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by

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the 50th anniversary of research conducted

at the Laurentian Forestry Centre, Quebec City,

Quebec, Canada

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Introduction

For as long as entomologists have turned their attention to Coleoptera in eastern Canada, the subject of adventive species has been a topic of considerable interest. In the first paper about Coleoptera from eastern Canada, Kirby (1837) listed eleven adventive species including *Pterostichus melanarius* (Illiger), *Philonthus politus* (Linnaeus), *Philonthus ventralis* (Gravenhorst), *Attagenus pellio* Linnaeus, *Dermestes lardarius* Linnaeus, *Gastrophysa polygoni* (Linnaeus), *Omosita discoidea* (Fabricius), *Nitidula rufipes* (Linnaeus), *Microbregma emarginatum* (Duftschmid), *Tenebrio molitor* (Linnaeus), and *Necrobia violacea* (Linnaeus). This was an indication that a significant number of adventive species had already established themselves in the region. Early reports of adventive beetles in Nova Scotia include nine Palaearctic species (Jones 1870), four weevil species (Harrington 1891), and eight additional species (Evans 1899).

Recent archaeo-entomological work now makes it clear that a substantial number of adventive species were established on the continent much earlier that we had previously known. In Newfoundland and Labrador, Prévost and Bain (2007) found remains of adventive species such as *Quedius mesomelinus* (Marsham), *Cercyon analis* (Paykull), *Ptinus fur* (Linnaeus), *Tipnus unicolor* (Piller and Mitterpacher), *Oryzaephilus surinamensis* (Linnaeus), *Mycetaea subterranea* (Fabricius), *Bruchus pisorum* (Linnaeus), *Latridius minutus* (Linnaeus), and *Sitophilus granarius* (Linnaeus) in archeological excavations of latrines that dated from ca. 1620.

In Québec, Bain (1999) found 61 species of adventive beetles in excavations of latrines dating from ca. 1850, a strong indication of the scale of the synanthropic beetle fauna that had already established itself in this region over 150 years ago. In similar excavations in Boston, Massachusetts dating from the 17th century, Bain (1998) found 25 adventive species of Coleoptera, all of which are also established in eastern Canada.

Although insect collections from the 17th century that could document importations are lacking, Majka and LeSage (2007) pointed out that sites such as Annapolis Royal in Nova Scotia have been more or less continuously inhabited by European settlers since 1605, and were the hub of a considerable trans-Atlantic commercial trade. They further pointed out that in contemporary collections of Coleoptera from Annapolis Royal, the proportion of adventive species collected there is exactly double that of the provincial average, an indirect indication that the area may have had a long history of importation and establishment of adventive species.

Many writers have contributed to our understanding of adventive species in North America; however, two deserve particular mention. In a series of papers, the Canadian entomologist, William J. Brown (1940a, 1950, 1967), documented the presence, distribution, and early timelines of over 110 species of Coleoptera in Canada, most of them from eastern provinces. This substantial undertaking helped to delineate the composition and the scale of this adventive fauna. Brown (1940a, 1950) also helped to develop the theory that the transport of dry ballast (bulky rock, sand, and soil) in trans-Atlantic shipping was responsible for many such introductions. Brown (1950) noted that large quantities of dry ballast were unloaded at ports in the Maritime Provinces by British vessels in search of lumber, commencing with the Napoleonic Wars (1799-1815). Such practices persisted in varying degrees until the late 19th and early 20th centuries.

The great Swedish zoogeographer and coleopterist, Carl Lindroth (1954, 1955, 1957, 1963), continued to develop these ideas, in part as a result of the extensive fieldwork that he conducted in Atlantic Canada on the region's carabid fauna. Lindroth (1957) conducted vegetational and faunal surveys at sites in Great Britain known to have been sources of dry ballast in the trans-Atlantic shipping trade, and found many species that had been introduced into North America. The ideas developed by these two pioneering coleopterists, with their strong interests in trans-Atlantic zoogeography, remain a pillar on which subsequent research has been based.

In Atlantic Canada, investigators such as Hoebeke and Wheeler (1996a, 1996b, 2000, 2003), Wheeler and Hoebeke (1994), Johnson (1990b), Bousquet (1992), many papers by C.G. Majka and J. Klimaszewski and their colleagues cited in the references, and a considerable number of other studies, have reported many additional adventive species in many families of Coleoptera. Recent fieldwork and examination of hitherto unidentified specimens in collections have focused attention on several unreported adventive species in the region and have suggested that many species have a wider distribution than previously documented.

In the research that has been conducted to date, it is clear that there are a number of mechanisms that are responsible for the introduction of adventive species:

1. Dry ballast. As documented by the studies of Lindroth and Brown, dry ballast consisted of rocks, soil, rubble, and associated material from a number of quarries in southwestern England, which was placed in the holds of ships to give them stability as they crossed the Atlantic from east to west in pursuit of the lumber and fish trade. The quantities of ballast were so sizeable that British naval authorities forbade the captains of vessels from simply dumping this material overboard in harbours, and so it was unloaded on land. Since no quarantine measures existed in those times, all associated plants and animals living in this material were simultaneously unloaded. It is clear that this mechanism was a pathway for the introduction of many adventive species of flora and fauna, including substantial numbers of Coleoptera, especially ground and rove beetles.

2. Agricultural and horticultural importations. There is a long history of importation of agricultural and horticultural plants into North America. Majka and Klimaszewski (2004) suggested that species such as *Chrysolina staphylaea* (Linnaeus) and *Meligethes viridescens* (Fabricius), associated with various imported plant species, may have been introduced into North America via this mechanism. LeSage et al. (2007, 2008), LeSage and Majka (2009), and Majka and LeSage (2006, 2007, 2008a–c) have documented a variety of leaf beetles associated with agricultural and horticultural plants introduced into Atlantic Canada.

Majka and LeSage (2007) also noted that Annapolis Royal, Nova Scotia, was the site of the largest plant nursery in eastern Canada from 1885-1945. This town is also the site of the earliest known records of the adventive Palaearctic leaf beetle, *Pyrrhalta viburni* (Paykull), in North America (first detected in 1924). During this period Annapolis Nurseries were importing at least three exotic European species of *Viburnum*, the host plant of *P. viburni*, so it is certainly possible that the leaf beetle was introduced in association with these nursery plants.

3. Importations of silvicultural products. There is a long history of silvicultural importations of seedlings of a large variety of trees and shrubs into eastern Canada, both for commercial as well as horticultural purposes. Majka and Klimaszewski (2004) noted a variety of beetle species such as *Phloeocharis subtilissima* Mannerheim, *Cephennium gallicum* Ganglbauer, *Dromius fenestratus* (Fabricius), and *Scymnus suturalis* Thunberg that are specifically associated with coniferous trees and pointed out the long history (commencing in 1878) of importation of tens of thousands of forest seedlings of a variety of species of trees from various points of origin in Europe. Recently the biodiversity of adventive insects and mites on woody plants in Canada was reviewed by Langor et al. (2008).

4. Importations associated with livestock. There is similarly a long history of importation of livestock into eastern Canada, a trade that offered the possibility of direct and indirect importations of a variety of beetles associated with such stock, or with their manure. Majka and Klimaszewski (2004) noted that species of scarab beetles in the Aphodiini such as *Aphodius fimetarius* (Linnaeus) and *Teuchestes fossor* (Linnaeus), which are commonly associated with cattle manure, and have been documented, in Halifax since at least 1869, could have been imported in association with livestock shipments. Horses were imported to Sable Island commencing in 1783 and it is probable that the adventive scarab beetles *Onthophagus nuchicornis* (Linnaeus), *Eupleurus subterraneus* (Linnaeus), and *Aphodius fimetarius*, associated with horse dung and abundant throughout the island, came to the island in association with such livestock shipments (Wright 1989).

Documenting a very different livestock associated importation, Majka et al. (2007h) reported the importation and establishment of the Palaearctic ptinid, *Ptinus sexpunctatus* Panzer, in association with the importation of blue orchard mason bees, *Osmia lignaria* Say (Hymenoptera: Megachilidae), from colonies in Utah in the United States. They also noted the importation of the meloid, *Tricrania stansburyi* Haldeman,

to Nova Scotia via the same mechanism, although this latter species has apparently not become established in the province.

5. Importations associated with wood products. Phloeophagous and xylophagous species in the Ptinidae, Bostrichidae, Buprestidae, Cerambycidae, and Curculionidae have been intercepted numerous times in wood "dunnage" used to pack shipping containers arriving at North American ports from overseas (Haack 2006). This pathway may be responsible for the introduction of *Anoplophora glabripennis* (Haack et al. 2010) and *Tetropium fuscum* (Smith and Hurley 2000) into North America. Softwood "dunnage" used to pack heavy goods in ships and shipping containers has long been recognized as a significant pathway for movement of bark- and wood-boring beetles (Ridley et al. 2000). More than 100 species of bark and ambrosia beetles (Curculionidae: Scolytinae) have been intercepted at New Zealand's borders, mainly in international shipments associated with wood dunnage, crating or sawn timber (Brockerhoff et al. 2006). In a similar study, Haack (2006) found interception records of 147 different species of bark- and wood-feeding Buprestidae, Cerambycidae, and Scolytinae at United States ports between 1985 and 2005. Both studies found that there was a relationship between interception frequency and probability of establishment of bark beetles (Brockerhoff et al. 2006; Haack 2006).

6. Importations associated with stored products such as grain, cereal and other organic materials. Bousquet (1990a) found that nearly two-thirds of the 120 species associated with stored products in Canada are adventive species, a clear illustration of the scale of this adventive fauna and of its economic importance. Majka (2007a) found that 50% (37 of 74 species) of Bostrichiformia fauna (species in the Derodontidae, Dermestidae, Bostrichidae, and Ptinidae, many of which are stored product pests) of the Maritime Provinces were adventive species.

7. Intentional introductions (e.g., for biological control of pest plants and animals). Sampson and Ingraham (1989) and Sampson and MacSween (1993) surveyed the extensive recent programs of intentional introductions of insects for biocontrol purposes in the Maritime Provinces of Canada, primarily of beetles in the Chrysomelidae, Brentidae, and Curculionidae. Gordon (1985) provided documentation and a survey of the 144 species of exotic Coccinellidae that have, at various times, been intentionally introduced for biocontrol purposes in North America. Of these, 11 species have been intentionally introduced in eastern Canada.

The ecological impacts of adventive insect species are not well understood; there have been a number of studies on the effects of invasive insects on native biodiversity but very few on their effects on ecosystem processes (Kenis et al. 2009). Cormier et al. (2000) found that 95% of the coccinellids captured in fields on Cape Breton Island were introduced species (*Hippodamia variegata* (Goeze), *Coccinella septempunctata* Linnaeus, and *Propylaea quatuordecimpunctata* (Linnaeus), whereas only 5% of the individuals belonged to six native species. In Nova Scotia, there are records of the native *Hippodamia parenthesis* (Say) from 1927 to 1961, but virtually no recent specimens

have been collected. It is possible that this species has declined in response to competition with introduced species (Majka and McCorquodale 2006).

In Manitoba, populations of the native *Hippodamia tredecimpunctata tibialis* (Say), *H. convergens* Guérin-Méneville, *H. parenthesis, Coccinella transversoguttata richardsoni* Brown, and *Coccinella trifasciata perplexa* Mulsant have all declined after the establishment of the adventive *C. septempunctata* (Turnock et al. 2003). Wheeler and Hoebeke (1995b) suggested that *C. septempunctata* may adversely affect *Coccinella novemnotata* Herbst. In the orchards of the Niagara Peninsula of Ontario, *Stethorus p. punctum* (LeConte) was displaced by the adventive *S. punctillum* Weise (Putman 1955).

Maerz et al. (2005) found that the introduced weevil *Barypeithes pellucidus* (Boheman) has had a significant effect on the diet of red-backed salamanders, *Plethedon cinereus* (Green), in New York and Pennsylvania where beetles, particularly *B. pellucidus*, comprised the largest proportion of food items for salamanders in upland forests and the second largest proportion (after earthworms) in lowland forests. The authors conclude that "the seasonally hyper-abundant *B. pellucidus* had a strong effect on seasonal fluctuations in *P. cinereus* diet" and further hypothesized that the "influence of introduced prey on temporal and geographic food resources contributes to temporal and geographic demographic and phenotypic variation among *P. cinereus* populations."

In a study of the fauna of owl nests in mainland Nova Scotia and Cape Breton Island, Majka et al. (2006b) found that 50% of the 14 Coleoptera found in such habitats were adventive species. They further remarked on the degree to which adventive species of Coleoptera appear to have penetrated indigenous habitats, even in remote areas where these owl nests were found, far from any human habitation, and even in habitats (owl nests in undisturbed coniferous forests) that one might expect would be relatively free of anthropogenic influences. Similar investigations and documentation of the impacts of adventive species clearly need to be undertaken in relation to other groups of beetles.

The emerald ash borer, *Agrilus planipennis* Fairmaire, is an adventive species from Asia that has killed tens of millions of ash trees (*Fraxinus* spp.), and spread to thirteen states and two provinces since its discovery in the Detroit-Windsor area in 2002 (Haack et al. 2002; http://www.emeraldashborer.info/map.cfm). It likely arrived in North America via either infested wood packing material or live ash nursery stock, and unlike its native congeners (e.g., *Agrilus anxius* and *A. bileneatus*), *A. planipennis* is not acting as a secondary pest, but is attacking and killing healthy trees, and is considered a serious threat to ash trees in North America (Poland and McCullough 2006). The easternmost location in Canada where the emerald ash borer is known to be established is near Montreal, Quebec, where it was discovered in June 2008 (http://www.inspection.gc.ca/english/plaveg/pestrava/surv/sit2008e.shtml#agrpla).

