

New Coleoptera records from owl nests in Nova Scotia, Canada

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Abstract

A preliminary study of boreal owl, *Aegolius funereus richardsoni* (Bonaparte), and northern saw-whet owl, *Aegolius acadicus acadicus* (Gmelin), nests from Nova Scotia, Canada revealed the presence of 14 species of Coleoptera, several of which represent significant extensions of their known ranges. *Atheta (Datomicra) celata* (Erichson) is newly recorded for North America; *Atheta irrita* Casey is newly recorded for Canada and eastern North America; *Atheta pseudocrenuliventris* Klimaszewski, and *Hylota ochracea* Casey are newly recorded for Nova Scotia; and *Gnathoncus barbatus* Bousquet and Laplante, *Carcinops pumilo* (Erichson), and *Phyllodrepa floralis* (Paykull) are newly recorded for Cape Breton Island. *Gnathoncus barbatus*, *H. ochracea*, *A. irrita*, *A. pseudocrenuliventris*, and *Corticarina cavicollis* (Mannerheim) are all recorded for the first time from bird nests. One new synonym *Atheta (Datomicra) celata* (Erichson, 1837) [= *Datomicra wrangeli* Casey 1911. **syn nov.**] is designated. Additional new records of *A. irrita* from Québec are also reported. Attention is drawn to the limited state of knowledge of this specialized beetle fauna and to the high proportion (50%) of adventive species which were found in these environments.

Key words: Nova Scotia, Canada, adventive species, nidicolous fauna, owl nest, Coleoptera, Staphylinidae, Histeridae, Leiodidae, Latridiidae, Trogidae, *Atheta*, *Phyllodrepa*, *Hylota*, *Datomicra*, *Philonthus*, *Bisnius*, *Carcinops*, *Gnathoncus*, *Sciodrepoides*, *Corticarina*, *Trox*, *Aegolinus*

Introduction

Mammal and bird nests are examples of specialized micro-environments which are inhabited by a diverse suite of commensal invertebrates. Although Hicks (1959, 1962, 1971) compiled information on the occurrence of insects in birds' nests, and there have been

many subsequent contributions to the suite of insects found in such circumstances, knowledge about this group of insects and invertebrates remains incomplete.

Bird nests are a seasonally rich source of organic material in a sheltered micro-environment that provides ecological opportunities for a large suite of species of Coleoptera. There are species representing a wide range of genera, subfamilies, and families, which to a greater or lesser degree are specialist feeders on the materials present. For instance, beetles of the genera *Catops* and *Sciodrepoides* (Leiodidae) are scavengers on dead organic matter and many species amongst the Trogidae feed on sloughed hair, feathers, and skin present in such situations. A number of species of *Philonthus*, *Quedius*, and *Aleochara* (Staphylinidae) and many species of Histeridae are frequently found in birds' nests where they prey mainly on eggs and larvae of cyclorrhaphous Diptera. Species of Latridiidae are specialized feeders on fungal hyphae, and such moulds and mildews can also be characteristic of nest environments. Although these examples illustrate positive or neutral effects on birds, there are also beetles that are clearly detrimental to their hosts. For instance, *Cavognatha pullivora* Crowson (Cavognathidae) is a nest predator whose larvae feed on the nestlings of the Australian magpie (*Gymnorhina tibicen* (Latham)) (Crowson 1981).

Although important everywhere (Jurík & Šustek 1978, Kutzer et al. 1982), such ecological niches have been little investigated in the Maritime Provinces of Canada. In 2004 the boreal owl, *Aegolius funereus richardsoni* (Bonaparte), was newly recorded as breeding in Nova Scotia. The site is on Cape Breton Island, south of the Cheticamp River and 3 km west of LeBlanc Brook, in a remote area of the central Cape Breton Highlands (Lauff in press). The Coleoptera found in this nest were collected and compared with those found in two northern saw-whet owl, *Aegolius acadicus acadicus* (Gmelin) nests on the mainland of Nova Scotia. This is the first study to document any aspect of the nidicolous fauna of the boreal owl in North America.

