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The Erotylidae and Endomychidae (Coleoptera: Cucujoidea) of the Maritime Provinces of Canada: New records, zoogeography, and observations on beetle-fungi relationships and forest health

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Abstract

The Erotylidae and Endomychidae of the Maritime Provinces are surveyed. Fifteen species are now known from the region, fourteen in Nova Scotia, seven in New Brunswick, and four on Prince Edward Island. Thirteen new provincial records (seven from Nova Scotia, three from New Brunswick, and three from Prince Edward Island) are reported. Four erotylids, *Dacne quadrimaculata* (Say), *Triplax dissimulator* (Crotch), *Triplax flavicollis* Lacordaire, *Triplax macra* LeConte; and two endomychids, *Rhanidea unicolor* (Ziegler) and *Lycoperdina ferruginea* LeConte, are newly recorded in the Maritime Provinces as a whole. New records of the rare endomychid, *Hadromychus chandleri* Bousquet & Leschen, are reported. The fauna is examined in a regional zoogeographic context, paying particular attention to the insular faunas of Cape Breton and Prince Edward Islands. Attention is also drawn to the number of species that have been very rarely collected. This apparent scarcity may be related to the long history of forest management in the region, in particular the effects of intensive forestry on the communities of forest fungi on which these species feed and depend. Attention is drawn to the importance of ongoing research to monitor their populations and assess how these species may be employed as indicators of the overall health forest ecosystems.

Key words: Coleoptera, Erotylidae, Endomychidae, Dacninae, Tritominae, Merophysiinae, Endomychinae, Stenotarsinae, Epipocinae, Lycoperdininae, Mycetaeinae, fungus beetles, forest Coleoptera, saproxylic fauna

Introduction

Fungi are an important habitat for many groups of families beetles. In Canada in a study in Gatineau Park, Québec, Matthewman & Pielou (1971) recorded 44 species of Coleoptera from just one species of polypore, *Fomes fomentarius* (Fr.) Kickx, while Pielou & Verma (1968) recorded 39 species from another polypore, *Piptoporus betulinus* (Fr.) Kar. Benick (1952) recorded an astounding 246 species of beetles from *Polyporus squamosus* Fr. Two of the families of beetles associated with forest fungi are the Erotylidae (Pleasing Fungus Beetles) and Endomychidae (Handsome Fungus Beetles). These beetles take advantage of the different groups of fungi and the different microhabitats that they provide. In the Erotylidae, species in the Dacninae and Megalodacninae burrow in hard bracket fungi (Polyporaceae) while those in the Tritominae feed on soft polypores or other basidiomycetes (Skelley & McHugh 2002). Within the Endomychidae, some species feed on spores and hyphae of microfungi, others are specialists on puffballs, some are found in subcortical fungi and soft polypores, others are found on fleshy basidiomycetes, while still others are found on Zygomycete molds and mildews associated with the decomposition of vegetative matter (Bousquet 1990; Skelley & Leschen 2002; F. Shockley pers. comm.). As such, they are reflective of a variety of microhabitats in forest ecosystems.

In the Maritime Provinces of Canada a faunal list was compiled by Campbell (1991a, 1991b) which listed three species of erotylids and six species of endomychids in the region, four from New Brunswick, seven from

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Nova Scotia, and one from Prince Edward Island. An examination of recent specimens collections in the region, as well as museum specimens, shows that the region supports a more robust fauna than previously documented. The present study reports the results of these investigations.

Methods and conventions

Specimens of Erotylidae and Endomychidae originating in the Maritime Provinces were examined. Codens of collections (following Evenhuis 2007) referred to in the text are:

ACNS	Agriculture and Agri-food Canada, Kentville, Nova Scotia, Canada
ACPE	Agriculture and Agri-food Canada, Charlottetown, Prince Edward Island, Canada
CGMC	Christopher G. Majka collection, Halifax, Nova Scotia, Canada
CNC	Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
DAL	Dalhousie University, Halifax, Nova Scotia, Canada
DHWC	David H. Webster collection, Kentville, Nova Scotia, Canada
JOC	Jeffrey Ogden collection, Truro, Nova Scotia, Canada
NBM	New Brunswick Museum, Saint John, New Brunswick, Canada
NSAC	Nova Scotia Agricultural College, Bible Hill, Nova Scotia, Canada
NSMC	Nova Scotia Museum collection, Halifax, Nova Scotia, Canada
NSNR	Nova Scotia Department of Natural Resources, Shubenacadie, Nova Scotia, Canada
RPWC	Reginald P. Webster collection, Charters Settlement, New Brunswick, Canada

The number of specimens examined is indicated in parentheses; if not specified, a single specimen was examined. For species where there were fewer than 10 specimens, all records are reported. For species where there were more than 10 specimens, a summary of specimens examined is given. The systematics of each family follows Skelley & McHugh (2002) (Erotylidae), and Skelley & Leschen (2002) and Tomaszewska (2005) (Endomychidae).

Results

In the course of the present research, 172 specimens of Erotylidae and Endomychidae from the Maritime Provinces were examined. Fifteen species are now known from the region. Fourteen have been recorded in Nova Scotia, seven in New Brunswick, and four on Prince Edward Island. Thirteen new provincial records (seven from Nova Scotia, three from New Brunswick, and three from Prince Edward Island) are reported. Four species of Erotylidae, *Dacne quadrimaculata* (Say), *Triplax dissimulator* (Crotch), *Triplax flavicollis* Lacordaire, *Triplax macra* LeConte, and two species of Endomychidae, *Rhanidea unicolor* (Ziegler) and *Lycoperdina ferruginea* LeConte, are newly recorded in the Maritime Provinces as a whole. Fourteen are native Nearctic species and one, *Mycetaea subterranea* (Fabricius), is an adventive Palearctic species (Table 1). Specific details follow.