Improved monitoring programs are needed to detect further importations of adventive species. This requires the ongoing support and development of taxonomic re-

sources (materials, reference collections, training, personnel) to be able to recognize such species. Museum research in historical collections of Coleoptera is important for establishing early timelines of the detection of adventive species. Without such information it would not be possible to trace the dispersal patterns of adventive species within the continent such as the detailed work on adventive *Amara* species in North America undertaken by Hieke (1990). In this volume we have compiled the available information on early dates of detection of adventive species with the objective of motivating further research on this topic. It is also increasingly apparent that archaeo-entomological research such as that being conducted by Allison Bain and her colleagues at Université Laval (e.g., Bain 1998, 1999; Bain and Prévost 2010) offers important opportunities for extending these timelines back hundreds of years before voucher specimens were preserved in museum collections.

This volume reviews our current understanding of adventive Coleoptera in eastern Canada and resulted from the collective efforts of entomologists from the Canadian Forest Service, the Nova Scotia Museum, and the Canadian National Collection of Insects, Agriculture and Agri-Food, Canada. Its focus is on the changing natural world around us, mainly due to human commercial activities. It brings together all available knowledge on adventive species of Coleoptera recorded from eastern Canada. The adventive fauna is increasingly penetrating native habitats and mixing with native species. It is clear that many species have become established in the region in the past 400 years since the time European settlement of the continent began. Adventive species now constitute a large component of our fauna. This is the first comprehensive contribution providing baseline data on adventive species of the region. It is our hope that it will enhance an understanding of these adventive species and promote further research on their role in our ecosystems, their negative and positive impacts on our economy, and on the native fauna.

Material and methods

Structure and convention. This review is based mainly on published literature and includes documented sources of the information on adventive Coleoptera species recorded from eastern Canada (Atlantic Canada and the province of Quebec).

The arrangement of the family group taxa and classification follows that in Beutel and Leschen (2005) and Leschen et al. (2010). Genera and species are arranged alphabetically and the references to original and selected subsequent publications are included in the tables.

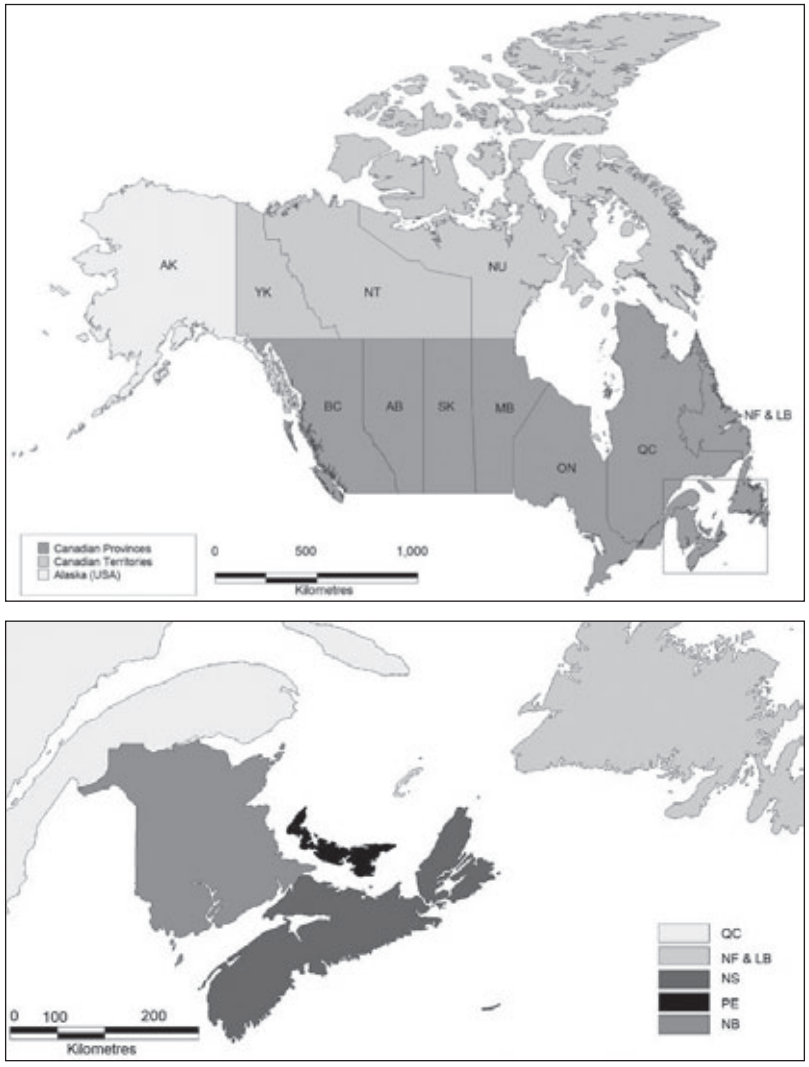
We use the term "adventive" species, indicating having arrived in a new habitat or geographic area either through natural dispersal or through inadvertent or deliberate human action (Wheeler and Hoebeke 2009).

References. All references are listed at the end of this publication, however abbreviations of selected cited papers are listed after each family under “selected references” and in the tables.

Images. We provide at least one colour image of a representative species per family (Figs. 46-189). Two specimens (Figs. 68, 72) on the plates are missing the apical part of the abdomen because they were dissected to make a positive identification. Major morphological terms used in the text are illustrated by line drawings on the slightly modified self-explanatory Figures 1-45 (Klimaszewski and Watt 1997).

Distribution. Every valid species is cited with its current known distribution in Canada and U.S.A., using abbreviations for the respective states, provinces and territories (Map 1). The following abbreviations are used in the text for Canadian provinces and territories:

AB	Alberta		
BC	British Columbia	NU	Nunavut
MB	Manitoba	ON	Ontario
NB	New Brunswick	PE	Prince Edward Island
NL	Newfoundland and Labrador	QC	Quebec
NS	Nova Scotia	SK	Saskatchewan
NT	Northwest Territories	YK	Yukon Territory



Map 1. Political regions of Canada and Alaska (NF + LB = NL)

Bibliographic information. Some 215 references are cited in the text. The references appear with author name and date of publication, and are followed by a page number (example: Klimaszewski 1984: 20). Multi-author publications are cited with the first author name followed by et al. (example: Klimaszewski et al. 2005: 25). Authors who published more than one paper in a given year are listed with an added letter (a+) after publication year (example: Anh 1996b: 180) following the order in the bibliographic list.

Index. An index of generic and species names cited in the text is provided. It contains only presently recognized valid names.

Results

This publication provides the first comprehensive account of adventive species of Coleoptera recorded from eastern Canada, and includes 510 adventive species in 290 genera and 48 families (Table 1). When compared with the most recent checklist of beetles (Bousquet 1991), this represents an increase of 142 in the total number of adventive beetle species in eastern Canada. Of the 510 adventive species in eastern Canada, 419 are recorded from Quebec, 283 from New Brunswick, 357 from Nova Scotia, 198 from Prince Edward Island, and 195 species from Newfoundland and Labrador. The highest numbers of adventive species were found in "species-rich" families, i.e., the Staphylinidae with 120 species (15.5%), Curculionidae with 85 species (20.8 %), Chrysomelidae with 43 species (14.2%), and Carabidae with 45 species (9%) (Table 1). The families with the highest percentages of adventive species were moderate to small, e.g., Dermestidae (16 sp., 66.7%), Latridiidae (20 sp., 51.3%), Silvanidae (6 sp., 42.9%), Monotomidae (5 sp., 38.5%), Cryptophagidae (10 sp., 32.3%), Bostrichidae (4 sp., 30.8%), and the Ptiniidae (10 sp., 29.4%) (Table 1), and these families have a high number of cosmopolitan species. Adventive species represent approximately 15.5% of the total Coleoptera fauna in Nova Scotia, 12.6% in New Brunswick, 22.4% in Prince Edward Island, and 17.7% in Newfoundland and Labrador. Overall, adventive species constitute approximately 14.6% of the total beetle fauna in the 48 families from the region. It is difficult to estimate precisely the total current number of Coleoptera species in eastern Canada but, based on an estimate of 4000-5000 species, adventive species constitute 10-13% of the total beetle fauna. Additional detailed studies are needed to understand the impact of these species on the native biota and our economy.

Table 1. Number of species of adventive Coleoptera per province in eastern Canada, based on published records and the change in number of adventive Coleoptera species in eastern Canada since Bousquet's (1991) checklist, and % of adventive species as components of the total fauna [families listed alphabetically].

Families of Coleoptera	Number of adventive species						Previous no. of adventive species (Bousquet 1991)	Difference between current and previous (1991) number of adventive species	% of adventive species per family [based on total current numbers from eastern Canada]	Current number of total species (adventives + natives)
	QC	NB	NS	PE	NL	Current no.				
1. Aderidae	1	0	0	0	0	1	1	0	12.5	8
2. Anthicidae	3	2	0	0	1	3	3	0	13.6	22
3. Anthribidae	1	0	0	0	0	1	1	0	8.3	12
4. Bostrichidae	3	2	4	2	0	4	1	3	30.8	13
5. Brentidae	2	1	3	1	0	3	1	2	15.0	20
6. Buprestidae	3	1	1	0	0	3	2	1	3.7	81
7. Byrrhidae	2	1	2	2	1	2	2	0	16.7	12
8. Carabidae	34	27	35	29	27	45	36	10	9.0	497
9. Cantharidae	2	1	1	1	1	2	2	0	3.4	58
10. Cerambycidae	5	3	3	1	1	5	1	4	2.5	197
11. Chrysomelidae	32	23	25	21	10	43	30	13	14.2	303
12. Ciidae	0	1	0	0	0	1	0	1	5.3	19
13. Clambidae	3	1	0	0	2	3	2	1	50.0	6
14. Cleridae	3	1	2	1	1	3	3	0	12.5	24
15. Coccinellidae	6	7	7	5	2	8	5	3	10.0	80
16. Corylophidae	1	0	1	0	0	1	1	0	10.0	10
17. Cryptophagidae	4	5	7	2	1	10	6	4	32.3	31
18. Curculionidae	69	40	63	40	37	85	63	22	20.8	408
19. Dermestidae	14	5	12	8	4	16	12	4	66.7	24
20. Derodontidae	0	1	1	0	1	1	1	0	25.0	4
21. Dryopidae	1	0	0	0	0	1	1	0	20.0	5
22. Elateridae	2	2	5	4	3	5	5	0	2.9	175
23. Endomychidae	1	0	1	1	1	1	2	-1	11.1	9
24. Erotylidae (incl. Langurinae)	1	0	0	0	0	1	0	1	5.3	19
25. Eucinetidae	1	1	1	0	0	1	1	0	20.0	5
26. Geotrupidae	1	1	0	1	1	1	1	0	14.3	7
27. Histeridae	10	4	6	2	2	10	8	2	14.9	67
28. Hydrophilidae	16	14	13	4	10	16	17	-1	17.8	90
29. Kateretidae (=Brachypteridae)	2	2	2	1	2	2	0	2	40.0	5
30. Laemophloeidae	3	1	3	1	1	3	3	0	30.0	10
31. Lampyridae	1	0	1	0	0	1	1	0	6.7	15
32. Latridiidae	15	6	17	8	8	20	13	7	51.3	39
33. Megalopodidae	1	0	0	0	0	1	1	0	25.0	4

Families of Coleoptera	Number of adventive species						Previous no. of adventive species (Bousquet 1991)	Difference between current and previous (1991) number of adventive species	% of adventive species per family [based on total current numbers from eastern Canada]	Current number of total species (adventives + natives)
	QC	NB	NS	PE	NL	Current no.				
34. Melyridae	2	1	1	1	1	2	2	0	16.7	12
35. Monotomidae	5	3	3	1	3	5	3	2	38.5	13
36. Mycetophagidae	1	1	1	1	0	1	1	0	8.3	12
37. Nitidulidae	9	8	8	4	4	10	4	6	16.1	62
38. Oedemeridae	1	1	1	0	1	1	1	0	20.0	5
39. Ptiliidae	9	6	4	1	0	10	11	-1	29.4	34
40. Ptinidae (incl. Anobiinae)	15	13	16	8	8	17	13	4	28.8	59
41. Scarabaeidae	20	9	13	2	8	21	20	1	21.2	99
42. Silphidae	1	0	0	0	0	1	0	1	6.3	16
43. Silvanidae	5	4	5	2	2	6	6	0	42.9	14
44. Staphylinidae	95	77	80	37	44	120	72	48	15.5	773
45. Tenebrionidae	10	6	9	5	4	10	8	2	14.5	69
46. Tetratomidae	1	0	0	0	0	1	0	1	5.6	18
47. Trogossitidae	1	1	0	1	1	1	0	1	11.1	9
48. Zopheridae (incl. Colydiinae)	1	0	0	0	0	1	1	0	16.7	6
Total	**419**	**283**	**357**	**198**	**195**	**510**	**368**	**142**	**14.6**	**3480**

Checklist of taxa with adventive species in eastern Canada
(in taxonomic order)

Order Coleoptera
Suborder Adephaga

1. Family **Carabidae** Latreille, 1802 [the ground beetles]

Suborder Polyphaga
Series Staphyliniformia
Superfamily Hydrophiloidea Latreille, 1802

2. Family **Hydrophilidae** Latreille, 1802 [the water scavenger beetles]
3. Family **Histeridae** Gyllenhal, 1808 [the clown beetles]

Superfamily Staphylinoidea Latreille, 1802

4. Family **Ptiliidae** Erichson, 1845 [the feather-winged beetles]
5. Family **Silphidae** Latreille, 1807 [the carrion beetles]
6. Family **Staphylinidae** Latreille, 1802 [the rove beetles, including former Scydmaenidae Leach, 1815]