Study Area

Details of the boreal owl nest location and its surrounding habitat are reported in Lauff (in press). The site was located within Cape Breton Highlands National Park near its southwest border, at an elevation of approximately 440 m. The land at this location is more or less level, though the steep-sided Cheticamp River valley is approximately one km north. The nest was located in the Plateau-Fir district of the Highlands theme region (Davis and Browne 1996).

The forest over much of this area had been largely defoliated by spruce budworm, *Choristoneura fumiferana* (Clemens), in the late 1970s and early 1980s. Despite this, the dominant tree species in the nesting habitat was balsam fir (*Abies balsamea* (L.) Mill). The trees had a mean diameter at breast height (dbh) of 10.7 ± 5.7 cm; tree density at the nest site was 0.20 trees/m²; only trees of a dbh >5.0 cm were included in these values.

The material from the northern saw-whet owl nest box from West River Station, Pictou County, was provided to by Richard Murphy. The site's physical parameters were not measured, but were described as "dense woods with mixed growth between rows of balsam fir." The nest box (of similar design to those used by RFL), was about 2.5 m high on a dead trembling aspen (*Populus tremuloides* Michx.).

Methods

Nest boxes were constructed of rough-cut pine lumber, and followed the design of Korpimäki (1985). Wood shavings were placed in the box to a depth of approximately 5 cm. The nest box was mounted 3 m up on a live black spruce (*Picea mariana* (Mill.) BSP.) with the entrance hole facing southeast. The nest materials were collected shortly after the young owls had fledged; the material was placed in a Berlese funnel, the insects extracted and preserved in 70% isopropyl alcohol. Specimens of Coleoptera were subsequently sorted and determined.

Results

Fourteen species of beetles were extracted from the nest material (**Table 1**). Individual species accounts follow. Unless otherwise indicated, all beetles were found in the nests of both species.

Histeridae

Gnathoncus barbatus Bousquet & Laplante is known from British Columbia east to Nova Scotia, and in Illinois (Bousquet & Laplante 2006). It is herein recorded for the first time from Cape Breton Island. It has previously been found associated with porcupine dung (Bousquet & Laplante 2006); it has not hitherto been recorded from bird or mammal nests.

Gnathoncus rotundatus (Kugelann) is an adventive Palearctic species which is now found throughout Canada from British Columbia to Newfoundland and is considered cosmopolitan (Bousquet & Laplante 2006). It has been recorded from the nests of many species of birds (Bousquet & Laplante 2006; Hicks 1962, 1971) and is an important component of the nidicolous fauna of Tengmalm's owl (*Aegolius f. funereus*) nests in Europe (Krištofík et al. 2003, Nordberg 1936). In this study *G. rotundatus* was recorded only from the northern saw-whet owl nest at West River Station.

Carcinops pumilo (Erichson) is an adventive Palearctic species. It is cosmopolitan in distribution and in Canada has been recorded from British Columbia to Québec and Newfoundland (Bousquet & Laplante 2006). It is herein recorded for the first time from Cape Breton Island. It found in stables, hen houses, granaries, and mills, as well as on dung, in bird nests, and on carrion (Bousquet & Laplante 2006).