Erotylidae

Dacninae

TABLE 1. The Erotylidae and Endomychidae of the Maritime Provinces of Canada.

	Nova Scotia					NS	NB	PE	
species	Northern Shore	Cape Breton	Eastern Shore	South Shore	Bay of Fundy				Regional Distribution
EROTYLIDAE									
Dacninae									
Dacne quadrimaculata (Say)					1	1			MA, ME, NH, NS, NY, ON, QC, VT
Tritominae									
Triplax dissimulator (Crotch)	2				2	4	1	1	MA, ME, NB, NH, NS, NY, ON, PE, QC
Triplax flavicollis Lacordaire				1		1			NH, NS, NY, ON, QC, VT
Triplax frosti Casey					1	1	1		MA, ME, NB, NH, NS, NY, ON, QC
Triplax macra LeConte			1			1			MA, ME, NH, NS, ON, QC, RI
Triplax thoracica Say	3		1	1	1	6	1	1	MA, ME, NB, NH, NS, NY, ON, PE, QC, RI, VT
Tritoma pulchra Say	4	2	2	2	2	12			MA, ME, NH, NS, NY, ON, QC
ENDOMYCHIDAEE									
Leiestinae									
Phymaphora pulchella Newman	2	3	2	2	2	11	1	1	ME, NB, NH, NS, NY, ON, PE, QC
Rhanidea unicolor (Ziegler)							1		NB, NH, NY, ON, QC
Endomychinae									
Endomychus biguttatus Say	1	1			2	4	2		CT, MA, ME, NB, NF, NH, NS, NY, ON, QC, RI, VT
Stenotarsinae									
Danae testacea (Ziegler)		1				1			CT, MA, NH, NS, NY, ON, QC, RI
Danascelinae									
Hadromychus chandleri Bousquet & Leschen	2		1	1		4			NH, NS, QC
Lycoperdininae									
Lycoperdina ferruginea LeConte					1	1			CT, MA, NH, NS, NY, ON, QC, RI
Mycetina perpulchra (Newman)	4		2	2	1	9	1		MA, ME, NB, NH, NS, ON, QC, RI
Mycetaeinae									
Mycetaea subterranea (Fabricius) †	1		2		1	4		1	CT, MA, NF, NS, NY, ON, PE, QC, RI
Total county records	19	7	11	9	14	60	8	4	
Number of species	8	4	7	6	9	14	7	4	

Note: Numbers indicate the number of county records in each province or region. For the purposes of this treatment, northeastern North America consists of the following jurisdictions: Connecticut (CT), Labrador (LB), Massachusetts (MA), Maine (ME), New Brunswick (NB), Newfoundland (NF), New Hampshire (NH), Nova Scotia (NS), New York (NY), Ontario (ON), Prince Edward Island (PE), Québec (QC), Rhode Island (RI), Saint-Pierre et Miquelon (PM), and Vermont (VT).

Districts in Nova Scotia consist of the following counties: **Northern Shore:** Antigonish, Cumberland, Colchester, Pictou, Antigonish; **Cape Breton:** Cape Breton, Inverness, Richmond, Victoria; **Eastern Shore:** Guysborough, Halifax; **South Shore:** Lunenburg, Queens, Shelburne, Yarmouth; **Bay of Fundy:** Annapolis, Digby, Hants, Kings. There are 3 counties on Prince Edward Island and 15 counties in New Brunswick.

Regional distributional information is derived from Campbell (1991a, 1991b), Downie & Arnett (1996), Chandler (2001), and Sikes (2004) as well as the present study.† Palearctic species.

***Dacne quadrimaculata* (Say, 1835)**

NOVA SCOTIA: Kings Co.: Kentville, 28.v.2006, D.H. Webster, DHWC.

Newly recorded in Nova Scotia and the Maritime Provinces as a whole (Fig. 1). Larvae feed in a variety of hard and soft basidiomycete bracket fungi in the genera *Clavicorona, Ganoderma, Hypsizygus, Lentinus, Piptoporus, Pleurotus, Pluteus, Polyporus,* and *Stereum* (Skelley *et al*. 1991).

Tritominae

***Triplax dissimulator* (Crotch, 1873)**

NEW BRUNSWICK: Carleton Co.: Richmond Hovey Hill, 19.viii.2004, R.P. Webster, hardwood forest: fleshy fungi, RPWC. **NOVA SCOTIA: Antigonish Co.:** Morar, 7.vii.1993, M. Leblanc, funnel trap, (4), NSNR; **Colchester Co.:** Shubenacadie, 7.vi.2005, J. Gordon, flight intercept trap, NSNR; **Hants Co.:** Nine Mile River, 15-30.vi.1997 & 16-29.vii.1997, D.J. Bishop, black spruce forest, flight intercept trap, (2), NSMC; **Kings Co.:** Coldbrook, vi.2003, R. Williams, flight intercept trap, NSNR; New Minas, 7.vi.2003, D.H. Webster, hardwoods, DHWC. **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 27.vi.2003, C.G. Majka, coniferous forest, funnel trap, (3), CGMC.

