primarily at supra-specific taxonomic levels) (Hamilton 1978, Ås 1993, Grove 2002); decay stage and decay type (e.g. white-rot or brown-rot fungi) (Araya 1993, Yee *et al*. 2001) and moisture and exposure to sun (Martikainen 2001). In particular, large-diameter, senescent, moribund, or veteran trees and fallen logs can be critically important microhabitats for the survival of many saproxylic species (Grove 2002).

Saproxylic insects which are phloeophagous species (e.g., many Scolytinae (Curculionidae) and Cerambycidae) feed on cambium, a food resources that is ephemeral and often scattered, and consequently are adept at dispersal. Xylophagous, myceophagous, or bolitophagous species, however, rely on resources that are long-lived and (in undisturbed forests) of relatively even distribution (Grove 2002). Consequently such species can be very sensitive to timber-harvesting practices that significantly disrupt both the spatial and temporal continuity of these resources (Speight 1989, Simila *et al.* 2002, Grove 2002). Of the 180 species of Coleoptera selected by Alexander (2004) for use in the calculation of the Index of Ecological Continuity in Great Britain, two are Tetratomidae, 10 Melandryidae and three Scraptiidae. These are species thought to be remnants of saproxylic beetle assemblages characteristic of ancestral post-glacial British forests and indicative of ecological continuity, considered as inversely related to disturbance.

Many groups of saproxylic beetles have been hitherto little studied in the Maritime Provinces of Canada. The focus of early collecting in the region was often on other groups (for instance of species of significance in agricultural contexts) or employed sampling methods that tended not to sample many of these species. The Scolytinae have been examined in some detail by Bright (1976) and the Cerambycidae by McCorquodale and Bondrup-Nielsen (2004) but families such as the Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae have not received comparable attention. In the only compendium of the region's fauna, of these four families LeSage (1991a, 1991b, 1991c, 1991d) recorded 15 species from New Brunswick, 12 species from Nova Scotia, and no species from Prince Edward Island for a combined regional fauna of 23 species.

Since that time several studies of saproxylic Coleoptera have been undertaken (e.g. Bishop 1998; Kehler *et al.* 1996, 2004; Dollin 2004) that added substantially to our

knowledge of these groups in the region. Collecting by a variety of individuals and institutions, and examination of holdings in regional and national collections, have brought to light additional specimens. As a result it seems an appropriate time to review the current state of knowledge. Majka and Pollock (2006) provided a survey of the fauna of the Atlantic Maritime Ecozone (the Maritime Provinces, the Gaspé Peninsula, and portions of Québec south of the St. Lawrence River). Not included in that treatment, however, were details of the many new species records from the Maritime Provinces, the subject of the present study.

Methods and conventions

Specimens of Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae collected in the Maritime Provinces of Canada were examined and determined. Abbreviations of collections referred to in this study are:

ACNS	Agriculture and Agri-food Canada, Kentville, Nova Scotia.
CBU	Cape Breton University, Sydney, Nova Scotia.
CGMC	Christopher G. Majka collection, Halifax, Nova Scotia.
CNC	Canadian National Collection, Ottawa, Ontario.
DHWC	David H. Webster collection, Kentville, Nova Scotia
FNP	Fundy National Park collection, Alma, New Brunswick
JCC	Joyce Cook collection, North Augusta, Ontario
NBM	New Brunswick Museum, Saint John, New Brunswick
NSAC	Nova Scotia Agricultural College, Bible Hill, Nova Scotia
NSMC	Nova Scotia Museum, Halifax, Nova Scotia
NSNR	Nova Scotia Department of Natural Resources, Shubenacadie, Nova Scotia
SDSU	South Dakota State University, Brookings, South Dakota, USA
STFX	Saint Francis Xavier University, Antigonish, Nova Scotia
UPEI	University of Prince Edward Island, Charlottetown, Prince Edward Island

To illustrate a finer detail, Nova Scotia (the only province for which there is sufficient data to do so) has been additionally partitioned (on a county-by-county basis) into several sub-regions. These are ***Northern NS*** (Cumberland, Colchester, Pictou, and Antigonish counties); ***Cape Breton*** (Inverness, Victoria, Cape Breton, and Richmond counties); ***Eastern Shore*** (Guysborough and Halifax counties); ***Southern Shore*** (Lunenburg, Queens, Shelburne, and Yarmouth counties); and ***Bay of Fundy*** (Digby, Annapolis, Kings, and Hants counties). While these are simple approximations they do allow for a ready way to represent distributions that mirror (albeit imperfectly) some of the physiographic eco-districts within the Nova Scotia portion of Atlantic Maritime Ecozone.

In relation to new records, where fewer than 20 specimens were examined, data on all

are reported in the individual species accounts. Where more than 20 specimens were examined, the records are summarized. Except where specified, the number of specimens for each record reported is one. A total 1,196 specimens from Nova Scotia, 42 from New Brunswick, and 38 from Prince Edward Island (N = 1,276) were examined.

Results

Table 1 provides a summary of the fauna of the Maritime Provinces. This information is compiled both from specimens examined and published records. Numbers in the table indicate the number of county records for each species in that province or, in the case of Nova Scotia, in the province and each sub-region.

The distribution of each species is also briefly summarized within northeastern North America and the continent as a whole. This information is compiled from Laliberté (1965, 1966), Chantal (1985), Laplante *et al.* (1991), LeSage (1991a, 1991b, 1991c, 1991d), Downie and Arnett (1996), Chandler (2001), and Sikes (2003). For the purposes of this study the provinces of Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador, and the states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, and New York were considered to be geographically comprise northeastern North America.

Thirty-seven species of Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae have now been recorded in the Maritime Provinces, 36 from Nova Scotia, 21 from New Brunswick, and 10 from Prince Edward Island. The present study reports new records of 25 species from Nova Scotia, 10 from Prince Edward Island, and 3 from New Brunswick. Specific accounts follow.