TABLE 1: Owl Nest Coleoptera

Number of specimens	Sites		
	Boreal 1 Cheticamp R.	Saw-whet 1 W. River Sta.	Saw-whet 2 Donnelly's L.
Histeridae			
<i>Gnathoncus barbatus</i> Bousquet & Laplante	1	3	1
<i>Gnathoncus rotundatus</i> (Kugelann) †		1	
<i>Carcinops pumilo</i> (Erichson) †	1		1
Leiodidae			
<i>Sciodrepoides terminans</i> (LeConte)	12		
Staphylinidae			
<i>Phyllodrepa floralis</i> (Paykull) †	1		
<i>Hylota ochracea</i> Casey	1		17
<i>Atheta celata</i> (Erichson) †	9		2
<i>Atheta irrita</i> Casey	2		2
<i>Atheta pseudocrenuliventris</i> Klimaszewski	1		
<i>Bisnius cephalotes</i> (Gravenhorst) †			1
<i>Philonthus carbonarius</i> (Gravenhorst) †	1		
<i>Philonthus politus</i> (Linné) †	1		
Trogidae			
<i>Trox aequalis</i> Say	3	2	3
Latridiidae			
<i>Corticarina cavicollis</i> (Mannerheim)	1		

† = Palearctic species

Leiodidae

Sciodrepoides terminans (LeConte) was recently elevated to specific rank by Peck & Cook (2002) from being a subspecies of *S. fumatus* (Spence). It is widely distributed in eastern North America and across Canada (Peck & Cook 2002). It has principally been collected on various species of dead mammals but also on dung, decaying fish and fungi, in mam-

mal nests, and in robin (*Turdus migratorius* Linné) and (unspecified) vulture nests (Peck & Cook 2002). It is an abundant and widely-distributed species throughout Nova Scotia and has been recorded from 13 of the province's 18 counties (C.G. Majka, unpublished data). In this study *S. terminatus* was recorded only in a boreal owl nest.

Staphylinidae

Phyllodrepa floralis (Paykull) is an adventive Palearctic species found throughout Europe, north to Iceland, east to Russia, south to the Caucasus, and west through Turkey to Algeria in North Africa (Herman 2001). It is found throughout Canada from British Columbia to Newfoundland (Campbell & Davies 1991). It has previously been associated with bird and mammal nests (Steel 1970, Newton et al. 2001). In this study *P. floralis* was recorded only in a boreal owl nest.

Hylota ochracea Casey: the genus *Hylota* Casey 1906 has been regarded as a synonym of *Oxypoda* Mannerheim 1830 (Seevers 1978) but will be re-elevated to its generic status by Klimaszewski et al. (submitted). It is known from New York, Ontario, Québec, Northwest Territories (Klimaszewski et al. submitted), and Nova Scotia (C.G. Majka, unpublished data). Nothing has previously been reported about the natural history of this species, so these records, from both boreal and northern saw-whet owl nests, represent the first information about its bionomics.

Atheta (Datomicra) celata (Erichson) [= *Datomicra wrangeli* Casey, 1911. syn nov.]

These specimens represent the first North American report of this apparently Palearctic species (**Figures 1-5**). It is widely distributed throughout Europe, east throughout eastern and western Siberia, and south to the North African coast (Löbl and Smetana, 2004). In Europe it is known to inhabit the nests of mammals and birds (Bickhardt 1907, Heinemann 1910, Strand 1967).

The distribution and status of *A. celata* clearly warrants further investigation to determine the extent of its distribution in Canada and to shed light on whether it is an adventive Palearctic or a Holarctic species (see below). It is noteworthy that the species was found in both a boreal owl nest on the Cheticamp River in the central Cape Breton highlands and in a northern saw-whet owl nest at Donnelly's Lake in Guysborough County on the mainland of Nova Scotia: two different host species at sites that are circa 130 kilometers apart. This suggests that this species may be widely distributed in Nova Scotia in suitable situations.