Series Scarabaeiformia
Superfamily Scarabaeoidea Latreille, 1802

7. Family **Geotrupidae** Latreille, 1802 [the earth-boring scarab beetles]
8. Family **Scarabaeidae** Latreille, 1802 [the scarab beetles]

Series Elateriformia
Superfamily Scirtoidea Fleming, 1821

9. Family **Eucinetidae** Lacordaire, 1857 [the plate-thigh beetles]
10. Family **Clambidae** Fischer von Waldheim, 1821 [the minute beetles or fringe-winged beetles]

Superfamily Buprestoidea Leach, 1815

11. Family **Buprestidae** Leach, 1815 [the metallic wood-boring beetles]

Superfamily Byrrhoidea Latreille, 1804

12. Family **Byrrhidae** Latreille, 1804 [the pill beetles]
13. Family **Dryopidae** Billberg, 1820 [the long-toed beetles]

Superfamily Elateroidea Leach, 1815

14. Family **Elateridae** Leach, 1815 [the click beetles]
15. Family **Lampyridae** Latreille, 1817 [the fireflies, lightningbugs, glowworms]
16. Family **Cantharidae** Imhoff, 1856 [the soldier beetles]

Series Derodontiformia
Superfamily Derodontoidea LeConte, 1861

17. Family **Derodontidae** LeConte, 1861 [the tooth-necked fungus beetles]

Series Bostrichiformia
Superfamily Bostrichoidea Latreille, 1802

18. Family **Dermestidae** Latreille, 1804 [the skin and larder beetles]
19. Family **Bostrichidae** Latreille, 1802 [the bostrichid beetles or horned powder-post beetles]
20. Family **Ptinidae** Latreille, 1802 (including Anobiinae Fleming, 1821) [the ptinid beetles]

Series Cucujiformia
Superfamily Cleroidea Latreille, 1802

21. Family **Cleridae** Latreille, 1802 [the checkered beetles]
22. Family **Melyridae** Leach, 1815 [the soft-winged flower beetles]
23. Family **Trogossitidae** Latreille, 1802 [the bark-gnawing beetles]

Superfamily Cucujoidea Latreille, 1802

24. Family **Kateretidae** Erichson, 1846 (formerly Brachypteridae Erichson, 1845) [the kateretid beetles]
25. Family **Nitidulidae** Latreille, 1802 [the sap-feeding beetles]
26. Family **Monotomidae** Laporte, 1840 [the root-eating beetles]
27. Family **Silvanidae** Kirby, 1837 [the silvanid flat bark beetles]
28. Family **Laemophloeidae** Ganglbauer, 1899 [the lined flat bark beetles]
29. Family **Cryptophagidae** Kirby, 1837 [the silken fungus beetles]
30. Family **Erotylidae** Latreille, 1802 (including Languriinae Crotch, 1873, the lizard beetles) [the pleasing fungus beetles]
31. Family **Endomychidae** Leach, 1815 [the handsome fungus beetles]
32. Family **Coccinellidae** Latreille, 1807 [the ladybird beetles or ladybugs]
33. Family **Corylophidae** LeConte, 1852 [the minute hooded beetles]
34. Family **Latridiidae** Erichson, 1842 [the minute brown scavenger beetles]

Superfamily Tenebrionoidea Latreille, 1802

35. Family **Mycetophagidae** Leach, 1815 [the hairy fungus beetles]
36. Family **Ciidae** Leach, 1819 [the minute tree-fungus beetles]
37. Family **Tetratomidae** Billberg, 1820 [the polypore fungus beetles]
38. Family **Zopheridae** Solier, 1834 (including Colydiinae Erichson, 1842) [the zopherid beetles]
39. Family **Tenebrionidae** Latreille, 1802 [the darkling beetles]
40. Family **Oedemeridae** Latreille, 1810 [the pollen-feeding beetles or the false blister beetles]
41. Family **Anthicidae** Latreille, 1819 [the ant-like flower beetles]
42. Family **Aderidae** Winkler, 1927 [the ant-like leaf beetles]

Superfamily Chrysomeloidea Latreille, 1802

43. Family **Cerambycidae** Latreille, 1802 [the long-horn beetles]
44. Family **Megalopodidae** Latreille, 1802 [the megalopodid leaf beetles]
45. Family **Chrysomelidae** Latreille, 1802 (including Bruchinae Latreille, 1802) [the leaf beetles]

Superfamily Curculionoidea Latreille, 1802

46. Family **Anthribidae** Billberg, 1820 [the fungus weevils]
47. Family **Brentidae** Billberg, 1820 [the straight-snouted weevils or pear-shaped weevils]
48. Family **Curculionidae** Latreille, 1802 [the weevils or snout beetles] (including Scolytinae Latreille, 1807, the bark and ambrosia beetles)

Key to families of Coleoptera with adventive species recorded from eastern Canada

Some couplets modified from Klimaszewski and Watt 1977, Arnett and Thomas 2000, and Arnett et al. 2002; Figures 1-45 include line illustrations explaining morphological structures, after Klimaszewski and Watt 1977.

1. First ventrite divided by metacoxae (Fig. 2); notopleural suture of pronotum distinct from sharp lateral margin (Figs. 2, 21, 22); tarsi 5-5-5; antennae usually filiform (Figs. 1, 4) (ADEPHAGA); antennae slender, inserted between eyes and base of mandibles (Figs. 1, 4); head at eyes nearly always narrower than pronotum; pronotum lacking deep median groove; metacoxae contiguous or narrowly separated (Fig. 2); metasternum with transverse suture (Fig. 2); legs usually long and slender; body shape distinctive, usually black and glossy, sometimes brightly coloured; adults usually found on ground beneath objects, some occur on vegetation (Figs. 46-57) ..... [1] **CARABIDAE**

– First ventrite usually undivided by metacoxae and continuous from side to side (Fig. 3); notopleural suture absent, ventral portion of hypomeron jointed directly to sternum on either side by notosternal suture (Figs. 3, 23, 24); tarsal formula and antennae usually different; other characters in different combinations (POLYPHAGA) 2

2(1). Antennal club lamellate, flabellate or rarely pectinate (Figs. 8, 9, 17-20) 3

– Antennae not as above 5

3(2). Body broadly-to-narrowly cylindrical; head bent down toward ventral surface of pronotum, partially or completely concealed from above; pronotum usually tuberculate or with rasp-like teeth, not hoodlike; antennal club loosely formed and with 3-4 antennomeres; wood borers attacking living trees, dead twigs and branches, or dry seasoned timber (Fig. 106) .... [19] **BOSTRICHIDAE**

– Body oval or elongate, usually stout; head usually clearly seen from above; pronotum without rasp-like teeth; antennae with 8-11 antennomeres; saprophagous, coprophagous or mycetophagous, found mainly on ground (Figs. 82-87) 4

4(3). Antennae with fewer than 11 antennomeres, with club of 3 antennomeres, club lamellate or rarely flabellate, articles of club capable of being held tightly together; adults found in dung, carrion, dry animal carcasses, fungi, decaying vegetable matter, under logs, some occur under bark and in rotting logs and stumps, fruit, flowers and foliage of trees and shrubs (Figs. 83-87)..... ..... [8] **SCARABAEIDAE**

– Antennae with 11 antennomeres, club with 3 circular or oval antennomeres, adults live in burrows (Fig. 82) ..... [7] **GEOTRUPIDAE**

5(2). Tarsi 5-5-5 but appearing 4-4-4 because of vestigial article 4, article 3 distinctly bilobed (except some Chrysomelidae, Belidae and Brentidae) (Figs. 33-44); if tarsi appear 3-3-3 then head with rostrum (Figs. 168-183) 6

– Tarsi not as above, if 5-5-5 with article 4 reduced then all articles simple; if tarsi appear 3-3-3 then head without a rostrum 12

6(5). Anterior part of head without a rostrum (Figs. 155-165) (except for a short, broad beak in Bruchinae – Fig. 155).....7

– Anterior part of head elongate, forming a long or short rostrum (short in Scolytinae), with modified mouthparts (Figs. 167-189) 10

7(6). Body egg-shaped, usually broadest toward rear or at the middle; head often concealed from above, prolonged into a short and broad beak; hind femora enlarged and often toothed on lower margin; antennae with 6-7 antennomeres forming a club or antennae serrate or pectinate; eyes notched; associated with seeds of various plants (Fig. 155)..... ..... [45] **CHRYSOMELIDAE** (Bruchinae)

– Body differently shaped, other characters in different combination.....8

8(7). Antennae usually inserted on frontal prominences and capable of being flexed backwards over body, at least two thirds as long as body, often longer; body usually elongate and cylindrical; eyes generally notched; adults found on logs, tree trunks, foliage, flowers, with many species destructive to trees and cut logs, larvae of most species feed on solid tissue of dead or dying plants, in trunks and branches of fallen or cut trees and shrubs (Figs. 151-153) .... [43] **CERAMBYCIDAE**

– Antennae not inserted on frontal prominences and not capable of being flexed backwards over body, usually only moderately elongate; body usually oval in shape; eyes usually oval; plant feeders including many serious pests, adults found on flowers and foliage, including some aquatic plants, larvae feed on foliage and roots, some are leaf miners and some are stem borers (Figs. 154-165) 9

9(8). All tibiae with paired apical spurs; mesonotum with stridulatory file; adults are leaf-feeding and larvae are stem borers, leaf miners, or pollen feeders on cones of Araucariaceae (Fig. 154)..... [44] **MEGALOPODIDAE**

– All tibiae without paired apical spurs; mesonotum without stridulatory file; adults are leaf-feeding and larvae are not stem borers (Figs. 156-165) .... [45] **CHRYSOMELIDAE** (excluding Bruchinae)

10(6). Antennae elbowed (geniculate) (Fig. 15), with a more or less compact club and long scape; snout usually well developed (except short in Scolytinae); adults often bear pubescence or scales which form patterns; nearly all species are plant feeders including many pests of cultivated plants, adults and larvae of scolytines occur under bark of living or dead trees (Figs. 168-189) ....[48] **CURCULIONIDAE** (including Scolytinae)

– Antennae straight, with or without a club (Figs. 166, 167) 11

11(10). Labrum separated from clypeus by distinct suture; mandibles with mola; pronotum usually with transverse basal carina and lateral carina; tibiae without spurs; only 5th ventrite completely free, other ventrites partly fused or firmly braced; body robust, elongate to oval; snout short and broad; antennae clubbed; adults found on dead twigs and branches, under bark, or on fungi (Fig. 166).....[46] **ANTHRIBIDAE**

– Labrum fused with clypeus, without suture; mandibles without mola; body elongate and parallel-sided or oval, pronotum pear-shaped; snout long or short; rostrum extremely elongate; gular sutures united; femora stout and toothed; other characters not as above; adults occur under bark, in worm-eaten wood where they feed on fungi, insects, or sap from tree wounds, or on foliage (Fig. 167).....[47] **BRENTIDAE** (including Apioninae)

12(5). Body elongate, slender, parallel-sided, to elongate, robust, bullet-shaped, with sides subparallel and abdominal apex triangular, metallic, glossy and usually lacking pubescence; integument hard; head deflexed; abdomen with first two ventrites strongly connate, the suture partially obliterated; metasternum with distinct transverse suture; antennae short, serrate or nearly filiform, rarely pectinate; adults feed on foliage and bark or occur on flowers, trunks and branches of unhealthy trees; larvae bore under bark, occur in wood, logs, in roots of trees and shrubs or in leaves; includes many serious pests of trees and ornamental plants (Fig. 90) ..... [11] **BUPRESTIDAE**

– Body not bullet-shaped; first two ventrites rarely fused; other characters different 13

13(12). Tarsi usually appearing 5-5-5, with terminal article enlarged and ending in strong claws, sometimes longer than all articles combined; head deflexed, often concealed by pronotum in dorsal view; prosternum with process fitting into cavity of mesosternum; antennae weakly or distinctly clubbed (3-7 antennomeres), pectinate or serrate (BYRRHOIDEA) (Figs. 91, 92)..... 14

– Tarsi not 5-5-5, or if 5-5-5 then terminal article not enlarged, sometimes article 4 reduced and tarsi appear 4-4-4, other features not as above 15

14(13). Antennae shorter than pronotum, pectinate, often concealed (Fig. 16); body oval or elongate-oval; legs usually very long, strongly developed, claws large; found on partly submerged sticks and stones in moving water (Fig. 93)..... ..... [13] **DRYOPIDAE**

– Antennae usually longer than pronotum, slender, serrate, sometimes weakly clubbed; body oval and strongly convex, pill-shaped with head deflexed; legs usually concealed in grooves in repose, tibiae with spines; found beneath logs and objects on ground, often in sandy habitats or associated with mosses (Figs. 91, 92) ..... [12] **BYRRHIDAE**

15(13). Maxillary palpi extremely elongate, usually longer than antennae; antennae short with 7-11 antennomeres and with club of 2-5 antennomeres (Figs. 13, 14); body compact, spherical from above, moderately convex, ovoid or flattened; metasternum often prolonged posteriad as a sharp spine; hind legs flattened, usually with fringe of hair; species aquatic or semiaquatic or associated with decaying organic material (Sphaeridiinae) (Figs. 58-60) .... [2] **HYDROPHILIDAE**

– Maxillary palpi shorter than antennae, inconspicuous; antennae usually with 11 antennnomeres, with or without club of 3 antennomeres; other features not as above 16

16(15). Pronotum with posterolateral angles strongly produced backward into sharp points; body narrowly elongate, somewhat flattened and usually parallel-sided and rounded or pointed posteriad; clicking mechanism present, consisting of prosternal process extending posteriad into deep mesosternal cavity, and loosely articulated prothorax; antennae filiform, serrate or pectinate; adults found on foliage and flowers, under bark or in rotting wood (Figs. 94, 95)... ..... [14] **ELATERIDAE**