Tetratomidae: Tetratominae

Tetratoma tessellata Melsheimer

NOVA SCOTIA: Antigonish Co.: Cape George Pt., 15.vi.1993, M. Leblanc, NSNR; Morar, 7.vii.1993, M. Leblanc, NSNR; **Colchester Co.:** Upper Kemptown, 29.vii.1994, D. Kehler, NSMC; **Cumberland Co.:** East Leicester, 29.vi,1995, C. Corkum, NSMC; East Leicester, 28.vii.1995, C. Corkum, NSMC; Fox River, 28.vii.1995, C. Corkum, NSMC; Moose River, 29.vii.1995, C. Corkum, NSMC; Spencer's Island, 13.vii.1995, C. Corkum, NSMC; Spencer's Island, 28.vii.1995, C. Corkum, NSMC; **Guysborough Co.:** Dayspring Lake, 16–29.vii.1997, D.J. Bishop, NSMC; Seloam Lake, 29.vii.-13.viii.1997, D.J. Bishop, NSMC; **Hants Co.:** Panuke Lake, 29.vii–13.viii.1997, D.J. Bishop, NSMC; **Queens Co.:** 13–24.viii.2004, H. Love, NSMC; **Yarmouth Co.:** Wellington, 12–20.viii.1991, J. Cook, JCC.

TABLE 1: Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae of the Maritime Provinces of Canada

Province	**NB**	**PEI**	**NS**	NS: Regions					**Distribution in**	**Continental**
Region				North	CB	East	South	Fundy	**Northeastern North America**	**Distribution**
number of counties	15	3	18	4	4	2	4	4		
TETRATOMIDAE										
Tetratominae										
Tetratoma tessellata Melsheimer			7	3		1	2	1	ME, NH, NS, NY, ON, QC	1,2
Penthinae										
Penthe obliquata (Fabricius)			9	1	3	1	1	3	CT, MA, ME, NH, NS, NY, ON, QC	1,2,3
Penthe pimelia (Fabricius)	1	1	6	1		2	2	1	CT, ME, NB, NH, NS, NY, ON, PE, QC	1,2,3
Hallomeninae										
Hallomenus scapularis Melsheimer			4			1	3		ME, NH, NS, NY, QC	1,2,4
Eustrophinae										
Eustrophini										
Eustrophopsis confinis (LeConte)			1	1					NS, ON, QC	1,2,4,5
Eustrophus tomentosus Say			3			2	1		MA, NH, NS, NY, ON, QC	1,2,4,5
Holostrophini										
Holostrophus bifasciatus (Say)		1	1			1			MA, ME, NH, NS, NY, ON, PE, QC	1,2
MELANDRYIDAE										
Melandryinae										
Orchesiini										
Orchesia castanea (Melsheimer)	2		9	2		2	3	2	MA, ME, NB, NF, NH, NS, NY, ON, QC	1,3,4,5
Orchesia cultriformis Laliberté			6	3	1	2			NH, NS, NY, QC	1,2,5
Orchesia ovata Laliberté	1		1		1		1		MA, ME, NB, NH, NS, ON, QC	1

TABLE 1 (continued).

Province	**NB**	**PEI**	**NS**	NS: Regions					**Distribution in**	**Continental**
Region				North	CB	East	South	Fundy	**Northeastern North America**	**Distribution**
Serropalpini										
Xylita livida (Sahlberg)	3		6	4		1		2	LB, ME, NB, NF, NH, NS, QC	1,4,5
Xylita laevigata (Hellenius)	1		4	1		2	1	2	ME, NB, NF, NH, NS, ON, QC	1,4,5
Spilotus quadripustulatus (Melsh.)			1					1	CT, NH, NS, NY, QC, RI	1
Scotochroa atra LeConte	1		3			2	1		LB, ME, NB, NF, NH, NS, QC	1
Scotochroa buprestoides (Kirby)	1		2			2			ME, NB, NF, NH, NS, NY, ON, QC	1
Scotochroides antennatus Mank			7			2	3	2	MA, NH, NS, QC	1
Enchodes sericea (Haldeman)	1		1		1				MA, ME, NB, NH, NS, NY, ON, QC, VT	1,4,5
Serropalpus coxalis Manx	1		7	3		2	2		MA, ME, NB, NF, NH, NS, NY, ON, QC	1,4,5
Serropalpus substriatus Haldeman	4		11	4	1	2	3	3	LB, MA, ME, NB, NF, NH, NS, NY, ON, QC	1,2,3,4,5
Dircaea liturata (LeConte)	3	1	13	4	1	2	3	3	ME, NB, NH, NS, NY, ON, PE, QC	1,2,5
Phloiotrya fusca (LeConte)		1	2			1	1		NH, NS, NY, PE, QC, RI	1,2,5
Hypulini										
Zilora hispida LeConte			1			1			ME, NH, NS, ON, QC	1,4,5
Hypulus simulator Newman	1		6	2	1	2	2	1	ME, NB, NF, NH, NS, ON, QC	1
Microtonus sericans LeConte			4				1	1	ME, NH, NS, NY, RI	1,2,3,5
Symphora flavicollis (Haldeman)		2	8	1		2	3	2	ME, NH, NS, NY, ON, PE, QC, RI	1,2,3,5
Symphora rugosa (Haldeman)			6			1	3	2	ME, NS, ON, QC	1,2
Melandryini										
Prothalpia undata LeConte	1		8	2	1	2	1	1	MA, ME, NB, NF, NH, NS, NY, ON, QC	1,2
Melandrya striata Say	1	1	4		1	1		2	MA, ME, NB, NH, NS, NY, ON, PE, QC	1,4,5
Emmesa connectens Newman	2		5	2		2		1	LB, ME, NB, NF, NH, NS, NY, ON, QC	1
Emmesa labiata (Say)	2		2	2				1	CT, ME, NB, NF, NH, NS, NY, ON, QC	1
Phryganophilus collaris LeConte	1		1		1				ME, NB, NS, NY, ON, QC	1,4,5

TABLE 1 (continued).