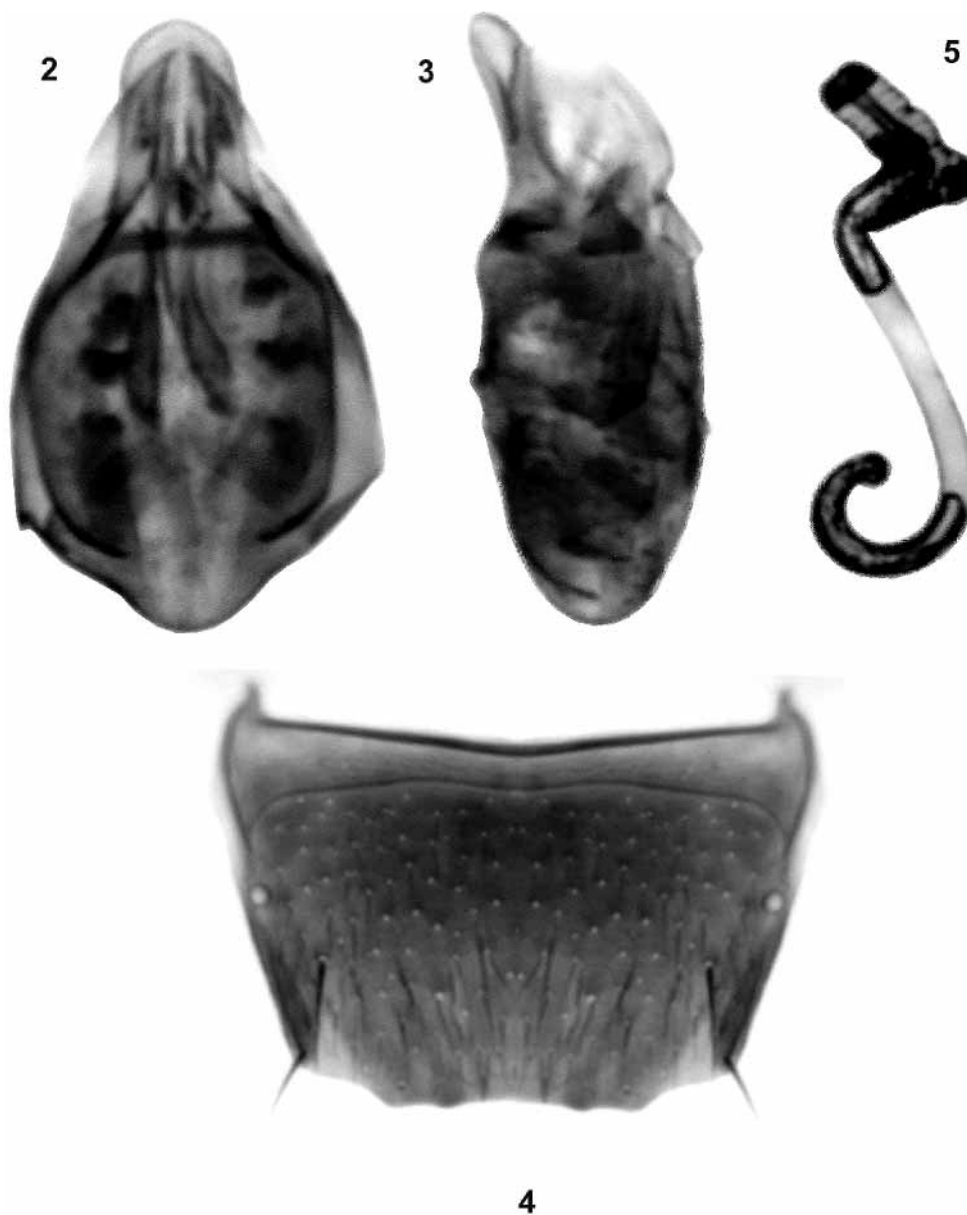
Casey (1910) described *Datomicra wrangeli* from Fort Wrangel, Alaska. The second author examined two syntypes of Casey's specimens and found no important and consistent morphological differences between *A. celata* from Europe, *A. celata* from Nova Scotia, and *A. wrangeli* (Casey) from Alaska. American specimens of *A. celata* have slightly more pronounced granulation of the forebody, a difference we attribute to

intraspecific variation. Therefore, we regard all these specimens as belonging to the same species of *A. celata* and consequently regard *A. wrangeli* (Casey) **syn. nov.** as a synonym of *A. celata* (Erichson 1837).