– Pronotum (except for some Lampyridae) and body shape not as above; antennae often clubbed; click mechanism absent 17

17(16). Body soft and flattened, head concealed from above, abdomen usually with luminous organs (Fig. 96) ..... [15] **LAMPYRIDAE**

– Body usually hard and convex, head visible from above, abdomen lacking luminous organs 18

18(17). Elytra short, truncate, exposing at least two, but often more, well-sclerotized abdominal tergites; abdomen usually flexible 19

– Elytra not as above, broadly rounded posteriad and usually covering entire abdomen, but if shorter then exposing only abdominal apex; tergites membranous or weakly-sclerotized..... 25

19(18). Elytra usually truncate posteriad, exposing at least 3 but most often 6 to 7 abdominal tergites; body nearly always elongate, slender, parallel-sided; abdomen flexible (exception Pselaphinae: abdomen short, broad, and inflexible,

and head, pronotum and often elytra with setose fovae), in life often bent upward; adults occur mainly in organic litter on ground or near water 20

– Elytra truncate or rounded posteriad, exposing 2 or exceptionally 3 abdominal tergites; other features not as above 21

20(19). Antennae not clubbed (exceptions: Proteininae, some Pselaphinae); elytra truncate, usually without costae, and usually exposing most of the abdomen (exceptions: some Omaliinae, Proteininae, Pselaphinae); adults occur in all terrestrial habitats and tidal zones of seas and oceans (Figs. 64-81)..... ..... [6] **STAPHYLINIDAE** (in part)

– Antennae distinctly clubbed; elytra usually truncate, tricostate and covering most of abdomen leaving 3 apical tergites exposed; body 10-35 mm long; adults found in association with decaying organic material, most commonly animal carcasses (Fig. 63)..... [5] **SILPHIDAE**

21(19). Antennae elbowed (geniculate), with abrupt club of 3 antennomeres, usually retractable into cavity on underside of prothorax; body hard, oval, disc-shaped, moderately to strongly convex, rarely cylindrical; usually highly glossy and glabrous; predominantly black; elytra shortened and exposing pygidium; adults occur around decaying organic matter like carrion, dung, decaying plants, animal nests, cylindrical species live in galleries of wood-boring beetles (Fig. 61).....[3] **HISTERIDAE**

– Antennae and body, or habitat not as above 22

22(21). Antennae apparently with 10 antennomeres and usually with club of 1 or 2 antennomeres; elytra parallel-sided, usually with rows of punctures, truncate posteriad, leaving pygidium exposed; body elongate, flattened, slender and parallel-sided; front coxae globular; adults occur mainly under bark (Fig. 123)..... [26] **MONOTOMIDAE** (in part)

– Antennae and other features not as above 23

23(22). Tarsi apparently 4-4-4, with article 3 bilobed; body robust, compact, oval and convex; usually broadest towards apex; head often concealed from above; antennae mostly less than half as long as body; pronotum rounded laterally; adults occur in seeds (Fig. 155)..... [45] **CHRYSOMELIDAE** (Bruchinae)

– Tarsi usually clearly 5-5-5 (4-4-4 in some Nitidulidae); pronotum keeled laterally; other features not as above..... 24

24(23). Antennae filiform, serrate or pectinate but never with a distinct club; body elongate, parallel-sided and soft; adults occur on flowers or foliage (Figs. 97, 98).....[16] **CANTHARIDAE**

– Antennae with a distinct, compact club of 3 antennomeres, body compact, robust, elongate or broadly oval; abdomen often exposed beyond apex of elytra; adults occur on decaying fruits, fermenting plant juices, fungi, on flowers, and some in ant nests and carrion (Figs. 118-122) .... [25] **NITIDULIDAE** (in part)

25(18). Head with 1 or 2 ocelli on frons 26
– Head without ocelli on frons 28
26(25). Head with one ocellus on frons, positioned medially ..... [18] **DERMESTIDAE** (in part); [6] **STAPHYLINIDAE** (some Proteininae)
– Head with two ocelli on frons, positioned laterally..... 27
27(26). Head and pronotum not strongly sculptured; body smooth and glabrous or with sparse punctation and pubescence (Fig. 64) .... [6] **STAPHYLINIDAE** (Omaliinae, some Proteininae)
– Head with series of canal- and bridge-like structures; pronotum divided by longitudinal ridges into several cell-like depressions, lateral margins strongly toothed or broadly flattened and bent upward; antennae with club of 3 antennomeres; adults occur in shelf fungi, in slime molds, and under bark (Fig. 99)..... [17] **DERODONTIDAE**
28(25). Body articulated loosely, elongate, oblong to sub-parallel; integument soft, often velvety in appearance, with decumbent pubescence and often with additional scattered and erect setae, or with short and inconspicuous pubescence; elytra sometimes with ridges and cell-shaped compartments..... 29
– Body compact; integument hard and glabrous or with decumbent pubescence; elytra not as above 32
29(28). Penultimate tarsal article simple, never bilobed (Fig. 114)..... ..... [22] **MELYRIDAE**
- Penultimate tarsal article bilobed 30
30(29). Body often sub-cylindrical, usually covered with bristling hairs; head at least as broad as pronotum; pronotum much narrower than elytra; antennae often with loosely-formed club of 3 antennomeres (Fig. 113) .....[21] **CLERIDAE**
– Body flattened to moderately convex, lacking bristling hairs; head usually narrower than pronotum; pronotum as broad as elytra or only slightly narrower; antennae lacking club of 3 antennomeres 31
31(30). Tarsal formula 5-5-5, pronotum subquadrate and laterally margined, usually as broad as elytra (Figs. 97, 98) .....[16] **CANTHARIDAE**
– Tarsal formula 5-5-4, pronotum broadened anteriorly, lacking margins on lateral borders, and posteriorly narrower than elytra (Fig. 148) .... [40] **OEDEMERIDAE**
32(28). Tarsal formula 5-5-4, if 4-4-4 (some Tenebrionidae), then base of each antenna obscured from above by a shelf-like expansion (canthus), and first 3 ventrites fused together; body broadly to narrowly oval; procoxae usually conical and projecting; antennae with 11 antennomeres, filiform, serrate, incrassate, pectinate, comb-like, or flabellate; without or with loosely defined club of 3-4 antennomeres 33
– Tarsal formula 2-2-2, 3-3-3, 3-4-4, 4-4-4, or 5-5-5, if 4-4-4 then canthus absent and first 3 ventrites not fused together 37

33(32). Body strongly flattened, elongate and usually narrow and parallel-sided, often hairless; antennae moniliform, sometimes with a club; pronotum with two submarginal carina on either side; elytra usually striate or striate-punctate; legs often with swollen femora (Fig. 128)..... [28] **LAEMOPHLOEIDAE**

– Combination of characters not as above.....34

34(33). Base of each antenna covered by a shelf-like expansion (canthus); antennae filiform, moniliform, or slightly clubbed; eyes almost always notched; integument usually dull black or brown; abdominal ventrites 1-3 fused together; adults occur under bark, in rotten wood, under logs, in fungi or in forest litter (Figs. 145-147).....[39] **TENEBRIONIDAE**

– Base of antennae exposed; abdominal ventrites 1-3 not fused together; other features not as above.....35

35(34). Pronotum approximately as wide at base as elytra and often with two impressions at base; body elongate-oval and usually dark-coloured; front coxal cavities open behind; first article of hind tarsi longer than any other article; antennae filiform; adults are found on the fruiting bodies of hymenomycete fungi, under bark with fungus and on softer shelf fungi (Fig. 143)..... ..... [37] **TETRATOMIDAE**

– Pronotum distinctly narrower at base than elytra, half to two-thirds of elytral width, often rounded and bearing a horn-like process extending forward over head; body elongate-oval, ant-like; abdomen with 5 ventrites; antennae filiform, moniliform or clubbed; adults common on flowers, foliage and on the ground.....36

36 (35). All ventrites free; penultimate tarsal article lobed; eyes with fine facets and not notched near antennal base; elytral epipleura incomplete (Fig.149)..... ..... [41] **ANTHICIDAE**

– Two basal ventrites connate; penultimate tarsal article small, simple, and antipenultimate article lobed beneath; eyes coarsely faceted, slightly notched near antennal insertions; elytral epipleura absent (Fig. 150)..... [42] **ADERIDAE**

37(32). Tarsal formula 5-5-5 (excluding families already keyed out).....38

– Tarsal formula 2-2-2, 3-3-3, 3-4-4, or 4-4-4; antennae filiform or moniliform, may be clubbed.....49

38(37). Pronotum hood-like in lateral view, partially or completely covering head from above; antennae usually clubbed, with all articles long and club not symmetrical, or serrate or pectinate; body compact, usually elongate and cylindrical or oval to nearly spherical; appendages often contractile; hind coxae grooved for reception of femora; adults feed on plant material, many bore into seasoned wood (Figs. 110-112)..... .....[20] **PTINIDAE** (Anobiinae, Ernobiinae)

– Pronotum not as above; if antennae clubbed, then club symmetrical; other features not as above.....39

39(38). Antennae not clubbed 40
– Antennae with more or less distinct club (loosely formed or compact) consisting of 1-8 antennomeres; if club not distinct then article 8 smaller than adjoining segments 42
40(39). Body appearing spider-like, integument covered with dense pubescence or scales forming pattern; legs and antennae long and thin; antennal insertions close together (Figs. 107-109) ..... [20] **PTINIDAE** (Ptininae)
– Body elongate or oval; legs and antennae moderately long; antennal insertions distant from each other 41
41(40). Body broadly-to-narrowly elongate, subparallel, flattened; head prognathous, facing forward, exposed and not concealed by pronotum; metacoxae not enlarged; elytra without cross-striation; pronotum usually constricted basally and margined, margins with teeth; other features not as in above combination; adults occur under bark, in stored plant materials including grain (Figs. 124-127) ..... [27] **SILVANIDAE**
– Metacoxal plates large, plate-like, longer medially than metasternite, hiding most of metafemur, even when fully extended; other combinations of characters not as above (Fig. 88) ..... [9] **EUCINETIDAE**
42(39). Body oblong to broadly oval, robust, with short, dense pubescence or with erect hairs or scales often forming patterns; lower surface often with close, silky pubescence; elytra if striate then with a scutellary striole; antennae with club of 3-8 antennomeres, usually 3 (Figs. 100-105)..... [18] **DERMESTIDAE**
– Body shape variable, glabrous or with sparse-to-dense pubescence, rarely forming patterns (Nitidulidae); lower surface without silky pubescence; elytra with or without striae; scutellary striole absent 43
43(42). Antennal club with 1-2 antennomeres; body narrowly elongate, flattened, slender; pronotum oval or rectangular, with anterior angles produced; pygidium exposed; tarsi glabrous; head with prominent temples; adults found under bark (Fig. 123)..... [26] **MONOTOMIDAE** (in part)
– Antennal club with at least 3 antennomeres; other characters different 44
44(43). Body ant-like; antennal club loose; dorsal surface usually with long pubescence, glossy; head with a distinct neck, nearly as wide as pronotum; pronotum and elytra oval with humeral angles rounded; legs long; adults occur under bark, in tree holes, under logs, in decaying vegetation, in moss, under stones, and in ant nests ..... [6] **STAPHYLINIDAE** (in part, Scydmaeninae)
– Body narrowly subparallel to broadly oval; head without apparent neck; elytra striate or striate-punctate; other characters different 45
45(44). Body narrowly subparallel, subcylindrical to slightly flattened, elongate; integument glossy, black or blue-black; head, pronotum and elytra nearly equal in width; elytra striate or striate-punctate; antennal club distinct, with 4-6

antennomeres; dorsal surface glabrous or variously pubescent; tarsi 5-5-5 but appear 4-4-4, tarsomeres 2 and 3 with setose lobes (Fig. 130) ....[30] **EROTYLIDAE** (Languriinae)

– Body broadly to narrowly oval, rarely subparallel; head distinctly narrower than pronotum; elytra as broad as pronotum, usually without distinct striae; tarsomeres 2 and 3 without setose lobes 46

46(45). Antennae usually closely approximate at base, often diverging to form a distinct V-shape, antennal club with 3 antennomeres; pronotum often depressed at base, rounded laterally and broadest near middle, sides often toothed or notched; body often with silky pubescence; adults found on flowers and foliage, in fungi and decaying vegetable matter, some species live in nests of wasps or bumblebees (Fig. 129) ..... [29] **CRYPTOPHAGIDAE**

– Antennal bases broadly separated, and antennae not forming a V-shape; pronotum not depressed; body with short pubescence and sometimes with additional longer hairs 47

47(46). Antennal club compact with 3 antennomeres, abrupt, often ball-shaped; tarsal articles 1-3 more or less dilated, and article 4 sometimes smaller; body elongate, robust, sometimes broadly oval and flattened; abdomen often exposed apically and elytra often short and truncate; some resemble rove beetles but have clubbed antennae; adults occur on decaying fruits, fermenting plant juices, in fungi, on flowers, and on carrion (Figs. 118-122) ..... [25] **NITIDULIDAE** (in part)

– Antennal club loosely formed and never ball-shaped, other characters different 48

48(47). Abdomen usually completely covered by elytra; antennal club often with antennomeres asymmetrical and/or extended laterally; body regularly oval and convex or elongate and subparallel; pubescence short or long, with bristles or scale forming patterns; margins of pronotum and elytra broadly flattened; body black, brown, blue or metallic green; adults live under bark, in fungi, and in dry vegetable matter (Fig. 115) ..... [23] **TROGOSSITIDAE**