SYNCHROIDAE										
Synchroa punctata Newman	1	1	5	1		1	2	1	CT, ME, NB, NH, NS, NY, ON, PE, QC, RI	1,2,3
SCRAPTIIDAE										
Scraptiinae										
Scraptiini										
Canifa pallipes (Melsheimer)		2	10	3	4	2	3	1	ME, NF, NH, NS, ON, PE, RI	1,2,4,5
Canifa pusilla (Haldeman)	2		11	2		1	2	2	ME, NB, NH, NS, NY, ON, QC, RI, VT	1,2
Anaspidinae										
Anaspidini										
Anaspis flavipennis Haldeman	1	1	11	3	1	2	2	2	MA, ME, NB, NH, NS, NY, ON, PE, QC	1,2,4
Anaspis nigrina Csiki			6	1		2	2	1	NF, NS, NY, ON, QC, VT	1,2,4
Anaspis rufa Say	3	2	18	4	4	2	4	4	ME, NB, NF, NH, NS, NY, ON, PE, QC	1,3,4,5
Number of County Records	34	13	210	50	21	49	52	42		
Number of Species	21	10	36	22	12	30	25	23		

Nova Scotia: Regions - North = Northern Shore that includes Cumberland, Colchester, Pictou, and Antigonish counties; CB = Cape Breton Island that includes Inverness, Victoria, Cape Breton, and Richmond counties; East = Eastern Shore that includes Guysborough & Halifax counties; South = Southern Shore that includes Lunenburg, Queens, Shelburne, and Yarmouth counties; and Fundy = Bay of Fundy and includes Digby, Annapolis, Kings, and Hants counties.

Northeastern North America: ON = Ontario; QC = Québec; NB = New Brunswick; PE = Prince Edward Island; NS = Nova Scotia; NF = Newfoundland; LB = Labrador, ME= Maine; NH = New Hampshire; VT = Vermont; MA = Massachusetts; CT = Connecticut; RI = Rhode Island; NY = New York.

Continental Distribution: 1 = Northeastern; 2 = Southeastern; 3 = Southwestern; 4 = Northwestern; 5 = Central.

Newly recorded in Nova Scotia. Found on dead *Betula*, *Acer*, and *Quercus* and on fungi growing on these trees (Chantal 1985); in Nova Scotia, specimens were collected in all ages of both coniferous and deciduous forests, the majority with flight-intercept traps.

Tetratomidae: Penthinae

***Penthe obliquata* (Fabricius)**

NOVA SCOTIA: 23 specimens from Cape Breton, Colchester, Halifax, Hants, Inverness, Kings, Queens, and Victoria counties were examined. The earliest records are from 1935 and 1947 (**Annapolis Co.:** Round Hill, NS, 23.vi.1935, F.C. Gilliatt, ACNS; **Victoria Co.:** Baddeck, NS, 3.vii.1947, D.C. Ferguson, NSMC).

Newly recorded in Nova Scotia. Generally distributed in both mainland and on Cape Breton Island. In Nova Scotia collected under bark of coniferous trees (*Picea rubens* Sarg., *Tsuga canadensis* (L.) Carr., *Pinus strobus* L., and *Abies balsamaea* (L.) Mill) and on red-belted polypore (*Fomitopsis pinicola* (Fr.) Kar.) on these trees.

***Penthe pimelia* (Fabricius)**

NEW BRUNSWICK: Saint John Co.: Saint John, 13.vi.1903, W. McIntosh, NBM. **NOVA SCOTIA: Colchester Co.:** Burnside, 29.vii.1994, D. Kehler, NSMC; **Guysborough Co.:** Country Harbour, 7 July, 1994, D. Kehler, NSMC; Borneo, 28.vi.1995, C. Corkum, NSMC; Stillwater, 13.vii.1995, C. Corkum, NSMC; Seloam Lake, 16–29.vii.1997, D.J. Bishop, NSMC; Malay Lake, 14.v–2.vi.1997, D.J. Bishop, NSMC; Malay Lake, 1–16.vii.1997, D.J. Bishop, NSMC; Malay Lake, 16–29.vii.1997, D.J. Bishop, NSMC; **Hants Co.:** Mount Uniake, 1.viii.1968, B. Wright, NSMC; **Lunenburg Co.:** Chester Basin, 22.viii.1995, NSMC; **Queens Co.:** Sixth Lake, 19.v.2003, P. Dollin, NSMC. **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 13.vii.2002, C.G. Majka, 2 specimens, CGMC.

Newly recorded in Nova Scotia and Prince Edward Island. Specimens were collected in young and old coniferous and deciduous forests, the majority with flight-intercept traps. On Prince Edward Island, specimens were collected on decaying *Piptoporus betulinus* (Fr.) Kar. growing on *Populus grandidentata* Michx. and *Herobasidion annosum* (Fr.) Bref. growing on *Picea rubens*.

Tetratomidae: Hallomeninae

***Hallomenus scapularis* Melsheimer**

NOVA SCOTIA: Guysborough Co.: Borneo, summer 1995, C. Corkum, NSMC; Trafalgar, 19.vii.1992, S. and J. Peck, 3 specimens, JCC; **Kings Co.:** Kentville,

23.vii.1997, R.F. Lauff, STFX; **Queens Co.:** Kejimkujik National Park, 28.vii–11.viii.1994, B. Wright, NSMC; **Shelburne Co.:** Clyde River Rd, 16.vii.1992, S. and J. Peck, 3 specimens, JCC; **Yarmouth Co.:** Carleton, 22.viii.1992, J. and T. Cook, JCC; Perry Rd, Carleton, 18.vii.1993, J. and T. Cook, JCC.

Newly recorded from Nova Scotia. Found on fungi growing on dead trees (Chantal 1985). In Nova Scotia, found in both deciduous and coniferous forests; primarily collected by car netting.

Tetratomidae: Eustrophinae

Eustrophini

***Eustrophopsis confinis* (LeConte)**

NOVA SCOTIA: Cumberland Co.: Wentworth, 21.v–5.vii.1965, B. Wright, 2 specimens, NSMC.

Newly recorded in Nova Scotia. Bionomics are little known; there is a record of one specimen in Maine collected from *Polyporus anceps* Peck. The specimens in Nova Scotia were collected in a window trap set in a sugar maple, *Acer saccharum* Marsh.

***Eustrophus tomentosus* Say**

NOVA SCOTIA: Guysborough Co.: Borneo, 28.vi.1995, C. Corkum, NSMC; **Halifax Co.:** Big St. Margaret's Bay, 29.vii–13.viii.1997, D.J. Bishop, NSMC; **Queens Co.:** Tobeatic Lake, 3.vi.2003, P. Dollin, NSMC.

Newly recorded in Nova Scotia. Found under the bark of dead trees, particularly *Ulmus americana* L.; attracted to sap (Chantal 1985). In Nova Scotia, found in a decaying *Picea rubens* stump and collected by flight-intercept traps.

Holostrophini

***Holostrophus bifasciatus* (Say)**

NOVA SCOTIA: Halifax Co.: Point Pleasant Park, 15.vii.2001, C.G. Majka, CGMC. **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, PEI, 25.vi.2003, C.G. Majka, CGMC.