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FIGURE 1. Habitus photograph of *Atheta (Datomicra) celata* (Erichson).



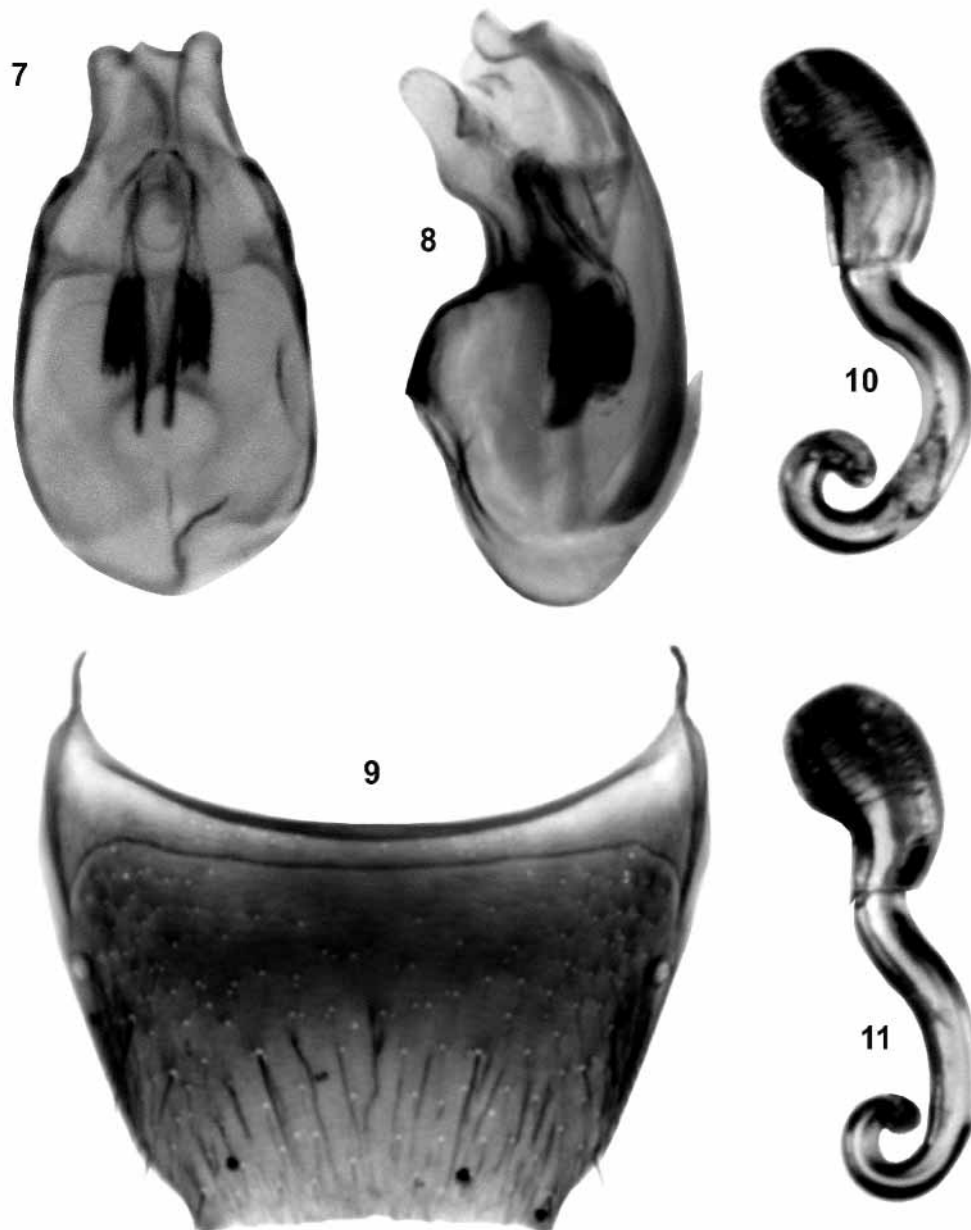
FIGURES 2-5. Genitalia and terminalia of *Atheta (Datomicra) celata* (Erichson): 2, median lobe of aedeagus in dorsal view; 3, median lobe of aedeagus in lateral view; 4, male tergite VIII; 5, spermatheca in lateral view.