Newly recorded in New Brunswick, Nova Scotia, Prince Edward Island, and the Maritime Provinces as a whole (Fig. 2). Adults and larvae of *Triplax* species feed in soft bracket fungi, particularly *Inonotus* spp. (Polyporaceae) and *Pleurotus* spp. (Tricholomataceae) (Skelley & McHugh 2002). Specifically, *Triplax dissimulator* has been recorded from *Hypsizygus tessulatus* (Bull. ex Fr.) Sing. (Tricholomataceae) and *Pleurotus* spp. (Skelley *et al*. 1991).

***Triplax flavicollis* Lacordaire, 1842**

NOVA SCOTIA: Lunenburg Co.: Card Lake, 29.vii-13.viii.1997, D.J. Bishop, old-growth red spruce/hemlock forest, flight intercept trap, NSMC.

Newly recorded in Nova Scotia and the Maritime Provinces as a whole (Fig. 2). Recorded from various mushrooms and soft polypore fungi in the genera *Cantharellus, Hericum, Panus, Pleurotus, Polyporus,* and *Tricholomopsis* (Skelley *et al*. 1991).

***Triplax frosti* Casey, 1924**

NEW BRUNSWICK: Kent Co.: Kouchibouquac National Park, 19.vi.1978, S.J. Miller, CNC. **NOVA SCOTIA: Kings Co.:** Upper Canard, 30.iv.2003, C. Sheffield, in pears on ground, ACNS.

Newly recorded in Nova Scotia (Fig. 2). Recorded from *Pleurotus ostreatus* Fr. and *Pleurotus sapidus* (Schulz.) Sacc. (Skelley *et al*. 1991).

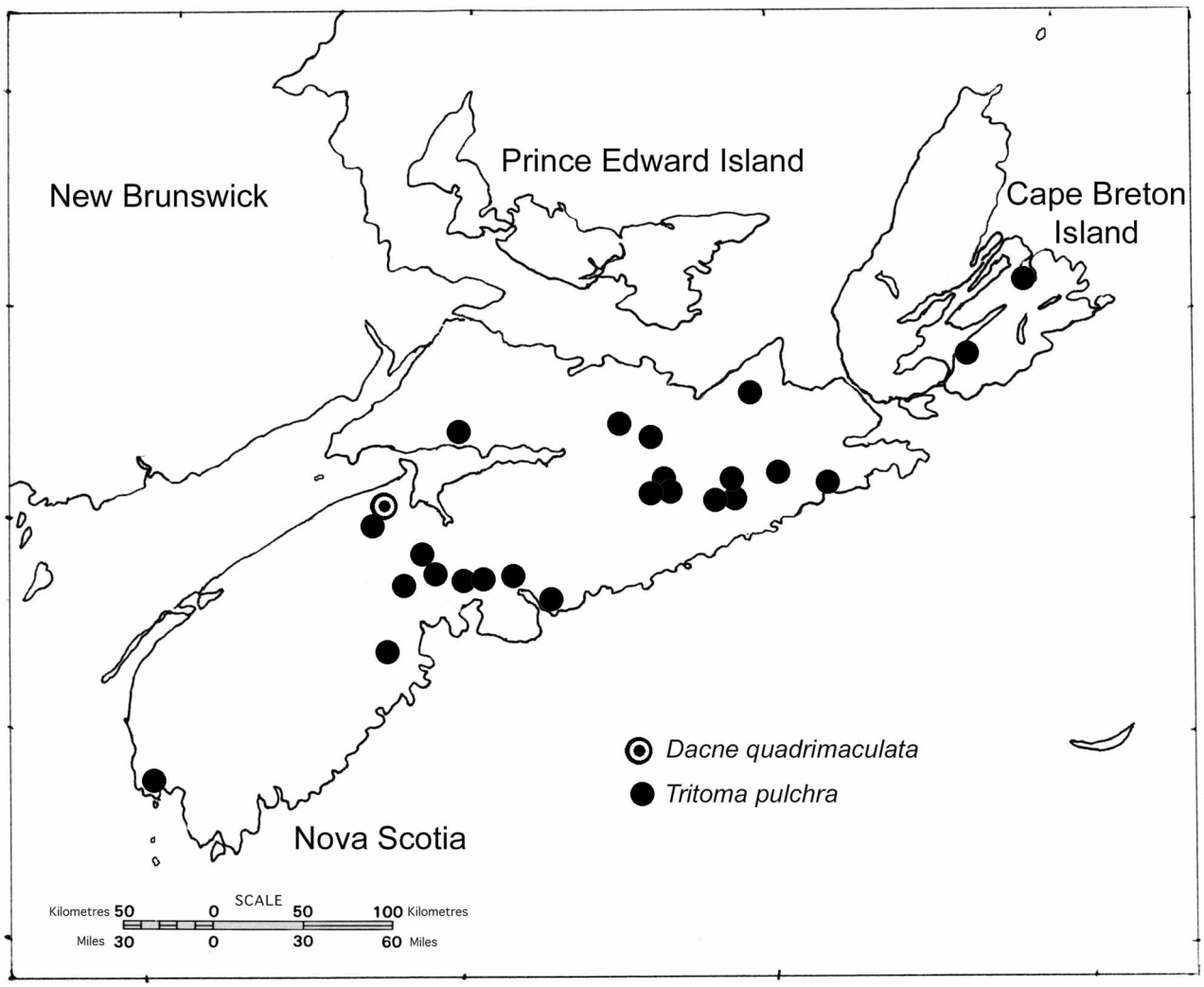

FIGURE 1. Distribution of *Dacne quadrimaculata* (Say) and *Tritoma pulchra* Say in the Maritime Provinces of Canada.