Newly recorded in Nova Scotia and Prince Edward Island. Found under bark of dead *Pinus strobus*, also on polypores including *Piptoporus betulinus*. (Chantal 1985).

Melandryidae: Melandryinae

Orchesiini

***Orchesia ovata* Laliberté**

NOVA SCOTIA: Cape Breton Co.: Ball's Creek, 2.viii.1995, B.L. Musgrave, CBU; **Queens Co.:** Cobreille Lake, 6–17.vii.2005, S. Poirier, NSMC.

Newly recorded in Nova Scotia. Found on wood covered in decaying foliage on various species of trees, primarily *Acer rubrum* L. (Laliberté 1966). At Cobreille Lake collected in a mixed *Acer* spp, *Betula*, spp., and *Quercus rubra* L. forest. In Québec collected by beating foliage of *Sorbus americana* Marsh., *Zanthoxylum americanum* Mill., *Ostrya virginiana* (Miller) K. Koch, and *Quercus macrocarpa* Michx. (D. Pollock, unpublished data).

Serropalpini

***Xylita laevigata* (Hellenius)**

NOVA SCOTIA: Colchester Co.: Masstown, 1.vi.1990, M. Leblanc, 2 specimens, NSNR; **Guysborough Co.:** Malay Lake, 2–15.vi.1997, D.J. Bishop, NSMC; **Halifax Co.:** Moser Lake, 2–15.vi.1997, D.J. Bishop, NSMC; Musquodoboit Valley, 14.vi.2002, K. George, NSNR; Point Pleasant Park, 6.vi.1990, S. Robertson, NSMC; Point Pleasant Park, 11.v.2001, 17.vi.2001, C.G. Majka, CGMC; Point Pleasant Park, 1.vi.2002, C.G. Majka, CGMC; **Kings Co.:** Coldbrook, 27.v.2004, R. Williams, NSNR; **Lunenburg Co.:** Young's Landing, 17.v.1969, B. Wright, NSMC; **Queens Co.:** Black Duck Lake, 24.v.2003, P. Dollin, NSMC.

Newly recorded in Nova Scotia. Members of the Serropalpini are xylophagous (Pollock 2002). In Nova Scotia, found in coniferous forests on *Picea rubens* and *Pinus strobus*.

***Spilotus quadripustulatus* (Melsheimer)**

NOVA SCOTIA: Hants Co.: Panuke Lake, 1–16.vii.1997, D.J. Bishop, NSMC.

Newly recorded in Nova Scotia. In Québec, most specimens have been captured in light traps; one specimen on *Acer saccharum* (Laliberté 1965). In Nova Scotia one specimen was captured in a flight-intercept trap in a 45 year-old stand of *Picea rubens*. In Québec, found on twigs and shoots of *Quercus rubra* and *Tilia americana* L. (D. Pollock, unpublished data).

***Scotochroa atra* LeConte**

NOVA SCOTIA: Guysborough Co.: Borneo, 26.vii.1995, C. Corkum, NSMC; **Halifax Co.:** French Village, 9.viii.1945, D.C. Ferguson, NSMC; Big St. Margaret's Bay, 1–16.vii.1997, D.J. Bishop, NSMC; Campbell Hill, 16–29.vii.1997, D.J. Bishop, NSMC; **Queens Co.:** Eight Mile Lake, 9.vii.2003, P. Dollin, NSMC.

Newly recorded in Nova Scotia. In Nova Scotia, most specimens were found in red spruce (*Picea rubens*) forests; one in a decaying white birch (*Betula papyrifera* Marshall) log.

***Scotochroa buprestoides* (Kirby)**

NOVA SCOTIA: Guysborough Co.: Trafalgar, 19.vii.1992, S. and J. Peck, JCC; **Halifax Co.:** Ten Mile Lake, 29.vii–13.viii.1997, D.J. Bishop, NSMC; Pockwock Lake, 29.vii–13.viii.1997, D.J. Bishop, NSMC; Pogwa Lake, 29.vii–13.viii.1997, D.J. Bishop, NSMC.

Newly recorded in Nova Scotia. All specimens in Nova Scotia collected in young red spruce (*Picea rubens*) forests, mostly with flight-intercept traps.

***Scotochroides antennatus* Mank**

NOVA SCOTIA: 26 specimens examined from Guysborough, Halifax, Lunenburg, Queens, Yarmouth, Kings, and Hants counties. The earliest record is from 1958 (**Kings Co.:** Kentville, 6.viii.1958, J.R. Vockeroth, CNC).

Newly recorded from Nova Scotia. In Nova Scotia, collected in *Picea rubens*, *P. mariana* (Mill.) BSP., *Tsuga canadensis* and *Pinus strobus* stands ranging in age from 40 to 120+ years; most specimens collected with flight-intercept traps or by sweeping vegetation.

***Enchodes sericea* (Haldeman)**

NOVA SCOTIA: Victoria Co.: Middle River, 27.vii.1970, B. Wright, NSMC. **NEW BRUNSWICK: York Co.:** Fredericton, 21.vii.1915, A.B. Baird, CNC.

Newly recorded in Nova Scotia and New Brunswick. In Québec, collected on dead conifers and at light traps (Laliberté 1965).

***Serropalpus substriatus* Haldeman**

NEW BRUNSWICK: Gloucester Co.: Bathurst, 21.vi.19??, J.N. Knull, CNC; Bathurst, 15.vii.19??, J.N. Knull, CNC; **Northumberland Co.:** Bartibog, no date, A.C. Ashworth, NDSU; **Queens Co.:** McDonald Corner, 27.vi.1963, 10.vii.1963, and 11.vii.1963, Forest Insect Survey, 5 specimens, NBM; **Saint John Co.:** Saint John, 7.viii.1900, W. McIntosh, NBM. **NOVA SCOTIA:** 65 specimens examined from Annapolis, Antigonish, Colchester, Cumberland, Guysborough, Halifax, Hants, Kings, Lunenburg, Pictou, Queens, Victoria, and Yarmouth counties. The earliest record is from 1909 (**Annapolis Co.:** Granville, 25.vi.1909, H.G. Payne, NSAC).