– Abdomen exposing pygidium and at least one abdominal tergite; antennal club weak and symmetrical; body usually elongate oval, pale or piceous; pubescence sparse, fine and short; adults and larvae phytophagous (Figs. 116, 117) ..... [24] **KATERETIDAE**

49(37). Tarsal formula 2-2-2; body minute, often less than 1 mm long, broadly-to-narrowly oval; elytra often exposing 1 or 2 abdominal tergites; hind wings feather-like, fringes with long hairs; antennae thin, bearing long hairs and with club of 2-3 antennomeres; adults found in rotten wood, fungus-covered logs, vegetable detritus, and dung (Fig. 62) .....[4] **PTILIIDAE**

– Tarsal formula 3-3-3, 3-4-4, or 4-4-4; body usually over 1 mm long, variable in shape; elytra covering abdomen; hind wings not feather-like, not fringed with hairs 50

50(49). Body broadly oval to hemispherical; head more or less concealed by pronotum 51
– Body oblong oval to narrowly elongate and subparallel; head not concealed by pronotum 54
51(50). Tarsal formula 4-4-4, all articles simple; antennae with 8-10 antennomeres, with 2 forming club; body small, 0.9-1.5 mm long, broadly oval and convex, capable of rolling into a ball; metacoxae expanded into large plates concealing femora; eyes partly or entirely divided; adults live in decaying vegetable matter, a few live in ant nests (Fig. 89) ..... [10] **CLAMBIDAE**
– Tarsal formula 3-3-3 or appearing 3-3-3, with at least second article bilobed; antennae with 7-11 antennomeres with club of 1-6 antennomeres (most often 3); metacoxae without large plates; eyes not divided; other characters different 52
52(51). Pronotum with forward angles produced anteriorly and usually with two longitudinal grooves at base; antennae usually with 3 antennomeres forming a spherical club; body smooth, glossy black or brown, often with orange markings; adults found in fungi, under bark, beneath logs, and in rotting wood (Fig. 131) ..... [31] **ENDOMYCHIDAE**
– Pronotum differently shaped and without two longitudinal grooves, other characters not as above 53
53(52). Head partially or entirely concealed by pronotum, but anterior part of pronotum usually emarginate and not extended into a sharp margin over head; body 1-7 mm long, often spotted, usually glabrous or subglabrous; antennae shorter than pronotum, with a club formed by 1-6 antennomeres; maxillary palpi securiform or with apex obliquely truncate; adults and larvae are predaceous on aphids, scale insects, mites, and other soft-bodied arthropods, they are numerous where these insects occur (Figs. 132-134) ..... [32] **COCCINELLIDAE**
– Head partially or entirely concealed by pronotum, with anterior part of pronotum extending into a sharp margin over head concealing head from above; body 0.5-2.5 mm long, usually unicoloured, densely pubescent; antennae longer than pronotum, with 3 antennomeres forming club; maxillary palpi not as above; adults occur under decaying bark, in or near rotting fungus, and in decaying vegetable matter (Fig. 135) ..... [33] **CORYLOPHIDAE**
54(50). Body small (length 1.0-3.0 mm), head prominent, usually as wide as pronotum; pronotum often round and usually narrower than elytra; elytra elongate oval, widest at middle and usually striate (Figs. 136-140) ..... [34] **LATRIDIIDAE**
– Body usually over 3.0 mm and differently formed 55
55(54). Body elongate, cylindrical, glabrous or with erect bristles; pronotum and/or head often bearing tubercles or horns; head deflexed; antennal club large,

usually formed by 3 antennomeres; body length 1-3 mm; adults and larvae found in shelf fungi, under bark, and in wood, some species occur in galleries of bark beetles (Fig. 142) .....[36] **CIIDAE**

– Body elongate to broadly oval, flattened or moderately covex, rarely cylindrical (some Colydiidae); variably pubescent, rarely with bristles; head and pronotum without horns; head usually not deflexed 56

56(55). Tarsal formula 3-4-4 or 4-4-4; sides of pronotum smoothly continuous with sides of elytra; pronotum often with two depressions near base; body elongate-oblong, black or brownish, often with orange or yellowish spots on elytra, densely pubescent, length 1.5-6.0 mm; antennae usually with loose club of 3-4 antennomeres, antennal insertions exposed; adults found under fungus-covered bark, in shelf fungi, and in moldy vegetable materials (Fig. 141)..... [35] **MYCETOPHAGIDAE**

– Tarsal formula 3-3-3 or 4-4-4; sides of pronotum not as above, often with ridges and grooves; integument often with pubescence or scales forming patterns; body parallel-sided, rarely oval and flattened, length mostly 1-8 mm; antennae with abrupt club of 2-3 antennomeres, antennal insertions concealed; adults found under bark and in infested wood, in shelf fungi, vegetable detritus or in ant nests (Fig. 144).....
.....[38] **ZOPHERIDAE** (incl. Colydiinae)

Review of families, adventive species and literature

Order Coleoptera

Suborder Adephaga

1. Family **Carabidae** Latreille, 1802 [the ground beetles]
(Figs. 46-57, Table 2)

Length 1.4-40 mm (usually 3-8.5 mm). Tarsal formula 5-5-5

Diagnosis. Body with head narrower than pronotum and pronotum narrower than elytra in most species, with several punctures of fixed position bearing tactile setae; integument glossy and black or reddish brown in most species, with some species brilliantly and metallically coloured; antennae 11-articled, usually filiform, inserted between eyes and bases of mandibles (exception Cicindelinae); eyes prominent; pronotum margined and smooth in most species; elytra usually with longitudinal grooves (striae); legs strong, long and suitable for running in most species; procoxae often globose with open or closed cavities.

Bionomics. A dominant group of terrestrial predators in the temperate regions. Carabids are usually found in forested and open places under stones and other debris on the ground, along river and lake banks, or in marshes and bogs. A few North American species live in trees. Adults and larvae of most species are predators of other arthropods.

Faunal Composition. 45 species in 22 genera, most in *Amara* (9), *Bembidion* (8), *Carabus* (3) and *Pterostichus* (3).

Selected References. Ball and Bousquet 2000, Bousquet 1983, 1991a, 1992, Bousquet and Larochelle 1993, Bousquet and Webster 2004, Bousquet et al. 1984, Brown 1940a, 1950, 1967, Cardenas and Buddle 2007, Chantal 1994, Dunn 1981, Freitag et al. 1973, Hieke 2000, Hoebeke and Wheeler 1983, Jarrett and Scudder 2001, Krinsky and Oliver 1988, Larochelle and Larivière 1990, 2003, Larson 1978, 1998, Larson and Langor 1982, Lindroth 1954a, b, 1961-69, Majka 2005, Majka and Klimaszewski 2004, Majka et al. 2006a, 2007d,e, Niemelä and Spence 1991, Webster and Bousquet 2008, Westcott et al. 2006.

Table 2. Adventive species of Carabidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Abax parallelepipedus* (Piller and Mitterpacher)			x		x	-	Europe	1965	1965	Found in forest and forest edges	Brown 1967; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69
2. *Acupalpus meridianus* (Linnaeus)	x					**AB, BC, SK**; ID, OR, WA;	Palaearctic	1953	1931	Found in vacant lots, gardens	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69
3. *Agonum muelleri* (Herbst)	x	x	x	x	x	**AB, BC, ON**; eastern USA south to IA and WV	Palaearctic	1840	1840	Found in abandonedand cultivated fields, gardens, forest edges, sand and gravel pits	Brown 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Cardenas and Buddle 2007; Krinsky and Oliver 1988; Lindroth 1961-69, 1954a, b; Majka and Klimaszewski 2004
4. *Amara aenea* (DeGeer)	x	x	x	x	x	**AB, BC, ON**; most eastern USA south to LA and FL	Palaearctic	<1828, 1931, 1947-49	1904	Found in vacant lots, cultivated fields; roadsides, sand pits, orchards	Brown 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Jarrett and Scudder 2001; Majka et al. 2007d,e
5. *Amara apricaria* (Paykull)	x	x	x	x	x	**AB, BC, MB, NT, ON, SK, YT**; most USA south to CA, CO, KS, VA, also AK	Palaearctic	<1790, <1865	Before <1865	Found in cultivated and abandoned fields, gardens, parks, sand and gravel pits	Bain and Prévost (2010); Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2007d,e
6. *Amara aulica* (Panzer)	x	x	x	x	x	**BC, ON**; ME;	Palaearctic	<1797, 1929	1929	Found in vacant lots, roadsides, meadows, gravel pits	Bain and Prévost (2010); Brown 1940a, 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1954a, b, 1961-69; Majka et al. 2007d,e
7. *Amara bifrons* (Gyllenhal)	x	x	x	x	x	MA, ME, NH	Palaearctic	1929	1929	Found in sand and gravel pits, vacant lots, roadsides, meadows	Brown 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Majka and Klimaszewski 2004; Lindroth 1954a, b, 1961-69; Majka et al. 2007d, e
8. *Amara communis* (Panzer)	x	x	x	x		CT	Palaearctic	1988	1988	Found in vacant lots, meadows	Bain and Prévost (2010); Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Majka 2005; Majka et al. 2007d,e
9. *Amara eurynota* (Panzer)					x		Palaearctic	1971	1971	Found in open areas	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Larochelle and Larivière 2003

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
10. *Amara familiaris* (Duftschmid)	x	x	x	x	x	**AB, BC, MB, ON, SK**; eastern USA south to MS and FL, western USA south to CA and MT, also AK	Palaearctic	1915	1901	Found in cultivated and vacant fields, roadsides, sand and gravel pits, forest edges	Brown 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1954, 1961-69; Majka et al. 2007d,e
11. *Amara fulva* (O.F. Müller)	x	x	x	x	x	-	Palaearctic	1905	1905	Found in vacant fields	Brown 1940a, 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1954a, b, 1961-69
12. *Amara ovata* (Fabricius)	x	x	x			**AB, BC, ON**; eastern USA south to VA	Palaearctic	1928	1925	Found in vacant lots, roadsides, open forests	Bousquet and Larochelle 1993; Hieke 2000; Larochelle and Larivière 2003; Majka et al. 2006a, 2007e; Webster and Bousquet 2008
13. *Bembidion bruxellense* Wesmael	x	x	x	x	x	ME	Palaearctic	1907	1907	Found in gardens, roadside ditches, sand and gravel pits; vacant fields	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-1969; Majka et al. 2007d,e
14. *Bembidion femoratum* Sturm		x	x	x		WA	Palaearctic	1967	1967	Found in river banks	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Majka 2005; Majka et al. 2007e
15. *Bembidion lampros* (Herbst)					x	**BC**; OR, WA	Palaearctic	1947, 1949	1947	Found in cultivated and vacant fields, gardens	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Westcott et al. 2006
16. *Bembidion obtusum* Audinet-Serville	x			x		**ON**; MI, NY, OH, PA, VT	Palaearctic	1956	1956	Found in vacant and cultivated fields, roadside ditches	Bousquet 1991a, 1992; Cardenas and Buddle 2007; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2007d,e
17. *Bembidion properans* (Stephens)	x	x	x	x	x	ME	Palaearctic	1942	1942	Found in cultivated and vacant fields, roadsides, sand pits	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1954a, b, 1961-69; Freitag et al. 1973; Majka et al. 2007d,e

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
18. *Bembidion stephensi* Crotch	×	×	×	×	×	**ON**; eastern USA, south to MA and northern OH	Palaearctic	1891	1891	Found in margins of brooks, pools and ponds, also sand and gravel pits, roadsides, vacant lots	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2007d,e
19. *Bembidion tetracolum* Say	×	×	×	×	×	**BC, ON**; Most USA south to CA, UT, SD, VA;	Palaearctic	1850, 1900	1650-1700, <1823	Found in vacant and cultivated fields, gardens, sand and gravel pits	Bain 1998, 1999; Bain and Prévost (2010); Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2007d,e
20. *Blemus discus* (Fabricius)	×	×	×	×		**ON**; eastern USA south to PA	Palaearctic	1933	1933	Found at edges of ponds, river banks, and in cultivated and vacant fields, roadsides	Bain and Prévost 2010; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Brown 1940a; Majka et al. 2007d,e
21. *Broscus cephalotes* (Linnaeus)			×	×		-	Palaearctic	1987	1987	Found on sea beaches	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Larochelle and Larivière 2003; Majka et al. 2007e
22. *Carabus granulatus granulatus* Linnaeus	×	×	×	×	×	**AB, BC, MB, ON** ; MA, MN, WA	Palaearctic	1890	1890	Found in marshes, pools, roadside ditches	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Brown 1940a; Lindroth 1954, 1961-69; Majka et al. 2007e
23. *Carabus nemoralis* O.F. Müller	×	×	×	×	×	**AB, BC, ON, SK**; eastern USA south to PA, western USA south to CA, UT, WY	Palaearctic	1890	1890	Found in cultivated and vacant fields, gardens, backyards, roadsides, forest edges and clearings	Bousquet 1991a; Bousquet and Larochelle 1993; Brown 1940a; Cardenas and Buddle 2007; Lindroth 1954a, b, 1961-69; Majka et al. 2007e
24. *Clivina fossor* (Linnaeus)	×	×	×	×	×	**AB, BC, ON, SK**; eastern USA south to PA, also OR, WA	Palaearctic	1915	1915	Found in cultivated and vacant fields, roadsides, sand and gravel pits, forest edges, margins of marshes and lakes	Brown 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Cardenas and Buddle 2007; Lindroth 1954a, b, 1961-69; Majka et al. 2007d,e
25. *Clivina collaris* (Herbst)	×					**BC, MB, ON**; MA, NH, OH, WA	Europe	1948	<1838	Found in cultivated and abandoned fields, gravel pits	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
26. *Dromius fenestratus* (Fabricius)			×		×	-	Europe	1968	1968	Found in forests	Larson 1998; Majka and Klimaszewski 2004; Majka et al. 2007e
27. *Harpalus affinis* (Schrank)	×	×	×	×	×	**AB, BC, ON**; eastern USA south to KS and WV, also FL, ID, OR, WA	Palaearctic	1883	<1798	Found in vacant fields, roadsides, gravel and sand pits, gardens	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Cardenas and Buddle 2007; Lindroth 1961-69; Majka et al. 2007d,e
28. *Harpalus rubripes* (Duftschmid)	×	×	×	×		Eastern USA south to PA	Palaearctic	1992	1981	Found in cultivated and vacant fields, roadsides	Bousquet 1992; Chantal 1994; Krinsky and Oliver 1988; Majka et al. 2006a, 2007d,e; Webster and Bousquet 2008
29. *Harpalus rufipes* DeGeer	×	×	×	×	×	CT, MA, ME, NH, RI, VT	Palaearctic	1937	1937	Found in cultivated and vacant fields, gardens, yards	Brown 1940a, 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Cardenas and Buddle 2007; Dunn 1981; Hoebeke and Wheeler 1983; Lindroth 1961-69; Majka et al. 2007d
30. *Laemostenus terricola terricola* (Herbst)	×	×	×	×	×	**BC**	Europe	1889	1889	Found in cellars, stables, barns	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Brown 1940a; Lindroth 1954; Majka et al. 2007d,e
31. *Leistus ferrugineus* (Linnaeus)					×	-	Europe	1977	1977	Found at forest edges, in woodlands, vacant fields, meadows	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Hoebeke and Wheeler 1983; Larson 1978
32. *Nebria brevicollis* (Fabricius)	×				×	OR	Palaearctic	1930	1930	Found in deciduous forests, forest edges	Bousquet 1991a; Bousquet and Larochelle 1993; Lindroth 1961-69; Morris 1983
33. *Notiophilus biguttatus* (Fabricius)	×	×	×	×	×	**BC**; CT, ME, NH, RI	Palaearctic	1923	1923	Found in deciduous forests, forest edges and adjacent fields	Brown 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2006a, 2007d,e
34. *Notiophilus palustris* Duftschmid			×	×		-	Palaearctic	1967	1967	Found in fields	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Larochelle and Larivière 1990; Majka et al. 2007d,e
35. *Ophonus puncticeps* (Stephens)	×		×	×		**ON**; eastern USA south to PA and NJ	Palaearctic	1985	1954	Found in gravel and sand pits, cultivated and vacant fields, orchards	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2006a, 2007d,e