Triplax macra LeConte, 1854

NOVA SCOTIA: Guysborough Co.: Country Harbour, 7.vii.1994 & 15.viii.1994, D. Kehler, old deciduous forest, flight intercept trap, (6), NSMC.

Newly recorded in Nova Scotia and the Maritime Provinces as a whole (Fig. 2). Recorded from *Inonotus andersonii* (Ell. & Ev.) Cerny, *Inonotus rheades* (Pers.) Karst., and *Pleurotus ostreatus* (Skelley *et al*. 1991).

Triplax thoracica Say, 1825

NEW BRUNSWICK: Gloucester Co.: Bathurst, vii.1910, J.N. Knull, CNC; **Carleton Co.:** Richmond Hovey Hill, 19.viii.2004, R.P. Webster, hardwood forest: fleshy fungi, RPWC. **NOVA SCOTIA:** 16 specimens examined from Colchester, Cumberland, Guysborough, Kings, Lunenburg, Pictou, and Queens counties. The earliest records are from 1965 (**Cumberland Co.:** Wentworth, 21.v-5.vii.1965, B. Wright, sugar maple forest, window trap, NSMC; **Lunenburg Co.:** Bridgewater, 19.vi.1965, Dept. of Forestry, NSMC). **PRINCE EDWARD ISLAND: Queens Co.:** Charlottetown, 26.ix.1983, L.S. Thompson, oyster mushroom, (4), ACPE; St. Patricks, 30.vi.2003, C.G. Majka, mixed forest, CGMC.

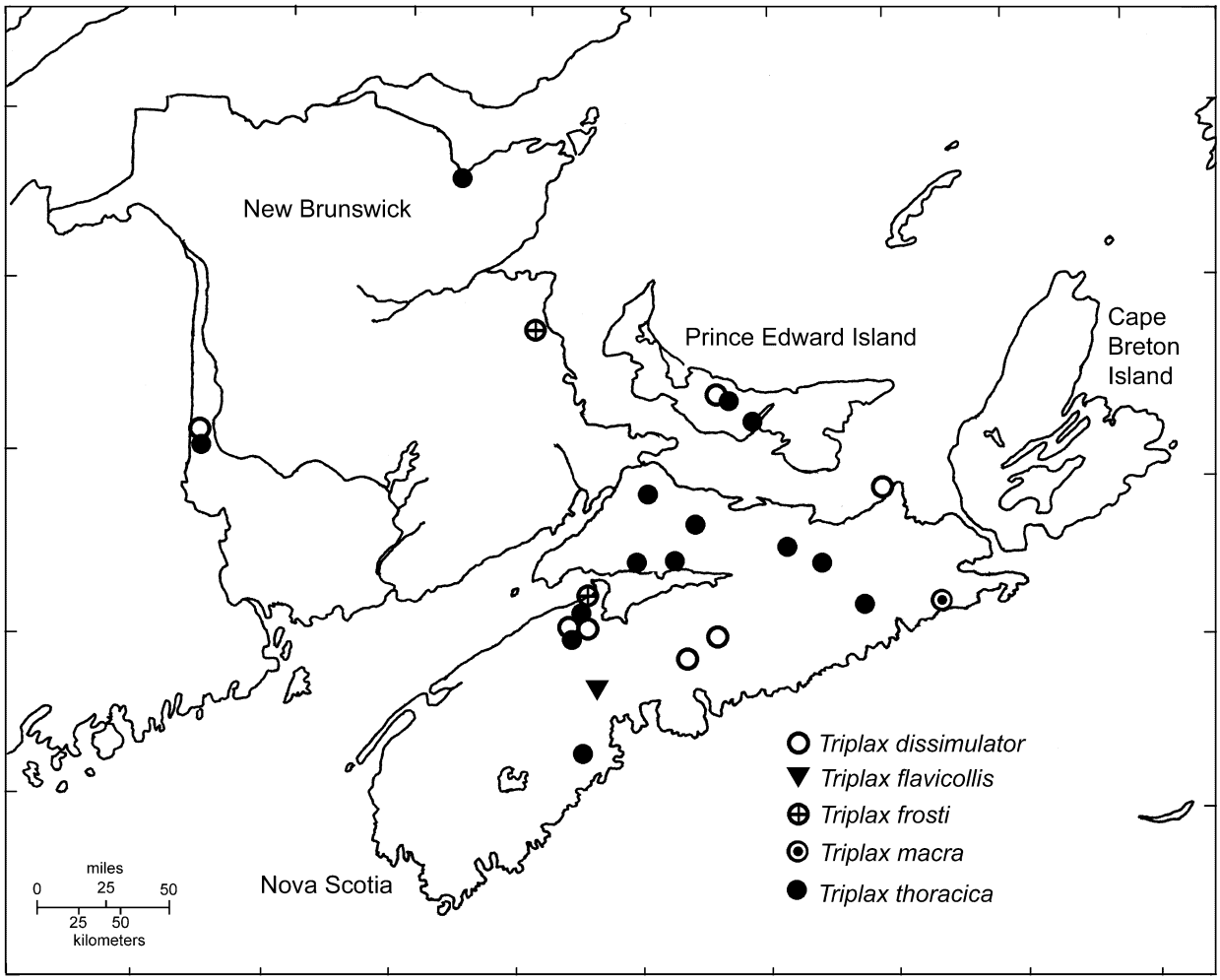

FIGURE 2. Distribution of *Triplax dissimulator* (Crotch), *Triplax flavicollis* Lacordaire, *Triplax frosti* Casey, *Triplax macra* LeConte, and *Triplax thoracica* Say in the Maritime Provinces of Canada.