Newly recorded in Nova Scotia. Adults found on standing or fallen dead conifers (*Abies balsamea*, *Picea glauca* (Moench) Voss, and *Picea mariana* (Laliberté 1965). In Nova Scotia, almost all specimens were found in coniferous forests (*Picea rubens* and *Tsuga canadensis*) ranging in age from 40 to 120+ years; most collected with flight-intercept traps.

***Dircaea liturata* (LeConte)**

NEW BRUNSWICK: Albert Co.: Caledonia Mt., 1965–71, C.G. Majka, CGMC; Mary's Point, 12.viii.2004, C.G. Majka, CGMC; **Saint John Co.:** Saint John, 9.ix.1907. A.G. Leavitt, NBM. **NOVA SCOTIA:** 54 specimens examined from Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, and Yarmouth counties. Found throughout the mainland of Nova Scotia and on Cape Breton Island. The earliest record is from 1948 (**Kings Co.:** Kentville, 25.vii.1948, V.R. Vickery, NSAC). **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 17.vii.2001, C.G. Majka, CGMC.

Newly recorded in Nova Scotia and Prince Edward Island. In Québec collected on fallen trunks of *Quercus rubra*, *Acer rubrum*, *A. saccharum*, *Tilia americana*, and *Fagus grandifolia* Ehrh. (Laliberté 1965). In Nova Scotia, collected in both deciduous (*Acer* spp, *Betula* spp. and *Q. rubra*) and coniferous (*Picea rubens*, *P. mariana*, and *Tsuga canadensis*) forests, frequently with flight-intercept traps.

***Phloiotrya fusca* (LeConte)**

NOVA SCOTIA: Halifax Co.: Point Pleasant Park, 29.vii.2001, C.G. Majka, 3 specimens, CGMC; Point Pleasant Park, 23.vii.2002, C.G. Majka, CGMC; **Queens Co.:** Black Duck Lake, 1.viii.2003, P. Dollin, NSMC. **PRINCE EDWARD ISLAND: Kings Co.:** Woodville Mills, 23.vii.2001, C.G. Majka, CGMC.

Newly recorded in Prince Edward Island. Previously confused with the Palearctic *P.*

vaudoueri Mulsant. In Québec, collected on dead *Abies balsamea* and *Pinus strobus*. In NS associated with dead *Picea rubens* and *P. strobus*.

Hypulini

***Zilora hispida* LeConte**

NOVA SCOTIA: Halifax Co.: Point Pleasant Park, 27.x.2000, C.G. Majka, CGMC; Point Pleasant Park, 12.v.2001, C.G. Majka, CGMC; Point Pleasant Park, 5.viii.2001, C.G. Majka, CGMC.

Newly recorded in Nova Scotia. The bionomics of members of the Hypulini has been little investigated; museum label data, however, suggest that they are xylophagous. One specimen was reared from *Picea glauca* in Montana while another was collected in an *Abies balsamea* forest in Newfoundland (D. Pollock, unpublished data). In Maine found on *A. balsamea* (Dearborn & Donahue 1993). In Nova Scotia, collected in a *Picea rubens* dominated forest.

***Microtonus sericans* LeConte**

NOVA SCOTIA: Kings Co.: Kingston, 30.vi.2002, C.G. Majka, CGMC; North Alton, 21.vi.2003, D.H. Webster, DHWC; Kentville, 27.vii.2004, C. Sheffield, ACNS; **Queens Co.:** Eight Mile Lake, 9.vii.2003, P. Dollin, 8 specimens, NSMC; Sixth Lake, 11.vii.2003, P. Dollin, NSMC; Fifth Lake Bay, 13.vii.2003, P. Dollin, NSMC; Tobeatic Lake, 13.vii.2003, P. Dollin, NSMC; Brooklyn Bowaters, 26.vii.2004, P. Colp, NSNR; Canning Field, 6–17.vii.2005, S. Poirier, NSMC.

Newly recorded from Nova Scotia. As is the case with *Z. hispida*, it is believed that the species is xylophagous. D. Pollock has collected specimens in Pennsylvania by beating a dead *Crataegus* tree. In Maine, found on *A. balsamea* (Dearborn & Donahue 1993). All specimens in Nova Scotia were collected in *Picea rubens* or *Tsuga canadensis* forests.

***Symphora flavicollis* (Haldeman)**

NOVA SCOTIA: 16 specimens were examined from Cumberland, Guysborough, Halifax, Hants, Lunenburg, Pictou, and Queens counties. The earliest specimen dates from 1992 (**Cumberland Co.:** Westchester-Londonderry, 20.vii.1992, S. and J. Peck, 2 specimens, JCC). **PRINCE EDWARD ISLAND:** *Kings Co.:* Woodville Mills, 23.vii.2001, C.G. Majka, CGMC, 2 specimens; *Queens Co.:* Cavendish, 19.vii.2001, C.G. Majka, CGMC; St. Patricks, 19.vii.2001, 17 July, 2001, 14 July, 2002, 25 June, 2003, and 27 June, 2003,

C.G. Majka, CGMC, 7 specimens.

Newly recorded in Prince Edward Island. On the island, found in coniferous forests; in Nova Scotia, in both coniferous (*Picea rubens*, *Tsuga canadensis*, and *Pinus strobus*), deciduous (*Betula papyrifera*) and mixed forests.

Melandryini

***Prothalpia undata* LeConte**

NEW BRUNSWICK: Westmoreland Co.: Moncton, 13.vii.1987, P. Mattais, CNC. **NOVA SCOTIA:** 18 specimens were examined from Annapolis, Colchester, Cumberland, Digby, Guysborough, Halifax, Kings, Queens, and Victoria counties. The earliest record is from 1965 (**Cumberland Co.:** Wentworth, 21.v–5.vii.1965, B. Wright, NSMC).

Newly recorded in New Brunswick. Members of the Melandryini are xylophagous (Pollock 2002). In Nova Scotia, *P. undata* has been found primarily in mature and old red spruce (*Picea rubens*) forests although occasionally also in deciduous forests. In Québec, it has been beaten from dead branches of *Quercus rubra*. (D. Pollock, unpublished data).