Atheta irrita Casey (**Figures 6-11**) was described from specimens collected in Nevada (Esmeralda County) and to date it is known only from this jurisdiction (Casey 1911). Consequently its discovery in Nova Scotia is a very substantial range extension (~ 4,800 km) for this species, and its discovery in an owl's nest represents the first bionomic information about it. As in the case of *A. celata*, it is noteworthy that the species was found in nests of

two different host species at sites that are circa 130 kilometers apart, on both the mainland and Cape Breton Island, also suggesting that this species may be widely distributed in Nova Scotia in suitable habitats.



FIGURE 6. Habitus photograph of *Atheta irrita* Casey.



FIGURES. 7–11. Genitalia and terminalia of *Atheta irrita* Casey: 7, median lobe of aedeagus in dorsal view; 8, median lobe of aedeagus in lateral view; 9, male tergite VIII; 10, 11, spermatheca in lateral view.

Examination of materials in the Laurentian Forestry Center has revealed 12 additional specimens of this species, all collected in Québec at St.-Jacques-de-Leeds, Erablière in Lindgren funnel traps [9 June 1993, 1 female; 25 June 1993, 2 males; 9 June 1993, 2 females; 7 July 1993, 1 female; 16 July 1993, 1 male; 19 July 1993, 1 female; 26 July

1993, 3 females; 28 July 1993, 1 male] indicating that this species readily disperses aerially.

Atheta pseudocrenuliventris Klimaszewski was recently described by Klimaszewski et al. (2005) and was known only from 11 specimens collected in the Acadia Research Forest in New Brunswick, Canada. Specimens there were collected in pitfall traps mainly in mixed spruce (*Picea* spp.)-deciduous forests. Its discovery in a boreal owl nest is the first bionomic information about the species, perhaps indicating that it is a regular inhabitant of these specialized micro-environments.

Bisnius cephalotes (Gravenhorst) is an adventive Palearctic species found throughout Europe, north to Iceland, east across Russia to Mongolia, south to Kazakhstan and west through Syria and Turkey to Egypt and Algeria in North Africa (Herman 2001). The first reports from North America were from 1884 from Massachusetts and the "middle states", and from Washington State in 1882 (Smetana 1995). It was first collected in Canada in 1917 in Manitoba and is now found scattered across much of the continent (Smetana 1995). In Europe it has often been reported from bird and rodent nests (Horion 1965) and in North America it has been reported from buzzard, squirrel, and fox nests (Smetana 1995) and pigeon, stork, and buteo nests (Hicks 1962, 1971). Krištofik et al. (2003) found it in Tengmalm's owl (*Aegolius f. funereus*) nests in Europe, however in the present study it was collected from a northern saw-whet owl nest.

Philonthus carbonarius (Gravenhorst) is an adventive Palearctic species found throughout Europe, south to North Africa, east through Turkey, the Caucasus and Iran to India and Nepal, and north through Central Asia to Russia (Herman 2001). The earliest records from North America are specimens collected in Newfoundland in 1905. The species was then found in Nova Scotia; in Queens County (1909), Port Medway (1910), and Truro (1912) (Smetana 1995). It is now widely distributed in eastern North America from Newfoundland south to West Virginia, and west to Illinois and Minnesota; on the west coast from British Columbia, Washington, Oregon, and Idaho; and at scattered localities in the central part of the continent, north to the Yukon, and south to Louisiana (Smetana 1995).