Newly recorded in Nova Scotia and Prince Edward Island (Fig. 2). Recorded from various mushrooms and soft polypore fungi in the genera *Amanita, Auricularia, Bjerkandera, Ganoderma, Hericium, Hipsizygus, Panus, Pholiota, Pleurotus,* and *Polyporus* (Skelley *et al.* 1991). Recorded from the oyster mushroom, *Pleurotus ostreatus*, on Prince Edward Island.

Tritoma pulchra Say, 1826

NOVA SCOTIA: 38 specimens examined from Antigonish, Cape Breton, Colchester, Cumberland, Guysborough, Halifax, Hants, Kings, Lunenburg, Pictou, Richmond, and Yarmouth counties (Fig. 1). The earliest record is from 1974 (**Lunenburg Co.:** Big Mushamush Lake, 30.vi.1974, B. Wright, NSMC).

Adults and larvae are found in various mushrooms and soft polypore fungi in the genera *Ceriporia, Ganoderma, Oligoporus, Piptoporus, Polyporus, Russula, Stemonitis,* and *Tyromyces* (Skelley *et al.* 1991).

Endomychidae

Leiestinae

Phymaphora pulchella Newman, 1838

NEW BRUNSWICK: Carleton Co.: Meduxnekeeg Valley Preserve, 19.viii.2004, R.P. Webster, hardwood forest: decaying fleshy fungi, RPWC. **NOVA SCOTIA:** 22 specimens examined from Cape Breton, Colchester, Cumberland, Guysborough, Halifax, Hants, Kings, Lunenburg, and Queens counties. The earliest record is from 1960 (**Kings Co.:** Cambridge Station, 29.x.1960, D.H. Webster, under bark of *Populus tremuloides* Michx. DHWC). **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, 13.vii.2002, C.G. Majka, on *Piptoporus betulinus* (Fr.) Kar. on *Betula papyrifera* Marshall, CGMC.

Newly recorded in New Brunswick and Prince Edward Island (Fig. 3). Associated with *Piptoporus betulinus* (Polyporaceae) and *Donkia pulcherrima* (B. & C.) Pilt (Hydnaceae) (F. Shockley, pers. comm.). On Prince Edward Island, found on birch polypore (*P. betulinus*).