***Melandrya striata* Say**

NEW BRUNSWICK: Gloucester Co.: Bathurst, 15.vi.1922, F.C. Craighead, CNC; Bathurst, 13.vi.19??, 21.vi, 19??, and 7.vii, 19??, J.N. Knull, CNC. **NOVA SCOTIA: Cape Breton Co.:** George's River, 1.vii.2000, D.B. McCorquodale, CBU; Howie Centre, NS, 12.vii.2004, CBU; **Halifax Co.:** Armdale, 29.vi.1974, K. Neil, NSMC; Halifax, 27.vi.1968, P. Doleman, NSMC; Miller Lake, 11.vii.2005, NSNR; **Kings Co.:** North Alton, 27.v.1999, D.H. Webster, NSMC; **Queens Co.:** Lake Kejimkujik, 31.v.1958, D.C. Ferguson, NSMC; **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 25.vi.2003, C.G. Majka, CGMC.

Newly recorded in Nova Scotia and Prince Edward Island. In Nova Scotia, found under bark of and on rotten *Populus tremuloides* Michx; in New Brunswick, reared from *Betula* sp. In Québec, recorded from dying *Fagus grandifolia* and on the trunk of fallen *Acer saccharum*. (D. Pollock, unpublished data).

***Emmesa connectens* Newman**

NEW BRUNSWICK: Kings Co.: Grand Bay, 25.vi.1990, D.F. McAlpine, NBM. **Saint John Co.:** Saint John, 31.vii.1899, W. McIntosh, NBM. **NOVA SCOTIA:** 30 specimens were examined from Colchester, Cumberland, Guysborough, Halifax, Kings, and

Richmond counties counties. The earliest specimen dates from 1952 (**Kings Co.:** Woodville, 3.vii.1952, V.R. Vickery, NSAC).

Newly recorded in New Brunswick. In Nova Scotia, found primarily in red spruce (*Picea rubens*) forests of varying age (40–120+ years) although occasionally also in deciduous forests. Frequently collected with flight-intercept traps. In Québec, recorded from *Acer* spp., *Pinus* spp., and *Fagus grandifolia*. (D. Pollock, unpublished data).

***Emmesa labiata* (Say)**

NEW BRUNSWICK: Gloucester Co.: Bathurst, 25.vi.19?? and 20.vi.19??, J.N. Knull, CNC; **York Co.:** Fredericton, 29.vi.1928, M.L.P., CNC. **NOVA SCOTIA: Colchester Co.:** Nuttby Mt., summer 1995, C. Corkum, NSMC; **Cumberland Co.:** Moose River, 30.vi.1995, C. Corkum, NSMC; Spencer's Island, 13.vii.1995, C. Corkum, NSMC, 2 specimens; **Kings Co.:** Kentville, 23.vii.1914, C.A.G., CNC.

Newly recorded in Nova Scotia. Found in both coniferous and deciduous forests; collected with flight-intercept traps. In Maine, found on *Abies balsamea* (Dearborn & Donahue 1993).

***Phryganophilus collaris* LeConte**

NOVA SCOTIA: Victoria Co.: Sunday Lake, Cape Breton Highlands National Park, 15.vi.1996, R.L. Lauff, NSMC.

Newly recorded in Nova Scotia; found in a regenerating coniferous forest.

Synchroidae

***Synchroa punctata* Newman**

NOVA SCOTIA: Cumberland Co.: Oxford, 6.vi.1989, E. Georgeson, NSNR; **Halifax Co.:** Armdale, 12.viii.1974, K. Neil, NSMC; Boulderwood, 26.vii.1959, J.H. McDunnough, 2 specimens, NSMC; Halifax, 4.v.1960, P.S. Doleman, NSMC; Point Pleasant Park, 23.vi.2001, C.G. Majka, CGMC; Point Pleasant Park, 19.viii.2001, C.G. Majka, CGMC; **Kings Co.:** Kentville, 21.vii.1948, NSAC; Kentville, 1.vii.1968, D.H. Webster, DHWC; Kentville, 19.vi.2001, D.H. Webster, DHWC; Avonport, 20.vii.1994, J. Smith, NSNR; **Lunenburg Co.:** Chester 1.viii.1969, B. Wright, NSMC; Big Mushamush Lake, 20.vii.1980, B. Wright, NSMC; Big Mushamush Lake, 23.vii1982, B. Wright, NSMC; **Pictou Co.:** Waterside, 28.vii.2004, D. MacDonald, NSNR; **Queens Co.:** Ponhook Lake, 13.vii.1993, J. Cook, JCC. **PRINCE EDWARD ISLAND:** 1974–83, UPEI.

Newly recorded in Nova Scotia and Prince Edward Island. Adults and larvae feed largely upon fungal material and decaying wood, commonly beneath the bark of dead deciduous trees (Payne 1931). In Maine, collected from *Abies* and *Picea* (Dearborn and Donahue 1993).

Scraptiidae: Scraptiinae

Scraptiini

***Canifa pallipes* (Melsheimer)**

NOVA SCOTIA: 78 specimens examined from Antigonish, Colchester, Cumberland, Guysborough, Halifax, Hants, Lunenburg, Pictou, Queens, Richmond, and Yarmouth counties. The earliest records are from 1965 (**Lunenburg Co.:** Bridgewater, 19.vi.1965, B. Wright, 13 specimens, NSMC; Bridgewater, 30.vi.1965, B. Wright, 2 specimens, NSMC). **PRINCE EDWARD ISLAND: Kings Co.:** Woodville Mills, 23.vii.2001, C.G. Majka, CGMC; **Queens Co.:** St. Patricks, 21.vii.2001, C.G. Majka, CGMC; St. Patricks, 22.vii.2001, C.G. Majka, CGMC; St. Patricks, 14.vii.14 2002, C.G. Majka, CGMC; St. Patricks, 27.vi.2003, C.G. Majka, CGMC; St. Patricks, 29.vi.2003, C.G. Majka, CGMC.

Newly recorded in Prince Edward Island. In Manitoba, *Canifa* larvae have been found under the bark of dead poplar (Pollock 2002b). Adults are found on foliage and vegetation in forested environments. In Nova Scotia, commonly found in both coniferous (*Picea rubens*., *P. mariana*, and *Pinus strobus*) and deciduous forests.

***Canifa pusilla* (Haldeman)**

NOVA SCOTIA: 32 specimens examined from Annapolis, Cumberland, Halifax, Hants, Pictou, Queens, and Yarmouth counties. The earliest record is from 1992 (**Cumberland Co.:** Westchester–Londonderry, 20.vii.1992, S. and J. Peck, JCC).

Newly recorded in Nova Scotia. Found primarily in coniferous (*Picea rubens*, *P. mariana*, *Tsuga canadensis*, *Pinus strobus*, and *Abies balsamaea*) forests.