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
36. *Ophonus rufibarbis* (Fabricius)	x					-	Palaearctic	1953	1953	Same habitat as preceding species	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69
37. *Paranchus albipes* (Fabricius)		x	x		x	ME	Palaearctic	<1840	<1840	Found in margins of rivers, lakes, ponds	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1954a, b, 1961-69; Majka et al. 2007e
38. *Perigona nigriceps* (Dejean)	x		x			**ON**; eastern USA south to LA and FL, also OR and CA	Subcosmopolitan	1939	<1853	Found at margins of ponds and lakes, and in gardens	Bousquet 1991a; Bousquet and Larochelle 1993; Krinsky and Oliver 1988; Lindroth 1958, 1961-69; Majka et al. 2007e; Webster and Bousquet 2008
39. *Porotachys bisculatus* (Nicolai)	x	x	x			**ON**; eastern USA south to PA and NJ, west to ND, also WA, OR	Palaearctic	1928	<1900	Found in coniferous forests near sawmills, also river banks and vacant lots	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2006a, 2007e; Westcott et al. 2006
40. *Pterostichus melanarius* (Illiger)	x	x	x	x	x	**AB, BC, MB, ON, SK**; most of the USA south to CA, UT, CO, IA, OH and PA;	Palaearctic	1926	1926	Found mainly in vacant and cultivated fields, roadsides, gardens, yards, forest edges	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Brown 1950; Cardenas and Buddle 2007; Freitag et al. 1973; Lindroth 1954a, b, 1961-69; Majka et al. 2007d,e; Niemelä and Spence 1991
41. *Pterostichus strenuus* (Panzer)					x	**BC**	Europe	1937	1937	Found in cultivated fields, grasslands	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69
42. *Pterostichus vernalis* (Panzer)	x					VT	Europe	1998	1998	Found in wet meadows	Bousquet 1983; Bousquet and Webster 2004; Lindroth 1961-69
43. *Stomis pumicatus* (Panzer)			x	x		-	Palaearctic	1984	1984	Found in vacant and cultivated fields, gardens, forest edges	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2007e
44. *Trechus quadristriatus* (Schrank)	x		x			**ON**; MD, MI, NY, PA, WI, WV	Palaearctic	1965	1965	Found in cultivated and vacant fields, and gardens	Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Bousquet et al. 1984; Majka et al. 2006a, 2007e
45. *Trechus rubens* (Fabricius)	x	x	x	x	x	ME, NH, VT	Palaearctic	<1863	<1863	Found at margins of lakes, rivers and ponds, also marshes and swamps	Brown 1940a, 1950; Bousquet 1991a, 1992; Bousquet and Larochelle 1993; Lindroth 1961-69; Majka et al. 2007d,e

Suborder Polyphaga

Series Staphyliniformia

Superfamily Hydrophiloidea Latreille, 1802

2. Family **Hydrophilidae** Latreille, 1802 [the water scavenger beetles]

(Figs. 58-60, Table 3)

Length 1.0-40 mm. Tarsal formula 4-4-4 or 5-5-5

Diagnosis. Body usually oval, moderately to strongly convex, smooth and usually glossy. Antennae short, with 7-9 antennomeres, often concealed from above, with long scape and densely pubescent club of 3 antennomeres, ones preceding club glabrous and often embracing it; maxillary palpi elongate, usually longer than antennae; metasternum often prolonged posteriad as sharp spine; hind legs flattened and usually with fringe of hairs.

Bionomics. Most species are aquatic, adults are scavengers but larvae are predaceous on other arthropods. Members of Sphaeridiinae are terrestrial and feed on dung, humus and decaying leaves.

Faunal Composition. 16 species in five genera, most species in genus *Cercyon* (9) and *Sphaeridium* (3).

Selected References. Brown 1940a, Majka 2008c, Roughley 1991, Smetana 1978, 1985, 1988b.

Table 3. Adventive species of Hydrophilidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Anacaena limbata* (Fabricius)*	x	x	x	x	x	**AB, BC, MB, SK, ON**; AR, CA, CO, CT, ID, LA, MA, MD, ME, MI, MN, MS, NH, NJ, NM, NY, OK, OR, PA, SD, UT, VT, WA, WI	Palaearctic	-	-	-	Roughley 1991; Smetana 1988b
2. *Cercyon analis* (Paykull)	x	x	x		x	**AB, BC, MB, ON, NT, SK**; widely distributed across the USA	Palaearctic	1621-1673, 1850, 1909	<1846, 1873, 1895, 1896, 1898	Found in various rotting organic matter, including plant debris	Bain 1999; Bain and Prévost 2010; Roughley 1991; Smetana 1978, 1988b
3. *Cercyon haemorrhoidalis* (Fabricius)	x	x	x	x	x	**AB, BC, ON**; widely distributed across the USA	Palaearctic	1881	1650-1700, 1825, 1867	Found in animal droppings and decaying organic matter	Bain 1998; Roughley 1991; Smetana 1978, 1988b
4. *Cercyon lateralis* (Marsham)	x	x	x		x	**AB, BC, NT, ON, SK**; CA, CT, DC, IA, IL, IN, KS, KY, MA, MD, MI, MN, ND, NH, NM, NJ, NY, OH, OK, OR, PA, RI, SD, TN, VA, WA, WV, WI	Palaearctic	1898	1901, 1914	Found in various rotting organic matter, such as compost, rotting mushrooms and manure	Roughley 1991; Smetana 1978, 1988b
5. *Cercyon nigriceps* Marsham (=*atricapillus* (Marsham)	x		x			**AB**	Cosmopolitan	1900?	1846, 1870, 1889	Often found in compost, dung, and plant debris	Roughley 1991; Smetana 1978, 1988b
6. *Cercyon pygmaeus* (Illiger)	x	x	x		x	**AB, BC, MB, ON, SK**; [widely distributed across the USA]	Palaearctic	1850, 1899 [CNC]	1823, 1868, 1871, 1888	Found in rotting organic matter	Bain 1999; Roughley 1991; Smetana 1978, 1988b

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
7. *Cercyon quisquilius* (Linnaeus)	x	x	x		x	**AB, BC, MB, ON, SK**; [known from most of the USA]	Palaearctic	1921	1922	Found in rotting organic matter	Roughley 1991; Smetana 1978, 1988b
8. *Cercyon terminatus* (Marsham)	x					**ON**; widely distributed in the USA	Palaearctic	1850, 1881	1650-1700, 1874	Found in various debris around farm buildings e.g., compost, manure, rotting apples	Bain 1998, 1999; Roughley 1991; Smetana 1978, 1988b
9. *Cercyon unipunctatus* (Linnaeus)	x	x	x			**AB, BC, MB, SK, ON**; CT, DC, IA, ID, IL, MA, MD, ME, MI, MN, NH, NJ, NY, OR, PA, RI, SD, WA, WI	Palaearctic	1850; 1906	1850; 1868, 1890	Found in rotting organic matter, such as animal droppings	Bain 1999; Roughley 1991; Smetana 1978, 1988b
10. *Cercyon ustulatus* (Preyssler)	x	x				NH, NJ, NY	Palaearctic	-	-	Found in plant debris and moss near bodies of water and in a beaver lodge	Roughley 1991; Smetana 1978, 1988b
11. *Cryptopleurum minutum* (Fabricius)	x	x	x	x	x	**AB, BC, MB, ON**; full list of the states in Smetana (1978)	Palaearctic	1850; 1881	1850; 1868, 1871, 1873, 1886	Found in rotting organic matter	Bain 1999; Roughley 1991; Smetana 1978, 1988b
12. *Cryptopleurum subtile* Sharp	x	x			x	**AB, BC, MB, ON, SK**; CA, CO, CT, DC, GA, ID, IL, IN, KY, MA, MD, ME, MI, MN, MO, MS, NC, ND, NH, NJ, NY, OH, OR, PA , SC, SD, UT, VA, WI	Europe, Japan, Taiwan	1928, 1933	1926, 1928, 1931	Found in rotting organic matter	Roughley 1991; Smetana 1978, 1988b

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
13. *Helophorus grandis* Illiger	x	x	x			**ON**; ME, NH, NY, VT, WI		1877	1872-1892	-	Brown 1940a; Majka 2008c; Roughley 1991; Smetana 1985
14. *Sphaeridium scarabaeoides* (Linnaeus)	x	x	x		x	**AB, BC, MB, ON, SK**; partial list of the states in Smetana (1978)	Palaearctic	<1861, 1891, 1897, 1899	<1817, 1821, 1880	Predatory, found in animal droppings	Brown 1940a; Roughley 1991; Smetana 1978, 1988b
15. *Sphaeridium lunatum* Fabricius	x	x	x		x	**AB, BC, MB, ON, SK**; full list of the states in Smetana (1978)	Palaearctic	1924, 1926	1916, 1917, 1921, 1922, 1923	Predatory, found predominantly in mammal droppings	Roughley 1991; Brown 1940a; Smetana 1978, 1988b
16. *Sphaeridium bipustulatum* Fabricius	x	x	x	x		**AB, BC, MB, ON, SK**; partial list of states in Smetana (1978)	Palaearctic	1929	1909, 1911, 1928	Predatory, predominantly in mammal droppings	Brown 1940a; Roughley 1991; Smetana 1978, 1988b

* Majka (2008b) noted that Albrecht Komarek, who is revising the genus worldwide, believes that North American specimens of what has been called "*A. limbata*" may represent an undescribed cryptic species in the *lutsecens* complex, distinct from either *A. limbata* (F.) or *A. lutescens* (Stephens 1829). Majka (2008b) provisionally treated North American specimens in this complex as an undescribed Nearctic species.

3. Family **Histeridae** Gyllenhal, 1808 [the clown or hister beetles]
(Fig. 61, Table 4)

Length 0.5-25 mm (usually less than 12 mm). Tarsal formula 5-5-5 or 5-5-4

Diagnosis. Body ovate to oblong and convex in many species, cylindrical or dorsoventrally flattened in others, usually robust, glabrous, black or dark reddish brown and glossy in many species with metallic lustre in some species (Saprininae); head retracted in prothorax in many species; antennae short, elbowed and with 3-articled short club, often inserted in a cavity or hidden on underside of prothorax; elytra truncate, exposing 1 or 2 abdominal segments, usually with striae.

Bionomics. The majority of species are predaceous on larvae and eggs of insects but some feed on fungal spores. Many species occur in decaying organic matter, carrion, dung, decaying plants and sap, other species are found under loose bark or in the galleries of wood-boring insects, and some occur in sandy places or in bird and mammal nests. A few species live in association with ants.

Faunal Composition. Ten species in seven genera, mostly in *Dendrophilous* (2), *Gnathocerus* (2) and *Margarinotus* (2).

Selected References. Bousquet and Laplante 1999, 2006, Leech 1984, Majka 2008a, Majka et al. 2006b.