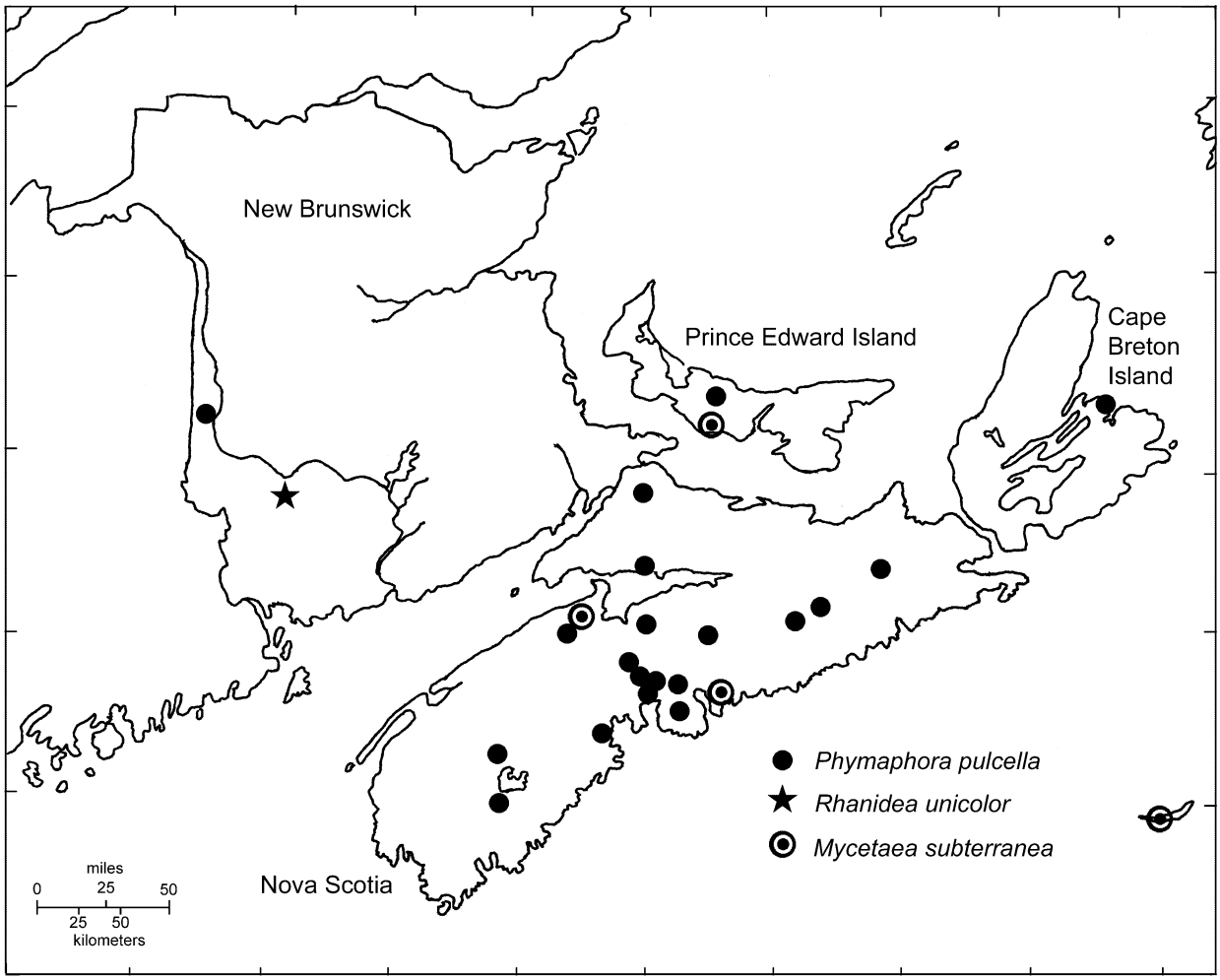

FIGURE 3. Distribution of *Phymaphora pulchella* Newman, *Rhanidea unicolor* (Ziegler), and *Mycetaea subterranea* (Fabricius) in the Maritime Provinces of Canada.

Rhanidea unicolor (Ziegler, 1845)

NEW BRUNSWICK: York Co.: Charter's Settlement, 15.vi.2002, R.P. Webster, RPWC.

Newly recorded in New Brunswick and the Maritime Provinces as a whole (Fig. 3). Associated with *Irpex lacteus* (Fr.) Fr. (Polyporaceae) and a variety of other soft basidiomycete fruiting bodies and subcortical hyphae (F. Shockley pers. comm.).

Endomychinae

***Endomychus biguttatus* Say, 1824**

NEW BRUNSWICK: Saint John Co.: Saint John, 10.viii.1901, W. McIntosh, NBM; Saint John, vii.190?, W. McIntosh, NBM; **York Co.:** New Maryland, 11.vi.2003, R.P. Webster, mixed forest, RPWC. **NOVA SCOTIA: Colchester Co.:** Shubenacadie, 4.viii.2004, D. MacDonald, flight intercept trap, NSBR; **Inverness Co.:** Cape Breton Highlands National Park, 9.ix.1997, J. Ogden, old-growth maple forest, JOC; **Kings Co.:** Kentville, 23.viii.1948, R.E. Morehouse, NSAC; Kentville, 6.v.1999, D.H. Webster, DHWC.

The distribution in the Maritime Provinces is shown in Fig. 4. Feeds and reproduces on *Schizophyllum communae* Fr. (Schizophyllaceae) although it is also found on *Auricularia* spp. (Auriculariaceae) and *P. betulinus* (Leschen & Carlton 1988, F. Shockley pers. comm.).