Scraptiidae: Anaspidinae

Anaspidini

***Anaspis flavipennis* Haldeman**

NOVA SCOTIA: 119 specimens examined from Annapolis, Colchester, Cumberland, Guysborough, Halifax, Hants, Lunenburg, Pictou, Queens, and Victoria counties. The

earliest records are from 1965 (**Lunenburg Co.:** Lunenburg, 19.vi.1965, B. Wright, NSMC; Lunenburg, 20.vi.1965, NSNR, 2 specimens, NSMC; Lunenburg, 30.vi.1965, B. Wright, 4 specimens, NSMC). **Colchester Co.:** Truro, July 26, 19xx, R. Matheson, Liljeblad (1945). **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 25.vi.2003, C.G. Majka, CGMC.

Newly recorded in Nova Scotia and Prince Edward Island. Although Liljeblad (1945) indicated a specimen from Nova Scotia (above) this record appears to have escaped the attention of LeSage (1991d) and the species was not included in the Nova Scotia fauna. Larvae of *Anaspis* occur under loose tree bark (Hatch 1965). In Nova Scotia, found only in coniferous (*Picea rubens*, *P. mariana*, *Tsuga canadensis*, *Pinus strobus*, and *Abies balsamaea*) forests.

Anaspis nigrina Csiki

NOVA SCOTIA: Colchester Co.: Debert, 6.vi.1994 and 29.vi.1994, J. Ogden, NSNR; Debert, 8.vii.1994, E. Georgeson, NSNR; Otter Brook, 29 June, 1995, C. Corkum, NSMC, 3 specimens; **Digby Co.:** Brier Island, 26.vii.2003, J. Ogden and K. Goodwin, NSNR; **Guysborough Co.:** Malay Lake, 2–15.vi.1997, 15–30.vi.1997, and 1–16.vii.1997, D.J. Bishop, NSMC; Seloam Lake, 1–16.vii.1997, D.J. Bishop, NSMC; Halifax Co.: Campbell Hill, 15–30.vi.1997, D.J. Bishop, NSMC; Big St. Margaret's Bay, 15–30.vi.1997, D.J. Bishop, NSMC; Queens Co.: Black Duck Lake, 10.vii.2003, P. Dollin, NSMC; **Yarmouth Co.:** Wellington, 30.vi.1987 and 22.vii.1998, J. Cook, JCC.

Newly recorded in Nova Scotia: found only in coniferous (*Picea rubens*, and *Pinus strobus*) forests.

Anaspis rufa Say

NEW BRUNSWICK: Albert Co.: Crooked Creek, 27.viii,2003, C.G. Majka, 2 specimens, CGMC; Mary's Point, 12.viii.2004, C.G. Majka, 2 specimens, CGMC; Headquarters: Fundy National Park, 14.vii.1972. R. Laforge, FNP. **NOVA SCOTIA:** 352 specimens examined from Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Richmond, Shelburne, Victoria and Yarmouth counties. The earliest record is from 1961 (**Kings Co.:** Gaspereau Lake, 8.vii.1961, D.H. Webster, 2 specimens, DHWC). **PRINCE EDWARD ISLAND:** PEI, 1974–1983, UPEI; **Kings Co.:** Woodville Mills, 23.vii.2001, C.G. Majka, 3 specimens, CGMC; **Queens Co.:** Park Corner, 18.vii.1997, D.B. McCorquodale, CBU; Wood Islands, 20.vii.1997, D.B. McCorquodale, CBU; Princeton-Wharburton Rd., 19.viii.2002, C.G. Majka, CGMC; St. Patricks, 21.vii.2001, 22.vii.2001, 13.vii.2002, 14.vii.2002, and 25.vi.2003, C.G. Majka, 8 specimens, CGMC.

Newly recorded in Prince Edward Island. In Nova Scotia, found in coniferous and deciduous forests of all types and in many forest edge (old field, scrub, bog, stream-edge, pine barren, etc.) areas. Very abundant on flowers.

Discussion

New records

The present study reports new records of 25 species from Nova Scotia, 10 from Prince Edward Island, and three from New Brunswick. As a consequence 37 species of Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae are now known from the Maritime Provinces (**Table 1**), a substantial increase from the 23 reported by LeSage (1991a, 1991b, 1991c, 1991d). The new records reported herein for *T. tessellata, P. obliquata, P. pimela, H. scapularis, E. confinis, E. tomentosus, H. bifasciatus, O. ovata, S. quadripustulatus, S, antennatus, E. sericea, D. liturata, Z. hispida, M. sericans, M. striata, P. collaris, S. punctata, C. pusilla,* and *A. flavipennis* (19 species) all represent range extensions for the respective species.

Distribution and zoogeography

The disparities in collecting effort between Nova Scotia (1,037 specimens) on the one hand, and New Brunswick (42 specimens) and Prince Edward Island (36 specimens) on the other, mean that an understanding of the region's fauna as a whole is still in its early stages. Since collection effort in New Brunswick and Prince Edward Island is only 3–4% that of Nova Scotia, further collecting in those provinces will doubtless reveal much more detail about the region's fauna. This disparity is also evident in terms of the number of county records, those of New Brunswick being only 16% that of Nova Scotia and those of PEI being only 6% that of Nova Scotia. Nonetheless the current data indicate that the fauna is broadly contiguous with the eastern boreal forest fauna as found in Québec. All the species found in the Maritime Provinces except *M. sericans* have also been recorded in Québec (Laplante *et al*. 1991). Specific information for Maine is only partially available, however, Bourque *et al*. (2005) recorded 38 species within the four families treated herein, indicating a similar-sized fauna for the state overall. Chandler (2001) recorded five species from Maine (see below) that have not been found in the Maritime Provinces.

Within Nova Scotia there are a similar number of county records in the North Shore (50), Eastern Shore (49), and Southern Shore (52) regions although the number of county records and species (30) in the Eastern Shore region are actually significantly greater since this region is comprised of only two counties (Guysborough and Halifax) whereas all the other regions of the province are comprised of four counties (Table 1). These greater numbers primarily reflect the much greater collection effort in the area of Halifax, where many researchers and studies have been based. County records in the Bay of Fundy region (39) and on Cape Breton Island (21) are somewhat less (see below).