Table 4. Adventive species of Histeridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Acritus nigricornis* (Hoffmann)	×					**AB, BC, MB, ON**; IN	Palaearctic	1927	1893-	Found in dung, manure, decaying mushrooms, on carrion	Bousquet and Laplante 1999, 2006
2. *Atholus bimaculatus* (Linnaeus)	×	×				**AB, BC, MB, ON**; AZ, KY, NM, NY, MA, MI	Palaearctic/ Cosmopolitan	1898, 1922	<1825	Found in dung and decaying vegetable matter	Bousquet and Laplante 1999, 2006; Majka 2008a
3. *Carcinops pumilio* (Erichson)	×	×	×	×	×	**AB, BC, MB, ON, SK**; CA, FL, ID, IN, MA, ME, NH, OR, RI, WA	Cosmopolitan	1850, 1920, 1974, 1993, 2003, 2005	<1834, 1845	Found in stables, henhouses, granaries, mills, in dung, bird nests and on carrion	Bain 1999; Bousquet and Laplante 1999, 2006; Majka et al. 2006a; Leech 1984; Majka 2008a
4. *Dendrophilus punctatus* (Herbst)	×		×			**BC, MB, ON**; IN, NH, NY, RI	Palaearctic	1850, 1915, 1967	<1825	Found in granaries, mills, bird and ant nests, deciduous tree hollows	Bain 1999; Bousquet and Laplante 1999, 2006; Majka 2008a
5. *Dendrophilus xavieri* Marseul	×					**BC, ON**; IN, OR, WA	East Asia including Japan, UK	-	<1938	Found in decaying organic matter such as compost, manure, bird and ant nests	Bousquet and Laplante 1999, 2006
6. *Gnathoncus rotundatus* (Kugelann)	×	×	×		×	**AB, BC, MB, ON, SK**; CA, GA, IN, MA, ME, NY, OR	Palaearctic/ Cosmopolitan	1900, 1965, 1981	1844	-	Bousquet and Laplante 1999, 2006; Majka 2008a; Majka et al. 2006b
7. *Gnathoncus communis* (Marseul)	×		×			**AB, BC, ON, MB**; AZ, CA, DC, FL, NY	Palaearctic	1900, 1967	<1862	Found in bird nests and on carrion	Bousquet and Laplante 1999, 2006; Majka 2008a
8. *Margarinotus brunneus* (Fabricius)	×	×	×	×		**MB, ON**; AL, IN, ME, NC, NH, NY, SC, TN, VA	Palaearctic	1913, 1948, 1953, 1965	<1837	Found on carrion and decaying vegetation	Bousquet and Laplante 1999, 2006; Majka 2008a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
9. *Margarinotus merdarius* (Hoffmann)	x		x			**AB, BC, MB, ON**; IN, MA, MI, NH, NY, OR, PA, RI, WA	Palaearctic	1921, 1983	<1825-	Found on dung, fungi, compost, chicken coops	Bousquet and Laplante 1999, 2006; Majka 2008a
10. *Saprinus subnitescens* Bickhardt	x					**ON**; IA, NC, KY, LA, NM, PA, VA	Palaearctic	1972	1914	Found on carrion, manure, and decaying vegetable matter	Bousquet and Laplante 1999, 2006

Superfamily Staphylinoidea Latreille, 1802

4. Family **Ptiliidae** Erichson, 1845 [the feather-winged beetles]

(Fig. 62, Table 5)

Length 0.3-1.0 mm. Tarsal formula 2-2-2 or 3-3-3 (appearing 1-1-1 in some species)

Diagnosis. Body minute, broadly elongate-oval, brown or black; antennae filamentous, bearing long hairs, with 2-3-articled club; elytra often shortened exposing 1-2 abdominal segments; hind wings feather-like, fringed with long hairs; scutellum large; procoxae transverse or globose with open cavities.

Bionomics. Adults occur in decaying organic matter, rotten wood, and fungus-covered logs, where they feed on fungal spores and hyphae.

Faunal Composition. Ten species in six genera, most in *Acrotrichus* (4).

Selected References. Campbell 1991a, Johnson 1990a, Majka and Sörensson 2007, 2010, Sörensson 2003.

Table 5. Adventive species of Ptiliidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Acrotrichis fasicularis* (Herbst)		x	x			-	Palaearctic	1972, 1983, 2002	-	On fungi	Campbell 1991a; Johnson 1990a; Majka and Sörensson 2007, 2010; Sörensson 2003
2. *Acrotrichis grandicollis* (Mannerheim)	x	x	x			**AB, BC, ON**; NY, OR, WA	Palaearctic or Holarctic?	1970, 1972, 1990	-	On fungi	Campbell 1991a; Johnson 1990a; Majka and Sörensson 2007, 2010; Sörensson 2003
3. *Acrotrichis sericans* (Heer)	x	x				**AB, MB, ON**; CA, IL, MA, MN, NH, WA	Palaearctic	1970, 1972	-	On fungi	Campbell 1991a; Johnson 1990a; Majka and Sörensson 2007, 2010; Sörensson 2003
4. *Acrotrichis thoracica* (Waltl)	x	x				**ON**; IL, MA, MI	Palaearctic or Holarctic	1970, 1972	-	On fungi	Campbell 1991a; Johnson 1990a; Majka and Sörensson 2007, 2010; Sörensson 2003
5. *Nephanes titan* (Newman)	x					**ON, MB**; OK, WA	Palaearctic	1970	-	On fungi	Campbell 1991a; Johnson 1990a; Sörensson 2003
6. *Ptenidium nitidum* (Heer)	x	x	x			**BC**; NH	Palaearctic	1972, 1988	-	On fungi and in leaf litter	Campbell 1991a; Johnson 1990a; Majka and Sörensson 2007, 2010; Sörensson 2003
7. *Ptenidium pusillum* (Gyllenhal)	x	x	x	x		**AB, BC, MB, ON**; CA, MA, OR, WA	Palaearctic	1979, 2002	-	On fungi	Campbell 1991a; Majka and Sörensson 2007, 2010; Sörensson 2003
8. *Ptiliola brevicollis* (Matthews)	x					-	Palaearctic	1970	-	On fungi	Campbell 1991a; Johnson 1990a
9. *Ptiliolum spencei* (Allibert)	x					-	Palaearctic	1970	-	On fungi	Campbell 1991a; Johnson 1990a
10. *Ptilium minutissimum* (Ljungh)	x					-	-	1970	-	On fungi	Campbell 1991a; Johnson 1990a

5. Family **Silphidae** Latreille, 1807 [the carrion beetles]

(Fig. 63, Table 6)

Length 1.5-35 mm (usually about 10 mm). Tarsal formula 5-5-5

Diagnosis. Body usually soft, flattened, broad posteriad, elytra loosely covering abdomen or short, truncate, and exposing 1-3 segments, usually 3-costate; integument black, often with yellow, orange or red markings; antennae distinctly clubbed with last 2-3 articles pubescent.

Bionomics. Adults are found in association with decaying organic material, most commonly encountered at animal carcasses.

Faunal Composition. One species in genus *Silpha*.

Selected References. Laplante 1997.

Table 6. Adventive species of Silphidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Silpha tristis* Illiger	x					-	-	1982-1995	1982-1995	Found on carrion	Laplante 1997

6. Family **Staphylinidae** Latreille, 1802 [the rove beetles] (including Scydmaeninae)[the ant-like stone beetles]

(Figs. 64-81, Table 7)

Length 1.0-25 mm (mostly 1.0-6.0 mm). Tarsal formula 5-5-5 or heteromerous

Diagnosis. Body shape diverse but usually elongate-slender and parallel-sided, rarely short, oblong, wedge-shaped, or short, stout and oval with abdomen not flexible (Pselaphinae); black, brown or less frequently brightly coloured or metallic; integument usually glossy and pubescent; head often with a posterior constriction and sometimes with ocellus/ocelli (Omaliinae, Proteininae); antennae with 10-11 antennomeres, filiform, bead-like, sometimes with last 1-4 articles forming a club; elytra usually truncate, and shorter than abdomen, exposing 3 or most often 6-7 abdominal segments, exceptionally concealing all or most of abdomen (Microsilphinae, and some Omaliinae, Proteininae, and Scaphidiinae); abdomen flexible dorsoventrally except for Pselaphinae and well sclerotized; procoxae usually conical and strongly projecting, their cavities usually closed. Recently the Scydmaenidae were included in the Staphylinidae as a subfamily (Grebennikov and Newton 2009). They are distinct as follows: length 1.0-5.0 mm; body sometimes ant-like, with "waist-like" constriction of the base of the pronotum; head and pronotum usually narrower than the elytra; integument often glossy, with long pubescence; head usually with distinct neck; antennae long, pubescent, with more or less distinct club of 2-6 antennomeres; pronotum highly variable in shape, often with basal fovae; elytra oval, usually covering entire abdomen, with rounded shoulders; maxillary palpi usually with subapical palpomeres enlarged, and with apical palpomere variably reduced; legs long, femora enlarged; procoxae transverse with open cavities.

Bionomics. Adults occur in almost all terrestrial habitats, most often found in decomposing organic matter such as forest and garden litter, uncompacted soil, organic matter in burrows and tree hollows, bird, mammal, and ant nests, under bark, in galleries of wood-boring insects, moss, fungi, at edges of streams and other bodies of water, on carrion and animal droppings, foliage and flowers, and decaying seaweed; the majority are predators on other arthropods but some species are ectoparasitoids on fly pupae, some feed on fungi and some are detrivores; many Scydmaeninae are known to be specialist predators on oribatid mites.

Faunal Composition. 120 species in 65 genera, most in *Philonthus* (14), *Aleochara* (7) and *Atheta* (5).

Remarks. Rove beetles are mainly litter dwellers, and as such are prone to introductions into other regions. In particular the species-rich subfamilies Staphylininae and Aleocharinae are known to have many adventive species all over the world, many of which have become cosmopolitan in distribution (Klimaszewski 1982, Klimaszewski et al. 2007, Majka and Klimaszewski 2008a-c, Muona 1984, Smetana 1971, 1982, 1995). Rove beetles are mostly predatory, relatively small, and highly mobile. Human activity has often resulted in introductions of these species along major trading routes in association with imported domestic livestock, horticultural and agricultural products, forest-related materials, and soil. Such introduced, highly competitive species of rove beetles may threaten native species and cause imbalances in historically established predator-prey relationships; this in turn may promote normally harmless insects to become pests or cause other ecological disturbances.

Selected References. Bain 1998, Bain and LeSage 1998, Brown 1940a, 1967, Campbell 1973, 1975, 1976, 1979a,b, 1988, Campbell and Davies 1991, Chagnon 1936, Frank 1981, Gouix and Klimaszewski 2007, Gusarov 2003, Hammond 1976, Hoebeke 1985, 1988, 1990, 1991, 1995a,b, Hoebeke and Wheeler 1983, Horn 1879, Klimaszewski 1979, 1982, 1984, 2000, Klimaszewski and Frank 1992, Klimaszewski and Génier 1985, Klimaszewski and Peck 1986, Klimaszewski et al. 2004, 2005, 2006, 2007, Lohse and Smetana 1988, Majka and Klimaszewski 2004, 2008a-c, Majka et al. 2006b, 2008b, 2009b, Mason and Huber 2002, Moore and Legner 1975, Muona 1984, Newton 1987, Seevers 1951, Smetana 1965, 1971, 1973, 1976, 1981a, 1981b, 1982, 1988a, 1990a,b, 1991, 1995, Voris 1939, Wagner 1975, Webster et al. 2009a.