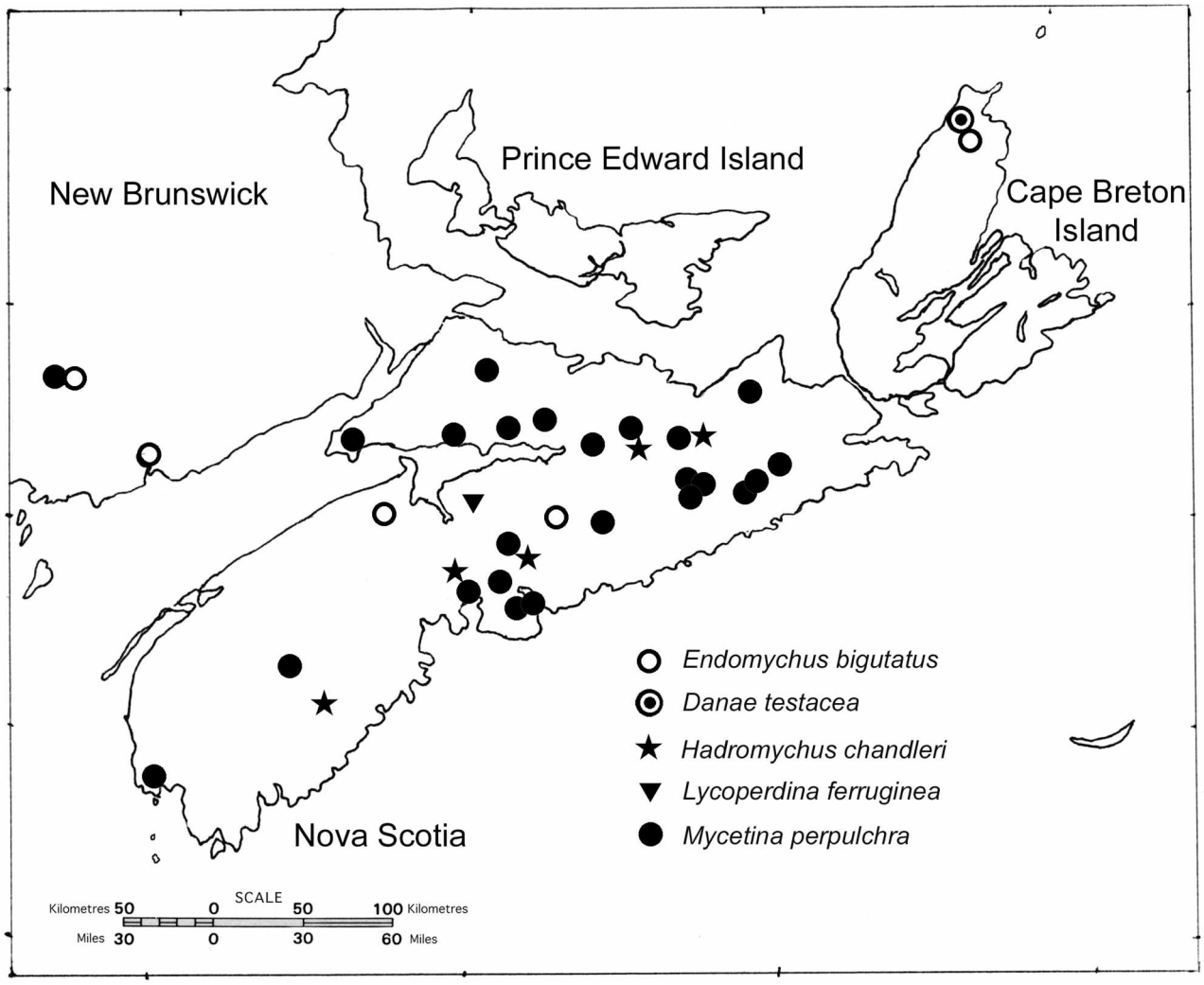

FIGURE 4. Distribution of *Endomychus biguttatus* Say, *Danae testacea* (Ziegler), *Hadromychus chandleri* Bousquet & Leschen, *Lycoperdina ferruginea* LeConte, and *Mycetina perpulchra* (Newman) in the Maritime Provinces of Canada.

Stenotarsinae

***Danae testacea* (Ziegler, 1844)**

NOVA SCOTIA: Inverness Co.: Lone Shieling, Cape Breton Highlands National Park, 7.vii.1983, R. Vockeroth, malaise trap, CNC.

Distribution in the Maritime Provinces is shown in Fig. 4. At Lone Shieling it was found in an old-growth hardwood stand. In eastern North America found largely as a relict species in old-growth hardwoods (Floyd Shockley pers. comm.) Found in subcortical fungi in hardwoods and softer species of Polyporaceae (Floyd Shockley pers. comm.).

Danascelinae

***Hadromychus chandleri* Bousquet & Leschen, 2002**

NOVA SCOTIA: Colchester Co.: Riversdale, 7.vi.2005, J. Ogden, flight intercept trap, (2), NSNR; **Halifax Co.:** Antrim, 3.vi.2005, J. Gordon, flight intercept trap, NSNR; Campbell Hill, 2-15.vi.1997, D.J. Bishop, red spruce forest, flight intercept trap, holotype & paratype, (2), CNC; **Pictou Co.:** Lorne, 1.vi.1995, C. Corkum, flight intercept trap, NSMC; **Queens Co.:** Butler Rd, 14.vi.2004, P. Colp, flight intercept trap, NSNR.

This genus and species were described by Bousquet & Leschen (2002) on the basis of seven specimens originating in New Hampshire, Nova Scotia, Ontario, and Quebec. The holotype (above) is from Nova Scotia. The present account reports five additional specimens of this very rare northeastern North American endomychid (Fig. 4). Bousquet & Leschen (2002) report that one specimen had conidiospores and fungal hyphae in its gut, indicating that it is mycophagous. Apart from that, nothing further is known about its bionomics. Tomaszewska (2005) recently changed the placement of *Hadromychus* from the Epipocinae to the Danascelinae.

Lycoperdininae

***Lycoperdina ferruginea* LeConte, 1824**

NOVA SCOTIA: Hants Co.: Stanley Airport, 6-20.ix.2003, T. Rossolimo, coniferous forest, pitfall trap, CGMC.

Newly recorded in Nova Scotia and in the Maritime Provinces as a whole (Fig. 4). The genus *Lycoperdina* is a specialist feeder on puffballs (Lycoperdales) (Pakaluk 1984).

***Mycetina perpulchra* (Newman, 1838)**

NEW BRUNSWICK: York Co.: New Maryland, 5.vi.2003, R.P. Webster, mixed forest, RPWC. **NOVA SCOTIA:** 35 specimens examined from Antigonish, Colchester, Cumberland, Guysborough, Halifax, Hants, Kings, Pictou, Queens, and Yarmouth counties. The earliest record is from 1974 (**Halifax Co.:** Armdale, 21.vi.1974, K. Neil, DAL).

Distribution in the Maritime Provinces is shown in Fig. 4. Associated with *Coniophora arida* (Fr.) Karst. (Coniophraceae), boletes associated with decaying pine, and other soft species in the Agaricales (F. Shockley pers. comm.).

Mycetaeinae

***Mycetaea subterranea* (Fabricius, 1801)**

NOVA SCOTIA: Halifax Co.: Dartmouth, 14.viii.1986, E. Angelopoulos, (3), NSMC; Sable Island, vii.1966-67, H. Howden, CNC; **Kings Co.:** Kentville, 14.x.2006, D.H. Webster, in basement, (2), DHWC.

PRINCE EDWARD ISLAND: Queens Co.: Hampton, 7.ix.1971, R.N. Sinha, in spilled oats, CNC.