Philonthus carbonarius is found in a wide variety of mostly open habitats in various ground debris, leaf litter, and under stones; also in various decaying matter, horse and cow dung, compost, and in flood debris (Smetana 1995). Osella & Zanetti (1975) recorded it from mammal nests in Italy. In this study *P. carbonarius* was recorded in a boreal owl nest.

Philonthus politus (Linné) is an adventive Palearctic species found throughout Europe, south to North Africa, east through Turkey, the Caucasus, Iran and Central Asia to Mongolia and China; north to Russia, and south to India (Herman 2001). It was first reported in North America by Kirby (1837) from specimens collected by Captain Basil Hall in Nova Scotia. It is now widely distributed throughout much of North America (Smetana 1995). It is found in all kinds of decaying organic matter and has frequently been reported in the nests of various species of birds (Hicks 1959, 1971) and mammals (Smetana 1995). In this study *P. politus* was recorded in a boreal owl nest.

Trogidae

Trox aequalis Say is widely distributed throughout much of eastern and central North America south to northern Mexico (Vaurie 1955). In Canada it is found from Manitoba east to Nova Scotia (McNamara 1991). Species of *Trox* feed in situations where feathers or mammal hairs abound, either in the nests of birds, chiefly hole-nesting species such as owls, woodpeckers, and starlings (*Sturnus vulgaris* Linné), or in the nests of burrowing mammals, such as foxes, gophers, squirrels, mice, rats, rabbits, and badgers. Owl pellets are a good source of supply for some of the smaller species (Vaurie 1955). *Trox aequalis* has been found in a variety of nests of mammals and birds, such as crows, screech owls, barn owls (*Tyto alba* (Scopoli)), great horned owls (*Bubo virginianus* (Gmelin)), buteos, turkey vultures (*Cathartes aura* Linné), starlings, and tufted titmice (*Baeolophus bicolor* (Linné)) (Robinson 1941), and in northern saw-whet owl nests (Phillips et al. 1983).

Latridiidae

Corticarina cavicollis (Mannerheim) is recorded in Canada from British Columbia, Ontario, Québec, and Nova Scotia (Bousquet 1991). Adults and larvae in the Latridiidae feed on the conidia of fungi and Myxomycetes, particularly fungi in the classes Phycmycetes, Deuteromycetes and Ascomycetes (Andrews 2002). The present report provides the first record of *C. cavicollis* from a bird's nest, however, related species in the Corticariinae such as *Corticaria elongata* (Gyllenhal), *C. pubescens* (Gyllenhal), *Corticaria gibbosa* (Herbst) (Hicks 1962, 1971), and *Corticarina fuscata* (Gyllenhal) (W. Rücker, pers. com.) have previously been found in bird's nests.

Discussion

Insects are well-known associates of birds and bird nests. Despite easy access to the nests of many owls, their nidicolous fauna has been little studied. No studies have documented the nest fauna of owls in Canada, and in only a few studies were arthropods collected from single nests in the United States (Phillips & Dindal 1990; Phillips et al. 1983).

In Europe Krištofík et al. (2003) examined the nidicolous fauna of the Tengmalm's owl (*Aegolius f. funereus*, the European subspecies of the boreal owl) in Bohemia, Moravia, and Slovakia. They found 23 species of beetles in the 94 nests examined including two of the species found in the present study (*G. rotundatus* and *B. cephalotes*) as well as congeners (*Sciodrepoides watsoni* (Spence), *Philonthus varians* (Paykull), *Atheta crassicornis* (Fabricius), and *Trox scaber* (Linné)) related to species found in this study, indicating substantial similarities in the faunas on both continents. They remark on the comparative scarcity of the mycetophagous Latridiidae in their study (only two individuals of two species) similar to the results of the present investigation.