Majka and Pollock (2006) record *Tetratoma variegata* (Casey), *Hallomenus punctulatus* LeConte, *Synstrophus repandus* (Horn), and *Mallodrya subaenea* Horn from the Québec portion of the Atlantic Maritime Ecozone; Chandler (2001) recorded *H. punctulatus*, *S. repandus*, *Pisenus humeralis* (Kirby), *Rushia longula* LeConte, and *Canifa plagiata* (Melsheimer) from Maine; and Dearborn & Donahue (1993) recorded *Scotochroa basalis* LeConte and *Canifa pallipennis* LeConte from Maine. LeSage (1991a, 1991b) recorded *S. basalis* and *T. variegata* from Newfoundland. All nine species are potential candidates for being found in the Maritime Provinces.

Island faunas

As is typically the case with island faunas, that of Prince Edward Island (10 species) appears diminished (27% of the fauna on the neighboring mainland), as is that of Cape Breton Island (12 species; i.e., 32%). This may represent an island-associated diminution, the paucity of collecting, or a combination of both. In relation to the much more extensively studied Coccinellidae, Majka and McCorquodale (2006) found that Prince Edward Island had 39% of the mainland fauna while that of Cape Breton, with a land area slightly more than twice the size of Prince Edward Island (10,311 km^2 vs. 5,660 km^2), and separated from the mainland by only 1.5 km (in contrast to the 13 km that separate New Brunswick and Prince Edward Island) was 41% that of the mainland. This suggests that further collecting in both areas may be required in order to fully discern their respective faunas.

In Newfoundland, to the northeast of the region and within the Canadian Boreal Shield Ecozone (Environment Canada 2005), has a land area of 111,390 km^2 and is circa 105 km distant from Cape Breton Island. LeSage (1991a, 1991b, 1991c, 1991d) records 17 species there. Most have also been recorded in the Maritime Provinces, however, *Scotochroa basalis* and *Tetratoma variegata* have not.

It is interesting to note that within Nova Scotia both *Enchodes sericea* and *Phryganophilus collaris* have only been collected on Cape Breton Island. Cape Breton (particularly the highlands) has a climate and physiography that supports a taiga and boreal forest community distinct from those of mainland Nova Scotia (Davis and Browne 1996). Both of these species were collected in the Cape Breton Highlands Plateau Forest District (Davis and Browne 1996), a portion of the Cape Breton Highlands Ecoregion of the Atlantic Maritime Ecozone (Environment Canada 2005); this is a possible indication that these species are confined to such environments within Nova Scotia.

Saproxylic beetles

Speight (1989), Grove (2002), and Dudley & Vallauri (2004) discussed the importance of saproxylic insects in the dynamics of forest ecosystems. In general, upwards of 30% of plant biomass produced annually in forests is in the form of woody tissue and the quantity of plant nutrients recycled annually by saproxylics in forests is roughly 50% of that

recycled from the annual leaf fall (Swift 1977, Speight 1989). A number of studies have drawn attention to the importance of this group in the trophic dynamics of forests. Siitonen (2001) found that 20–25% of all forest-dwelling invertebrates in Fennoscandia were saproxylic. Martikainen *et al*. (2000) found that 42% of the 553 species of beetles collected in a spruce forest in Finland were saproxylic. Köhler (2000) considered 56% of all forest-dwelling beetle species in forests in north Rhineland to be saproxylic.

In Nova Scotia, C.G. Majka (in preparation) in a study of a forested park found 484 species of beetles, 259 (54%) of which can be considered saproxylic. In a study of 11 coniferous forest stands in southwestern Nova Scotia Dollin (2004) found 243 species of saproxylic beetles. In a study of 30 coniferous forest stands in central Nova Scotia Bishop (1998) found 286 species of saproxylic beetles. Although Kehler *et al*. (1996, 2004) identified beetles only to morphospecies in the 25 coniferous forest stands in central Nova Scotia that they examined, subsequent taxonomic work by Majka and Bondrup-Nielsen (in preparation) revealed that 203 saproxylic species are present. Although the scale of studies and their sampling methodologies differ, these results indicate that saproxylic beetles are an important component of forest communities in the province. The results also indicate that the Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae together make up 6.9–9.4% of the saproxylic species present in forest stands (Table 2).

TABLE 2. Tetratomidae, Melandryidae, Synchroidae, and Scraptiidae from four studies of forest beetles in Nova Scotia.

	Number of species			
	Kehler *et al*. (1996)	Bishop (1997)	Dollin (2004)	Majka (in prep.)
Tetratomidae	4	8	3	2
Melandryidae	10	12	11	11
Synchroidae	0	0	0	1
Scraptiiidae	5	5	5	4
Total number of species	19	25	19	18
% of all saproxylic species	9.4	8.7	7.8	6.9
Number of saproxylic species	203	286	243	259
Total species	292	376	339	484

A number of species treated in this study appear to be rather rare: *E. confinis, H. bifasciatus, S. atra*, and *Z. hispida* are all known from eastern Canada from less than 10 specimens. The apparent scarcity of these saproxylic species could be indicative of a diminution of habitat as a result of forest management practices. For instance, in Nova Scotia although 78% of the land base is forested, less than 1% of that land is comprised of old-growth forests (Loo & Ives 2003). In this context it is important to bear in mind that

diversity of saproxylic species may depend on subtle variation in habitat characteristics, not apparent at a landscape-level analysis of forest diversity (Hammond *et al*. 2004, Spence *et al*. 1997).

While detailed studies in Canada are as yet few, they do indicate that populations of saproxylic beetles are significantly related to parameters of forest structure and disturbance. In light of the concerns summarized by Grove (2002) and Dudley & Vallauri (2004) of the impact of contemporary forest management practices on saproxylic beetles, further research needs to be done in the Maritime Provinces to determine the status of this and other groups of saproxylic beetles, the impact that forest practices may have had on them, and mechanisms that might lessen or ameliorate habitat fragmentation, the disappearance of old-growth forests, the diminution of coarse woody debris, and other parameters of forests that are of importance to saproxylic insects. In Canada we need to learn from the experiences of other jurisdictions. In Europe Grove (2002, pp. 14–15) wrote, "Many saproxylic species now survive ... only as relictual populations, 'hanging on by the tips of their tarsi' ... In the absence of positive management, the ultimate extinction of some such species (truly the 'living dead') is almost inevitable through stochastic events."

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