The distribution in the Maritime Provinces of this widely distributed, adventive, Palearctic species is shown in Fig. 3. It is associated with stored products in mills, granaries, warehouses and cellars where it feeds on Zygomycete hyphae. It has also been found in old tree trunks, caves, and bee hives (Bousquet 1990).

Discussion

Seven species of erotylids and eight species of endomychids are now known from the Maritime Provinces, a substantial increase from the nine species known at the time of Campbell (1991a, 1991b). Only one species, *Mycetaea subterranea*, is adventive. The 13 new provincial records are indicative of the fact that the representation of these species in the region is significantly greater than previously known. Nonetheless, it is likely the case that more remains to be discovered. There are an additional eight species of Erotylidae and one Endomychidae (*Aphorista vittata* (F.)) found in neighbouring areas of Québec and New England which could potentially occur in the region and should be looked for, particularly in western portions of New Brunswick. New Brunswick has been comparatively poorly investigated in terms of its communities of forest beetles and further research there will doubtless uncover much more about this group of fungus beetles in the province. As is typically the case with islands, the faunas of Cape Breton and Prince Edward Islands are diminished (27%) compared to that of the neighbouring mainland (Table 1). This may represent an island-associated diminution, a paucity of collecting, or a combination of both. C.G. Majka (unpublished data) found that overall Prince Edward Island had 30% of the native saproxylic mainland fauna (representing 14 families of Coleoptera), whereas the proportion on Cape Breton Island was 33%. In comparison, only two species of endomychids and no erotylids have been recorded from insular Newfoundland Campbell (1991a, 1991b).

C.G. Majka (unpublished data) has found 59 species of saproxylic beetles from 15 families, subfamilies, or tribes that have been recorded in the region from five or fewer specimens. These represent 33% of the species in these saproxylic groups, a very substantial proportion of the fauna. These data are compiled from several studies, all of which have noted that the apparent scarcity of such species could be indicative of a diminution of habitat as a result of forest management practices. For instance, in Nova Scotia although 73% of the land base is forested, no more than 0.6% of that land is comprised of old-growth forests, much in a highly fragmented condition (McMahon 1989; Loo & Ives 2003).

Similarly, amongst the Erotylidae and Endomychidae, six of the 15 species (40%) including *Lycoperdina ferruginea, Rhanidea unicolor, Danae testacea, Dacne quadrimaculata, Triplax flavicollis,* and *Triplax frosti* are known in the region from five or fewer specimens, representing = 0.005% of specimens examined by the author in the course of biodiversity studies of Coleoptera in the Maritime Provinces. What factors could be responsible for this apparent scarcity? It could be that these beetles have been inadequately sampled to date. The approximately 100,000 specimens examined, however, include extensive holdings reflecting a wide spectrum of collecting methods (pitfall traps, malaise traps, car nets, sweep nets, flight-intercept traps, Lindgren funnel traps, hand collecting, etc.) from many forest habitats and portions of the region over a period spanning some 110 years. This indicates that such apparent scarcity could be indicative of actual rarity. Therefore it may be the case that the history of forest management in this region has affected populations of erotylids and endomychids.

Norvell & Exeter (2004) conducted a four-year study of fungi in Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) forests in Oregon in which they found 531 species of ectomycorrhizal epigeous and non-ectomycorrhizal basidiomycete fungi. They monitored uncut (control), clear-cut, and selectively cut stands for a period of three years following treatment. The selectively cut stands were of three categories: low (100 trees/ha), medium (200 trees/ha), and high (300 trees/ha) retention. While species richness of fungi in comparison to levels prior to treatment in the control, high retention, and medium retention stands was almost unaffected

three years after cutting (in fact, there was a slight increase), species richness declined to 52% of pre-treatment levels in the low retention stands, and to only 3% in the clear-cut stands. It would seem reasonable to believe that such dramatic changes in the fungal community in clear-cut or heavily-cut areas would also effect the community of beetles dependant on such fungi as microhabitat and food source.

In the Maritime Provinces, there is a long history of intensive forest management employing clear-cutting, burning of residual slash, short harvest rotations, intensive management, and the selective planting of monocultures. All these practices could have a potential impact on fungal communities and their associated Coleoptera. For example, Norvell & Exeter (2004: 178) pointed out that the burning of slash robs soils of essential organic matter, "essentially setting back the ectomycorrhizal fruiting clock to zero."

In addition to overall concerns about the erotylid and endomychid faunas, there are species found in the region that are particularly noteworthy. *Danae testacea* is often characteristic of relict hardwood forests. *Hadromychus chandleri* may be the rarest North American endomychid, and seven of the 12 known specimens have been collected in Nova Scotia. As such, these species deserve further attention in terms of their status and potential vulnerability in the region. Cripps (2004: xiii) wrote that, "While it has become clear that forest management practices (clear-cutting, thinning, burning) affect mycorrhizal fungi that in turn affect forest health, clear patterns have yet to emerge." If the diversity of forest fungi is reflective of the environmental health of forests, then the diversity and abundance of fungus beetles such as the Erotylidae and Endomychidae could provide an indication of the health of both forests and their associated fungal communities. Grove (2002: 14-15) wrote that, "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." Consequently it is imperative that further attention and on-going monitoring be directed towards such groups of saproxylic insects, not only to ensure that they not fall into the abyss of extinction, but also in terms of what they can tell us about the overall health of forest ecosystems.

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