Several species and groups of beetles commonly found by Krištofík et al. (2003) have as yet to been found in owl nests Nova Scotia. Some of these species (or their congeners) might be expected to occur since they represent functional groups of importance in the trophic dynamics of nidicolous environments. These include *Aleochara (Coprochara) bilineata* Gyllenhal and *Dermestes lardarius* Linné, both Palearctic species found in Nova Scotia.

Thanatophilus sinuatus (Fabricius) (Silphidae) a carrion beetle, and *Onthophagus ovatus* (Linné) (Scarabaeidae), a dung beetle, were abundant species found by Krištofík et al. (2003). They point out that these species are not usually found in the nests of birds, however, both were attracted to the large quantities of dead animal material and excrement in owl nests. In Nova Scotia *T. lapponicus* (Herbst), *O. hecate hecate* (Panzer), and *O. nuchicornis* (Linné) are all common congeners and hence should be looked for in such environments.

Krištofík et al. (2003) also draw attention to the fact that the composition of this nidicolous fauna differs greatly from that found in species of many other European birds [house martin, *Delichon urbica* (Linné); sand martin, *Riparia riparia* Linné; penduline tit, *Remiz pendulinus* (Linné); lesser grey shrike, *Lanius minor* Gmelin; red-backed shrike, *L. collurio* Linné; reed warbler, *Acrocephalus scirpaceus* (Hermann); and great reed warbler, *A. arundinaceus* Linné]. Similarities in the composition of nidicolous faunas were noted with those of the bee-eater (*Merops apiaster* Linné) interpreted to be due to similar accumulations of animal food remains and excrement; and of the house sparrow (*Passer domesticus* (Linné)) ascribed to a similarity of accumulation of decaying organic material and of the situation of nests in relatively humid, shadowed places in forests. In Nova Scotia such detailed comparative work remains to be done.

The large number of new species records (for North America, Canada, Nova Scotia, and Cape Breton Island) and the number of species which are newly recorded from this environment, gives some indication of how poorly known this specialized micro-habitat remains despite many individual accounts of bird and mammal nest species. Basic faunistic, diversity, and distributional information about many components of this fauna still need to be determined and ecological studies have been few. Whether birds can derive some advantage from the presence of some of these beetles (for instance from predation of cyclorrhaphous Diptera, mites, and bird's parasites) in the nest environment remains to be determined.

Of particular interest are the discovery of *A. celata*, *A. irrita*, and *H. ochracea* in nests of two species of owls on both Cape Breton Island and the mainland of Nova Scotia. *Atheta celata* is well-known as a nest-inhabiting species in Europe, however, the bionomics of the latter two species are reported here for the first time and the preliminary findings would seem to indicate that these species may regularly occur in such habitats. Perhaps the scarcity of previous records of *A. irrita* and the very large disjunction between reported records in Nevada and Nova Scotia is attributable to the paucity of research on owl nest

associates in North America.

Also noteworthy is the large proportion of Palearctic species found in these environments. Seven of the fourteen species (50%) found in this preliminary study are apparently adventive species, in contrast to the overall proportion of 14.6% of introduced Nova Scotia beetles (C. Majka, unpublished data). More research, however, is required to ascertain this since, while *P. floralis*, *C. pumilo* and *G. rotundatus* are all regarded as adventive Palearctic species (Newton et al. 2001, Bousquet & Laplante 2006), none of these genera have been revised in the New World. Hence evidence to definitively establish their status has not yet been presented. Similarly *A. celata* also requires further research in to determine its status.

Bearing this in mind it is, however, interesting to note the degree to which adventive species appear to have penetrated indigenous habitats in such remote areas of the province. Typically high proportions of adventive species are taken to be indicative of anthropogenic environments (e.g. Spence & Spence (1988)) and as Lindroth (1957, pp. 216) points out, "The main bulk of European species ... which managed to cross the Atlantic with man and become settled in North America ... demonstrate a high degree of dependence upon human culture." The owl nest fauna reported here would seem to be in marked contrast to these typical relations.

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