Table 7. Adventive species of Staphylinidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Aleochara bilineata* Gyllenhal	x	x	x	x	x	**AB, BC, MB, ON, SK**; ID, IL, MA, ME, NY, OR, RI, WA, WI	Palaearctic	1916, 1999, 1918, 1958	<1870	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae; used in biological control of the cabbage root maggot, *Delia radicum* (L.)	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Hemachandra et al. 2005; Klimaszewski 1984, 2000; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a
2. *Aleochara curtula* (Goeze)	x	x	x	x	x	**BC, ON**; FL, IL, MA, ME, NH, NY, NJ, OH, PA, RI, VT	Palaearctic	1922 (CNC), 1927, 1974-1983	<1920	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae (Anthomyiidae, Calliphoridae, Sarcophagidae), found on decaying fungi, feces and carcasses of animals	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Klimaszewski 1984, 2000; Klimaszewski and Frank 1992; Majka and Klimaszewski 2008a; Moore and Legner 1975
3. *Aleochara fumata* Gravenhorst	x	x	x	x	x	**AB, BC, MB, ON,YK**; AL, AR, AZ, CA, GA, MA, ME, MN, MD, MO, NC, NH, NJ, NM, NY, OK, OR, PA, RI, TN, VT, WA, WI, WY, WV	Palaearctic	<1906, 1900 (CNC), 1910, 1967, 1978	<1906	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae, found on rotting mushrooms, organic debris, moss, and groundhog burrows	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Klimaszewski 1984, 2000; Klimaszewski and Génier 1987; Klimaszewski and Peck 1986; Majka and Klimaszewski 2008a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
4. *Aleochara lanuginosa* Gravenhorst	x	x	x		x	**AB, BC, ON**; CA, CO, ID, MA, MN, NH, NC, NJ, NY, OR, RI, WA, WI	Palaearctic	1893 (CNC), <1957, 2005	1930	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae, found on dung, litter and dead animals	Campbell and Davies 1991; Cervenka and Moon 1991; Klimaszewski 1984, 2000; Klimaszewski and Frank 1992; Majka and Klimaszewski 2008a; Moore and Legner 1975; Webster et al. 2009a
5. *Aleochara lata* Gravenhorst	x					**BC, MB, ON, SK, YK**; ME to FL and TX and to AZ and southern CA	Palaearctic	1889 (CNC), <1984	<1910	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae, found on dung, and carrion	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Harrington 1884; Klimaszewski 1984, 2000; Muona 1984
6. *Aleochara tristis* Gravenhorst	x	x				CA, MN	Palaearctic	1966, 1999	1966	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae, found on feces, manure, and decaying plant material	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Klimaszewski 1984, 2000; Klimaszewski and Cervenka 1986; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a
7. *Aleochara villosa* Mannerheim	x	x				**AB, BC**; AK, CA, OK, OR, WA	Palaearctic	1952 (CNC), <1984	1852	Adults are predators of fly larvae, larvae are ectoparasitoids of fly pupae, occurs on carrion and in bird nests	Campbell and Davies 1991; Klimaszewski 1984, 2000; Klimaszewski and Frank 1992; Webster et al. 2009a
8. *Aloconota sulcifrons* (Stephens)	x	x				AL, NH, NY, IN, IL, KY, MO, TN, VA, WA, WV	Palaearctic	1980, 2006	1904	Found in litter and moss near water, in compost, fungi, decaying sea wreckage , and in caves	Gusarov 2003; Klimaszewski and Peck 1986; Majka and Klimaszewski 2008b; Webster et al. 2009a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
9. *Amischa analis* (Gravenhorst)		×	×	×	×	**ON**; CA, CO, NY, IN, MA, ME, NH, PA, WA	Palaearctic	1949, 1997, 1999, 2003	1949	Adults are found in leaf litter, on soil, among mosses, and decaying plant debris	Bernhauer 1907; Campbell and Davies 1991; Gouix and Klimaszewski 2007; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a; Muona 1984
10. *Anotylus insecatus* (Gravenhorst)	×		×			**AB, MB, ON, SK**; CA	Palaearctic	1954, 1980, 2007	1954	In decomposing organic matter	Campbell and Davies 1991; Campbell and Tomlin 1984; Klimaszewski 2000; Majka and Klimaszewski 2008c
11. *Anotylus rugosus* (Fabricius)	×	×	×	×	×	**BC, MB, ON**; FL, ID, IN, LA, ME, NH, NY, OH, OR, PA, SC, TX, VA, WA	Palaearctic	1825-1875, <1895, 1900-1907, 1945, 1953	~1670	Found on dung, carrion, and other decomposing organic matter	Bain 1998, 1999; Campbell and Davies 1991; Evans 1895; Hammond 1976; Klimaszewski 2000; Majka and Klimaszewski 2008a
12. *Anotylus tetracarinatus* (Block)	×		×			**BC, ON**; IN, MN, NY, OR, WA	Palaearctic	<1957, 2007	1877	In decomposing organic matter	Campbell and Davies 1991; Cervenka and Moon 1991; Hatch 1957; Klimaszewski 2000; Majka and Klimaszewski 2008c; Moore and Legner 1975
13. *Atheta amicula* (Stephens)			×			CA, WA	Palaearctic	2005	<1926, <1975, 1978	Found in compost, decaying fungi, under animal droppings, in fallen leaves and mosses	Bernhauer and Scheerpeltz 1926; Majka and Klimaszewski 2008a; Moore and Legner 1975; Muona 1984
14. *Atheta celata* (Erichson)		×	×			AK, MA, WV	Palaearctic	2003, 2004	1910	In NS found in owl nests, in Europe in bird and mammal nests	Bernhauer 1907; Majka and Klimaszewski 2008a; Majka et al. 2006b
15. *Atheta dadopora* C.G. Thomson		×	×	×	×	**AB, ON, YT**; AK, NY, PA, RI	Palaearctic or Holarctic (status uncertain)	1965, 1999, 2002	<1910	Found in decaying fungi, cow dung, and leaf litter	Gusarov 2003; Klimaszewski et al. 2005, 2008c; Majka and Klimaszewski 2008a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
16. *Atheta (Chaetida) longicornis* (Gravenhorst)	x	x	x			**BC**; MN	Palaearctic	1982, 1995, 2002	1979, 1980	Found in association with dung, and rotting organic debris, fungi, and carrion	Gouix and Klimaszewski 2007; Klimaszewski et al. 2007; Majka and Klimaszewski 2008a; Muona 1984; Webster et al. 2009a
17. *Atheta (Thinobaena) vestita* (Gravenhorst)		x	x			-	Palaearctic	1996, 2003, 2004	1996, 2003, 2004	Found in decaying sea wreckage and in drift material on beaches	Gouix and Klimaszewski 2007; Klimaszewski et al. 2007; Majka and Klimaszewski 2008a,c; Majka et al. 2008b
18. *Autalia rivularis* Gravenhorst	x	x	x			**AB, BC, ON**; CA, MA, ME, MI, MN, NH, NJ, NY, OR	Palaearctic	1999, 1956	1928	Found in leaf litter, compost, and dung	Gouix and Klimaszewski 2007; Hoebeke 1988; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a; Moore and Legner 1975
19. *Bisnius cephalotes* (Gravenhorst)	x	x	x		x	**BC,MB, ON**; AZ, CA, CO, FL, ID, IA, MA, MD, MI, NY, NJ, NC, OR, PA, WA, WI	Palaearctic	1850, 1860, 1917, 1972, 2004	1850, 1860	Found in decaying organic matter, such as compost, dung. and carrion; frequently found near human settlements	Bain 1999; Campbell and Davies 1991; Klimaszewski 2000; Majka et al. 2006a, 2008a,c; Smetana 1995
20. *Bisnius fimetarius* (Gravenhorst)	x				x	-	Palaearctic	1949, 1954	1949	Found in organic decaying matter, especially in animal droppings and carrion; also around human settlements	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1965, 1995
21. *Bisnius parcus* (Sharp)	x					**BC, ON**; AZ, CA, CO, IL, IN, MO, NC, NJ, NM, NV, NY, OK, OR, PA, TN, UT, WA	Palaearctic, New Zealand	1912, 1935	1868, 1871, 1892, 1897, 1925	Found in bird nests including owls, on carrion, manure, ground nests of mammals and birds, and in caves	Klimaszewski 2000; Smetana 1995

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
22. *Bisnius sordidus* (Gravenhorst)	x	x	x		x	**AB, BC, MB, ON SK**; throughout US south to Central and South America	Palaearctic (nearly cosmopolitan)	1850, 1860, 1881, 1976, 1977	1850, 1860	Ubiquitous species, preferring decaying organic material, such as compost, animal droppings etc.; often around human settlements	Bain 1999; Campbell and Davies 1991; Fauvel 1874; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1995
23. *Carpelimus obesus* (Kiesenwetter)	x	x	x	x		FL, IN?, TX	Palaearctic	1850, <1988, 1971, 1999, 2001	~1670	Found on muddy banks of rivers and streams, ponds, and puddles, under stones and rotten plants	Bain 1999; Campbell and Davies 1991; Klimaszewski 2000; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a
24. *Carpelimus subtilis* (Erichson)			x			NY, PA, RI	Palaearctic	1995	1918	Found on exposed banks of sand, mud, alongside rivers and other wet habitats	Majka and Klimaszewski 2008a; Moore and Legner 1975
25. *Cephennium gallicum* Ganglbauer			x				Palaearctic	1988, 2001, 2002, 2004	1988	Found in subcortical environments, old tree trunks, under bark, rotten wood, in moss, leaf litter, in decomposing plant material	Majka and Klimaszewski 2004
26. *Cilea silphoides* (Linnaeus)	x	x				**AB, BC, ON**; CA, CT, DC, IA, KS, MA, MD, MI, MN, NC, NJ, NY, OR, PA, TX, VA, WA, WV, WI	Palaearctic	<1957, <1975, 1978	1802	In rotting vegetable matter: compost, grass cuttings, rotting fruit, dung and old mushrooms	Campbell 1975; Campbell and Davies 1991; Cervenka and Moon 1991; Hatch 1957; Moore and Legner 1975; Klimaszewski 2000; Majka and Klimaszewski 2008c

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
27. *Coprophilus striatulus* (Fabricius)	x		x			**ON**; NH, NY	Palaearctic	1981, 2003	1974	Found in decomposing plant material, decaying leaves, cow dung, and on carrion, under wet bark, and in mammal nests	Campbell 1979a; Chandler 2001; Hoebeke 1995a; Majka and Klimaszewski 2008a
28. *Cordalia obscura* (Gravenhorst)	x		x			**ON**; CA, CT, CO, IL, MA, MD, MI, NH, NJ, NY, OH, PA, WA	Palaearctic	1952 (CNC), 1956 (CNC), <2000, 2006	1905	In decaying plant material, on carrion, dung, decaying bracket fungi, and in bird nests	Campbell and Davies 1991; Fenyes 1920; Gouix and Klimaszewski 2007; Hoebeke 1985; Klimaszewski 2000; Majka and Klimaszewski 2008a; Moore and Legner 1975; Muona 1984
29. *Crataraea suturalis* (Mannerheim)		x	x			**BC, SK**; CA, IA, IL, IN, MA, MO, PA, SC, VA, VT	Palaearctic	1956, 1967	1956	Synanthropic, found in nests, haystacks, stables, barns, rotting mushrooms and trunks, and in leaf litter	Gouix and Klimaszewski 2007; Klimaszewski et al. 2007; Moore and Legner 1975; Webster et al. 2009a
30. *Creophilus maxillosus* (Linnaeus) [*C. maxillosus villosus* is a Nearctic subspecies and *C. maxillosus maxillosus* is an introduced subspecies, all records are mixed up and should be verified. This species is tentatively included in this list pending future verification]	x	x	x	x	x	**AK, BC**; CA, FL, IN, OR, SC, WA, WI	Palaearctic	1621-1673, <1837	<1939; 1948, 1957	Decaying organic matter, especially carrion	Bain and Prévost 2010; Campbell and Davies 1991; Hatch 1957; Kirby 1837; Klimaszewski 2000; Majka and Klimaszewski 2008a; Moore and Legner 1975; Smetana 1965; Voris 1939

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
31. *Dalotia coriaria* (Kraatz)		x	x			**AB, BC, ON**; CA, FL, LA, MA, NJ, NY	Cosmopolitan	1965, 2004	1925	Found in leaf litter, rotting organic materials, under decaying seaweed and carrion	Bernhauer 1906, 1907; Gouix and Klimaszewski 2007; Hamilton 1894; Klimaszewski et al. 2007, 2009; McLean et al. 2009a,b; Moore and Legner 1975; Muona 1984; Webster et al. 2009a
32. *Deleaster dichrous* Gravenhorst	x	x	x		x	**ON**; ME, NH	Palaearctic	1934, 1967, 1977	1934	Found in forest litter, wet debris, and under rocks and in debris near streams; probably predaceous	Brown 1940a; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Moore and Legner 1975
33. *Diglotta mersa* (Haliday)		x				-	Palaearctic	2008	2008	Adults found on fine gravel near or under rocks in intertidal zone, 1-3 meters below mean high tide mark	Klimaszewski et al. 2008b
34. *Dinaraea angustula* (Gyllenhal)	x	x	x	x		**AB, ON**; CA, NY	Palaearctic	1980, 1996, 2000, 2002, 2004	<1889, <1975	Epigaeic in arable land and other unforested habitats, also in marsh litter, leaf litter in mixed forest and in compost	Fauvel 1889; Gouix and Klimaszewski 2007; Klimaszewski et al. 2007; Majka and Klimaszewski 2008a; Moore and Legner 1975; Muona 1984; Webster et al. 2009a
35. *Dochmonota rudiventris* (Eppelsheim)	x	x			x	**NT, YK**; ID, MA	Palaearctic or Holarctic (status uncertain, provisionally included in this account)	1949, 2005	1910	Found in moist leaf litter	Gusarov 2003; Klimaszewski 2000; Majka and Klimaszewski 2008b; Muona 1984; Webster et al. 2009a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
36. *Drusilla canaliculata* (Fabricius)	x	x	x	x		**ON**; AK, KY, NY	Palaearctic	1968, 1996, 2004	<1906	Found mainly in riparian habitats, also in disturbed habitats, in open habitats under vegetation, mosses, decomposing materials and in soils and under stones	Gouix and Klimaszewski 2007; Gusarov 2003; Majka and Klimaszewski 2008a; Muona 1984; Webster et al. 2009a
37. *Euplectus karstenii* (Reichenbach)	x			x		**BC, MB, ON, SK**; DC, IA, IL, MA, ME, MI, MN, MT, NH, NY, OH, PA, WI	Palaearctic	1898, 1987	1894	Fungivore	Campbell and Davies 1991; Chandler 1997; Hoebeke and Wheeler 1983; Klimaszewski 2000; Majka and Klimaszewski 2008a; Wagner 1975
38. *Euplectus signatus* (Reichenbach)	x					**MB, ON, SK**; IL, ME, OH, VT, WI	Palaearctic	1956	1956	Fungivore	Campbell and Davies 1991; Hoebeke and Wheeler 1983; Klimaszewski 2000; Wagner 1975;
39. *Eusphalerum torquatum* (Marsham)					x	-	Palaearctic	1967	1967	Pollen feeder, on various flowers (Brassicaceae) including trees	Brown 1967; Campbell and Davies 1991; Klimaszewski 2000
40. *Falagria sulcata* (Paykull)	x					**AB, ON**; IL, MA, MD, NJ, NY, VA, UT	Palaearctic	1913 (CNC), 1917 (CNC), <1985	<1985	Under decaying plant material, such as compost, weeds, hay and rotting fungi	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Hoebeke 1985; Klimaszewski 2000

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
41. *Gabrius appendiculatus* Sharp [often listed as *G. subnigritulus* (Reitter)]	x	x			x	**BC**	Palaearctic	1978, 1979, 1983	-	Found in wet habitats such as swampy meadows and forests, marshes, near various bodies of water, in wet moss, grass clumps and grass roots.	Campbell and Davies 1991; Klimaszewski 2000; Klimaszewski et al. 2005; Smetana 1990c, 1995
42. *Gabrius astutoides* (A. Strand)	x	x	x			**MB, ON**; NH, PA	Palaearctic	1972, 1977, 1983	<1936	In alder litter along streams, and in leaf litter	Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1991, 1995
43. *Gabrius nigritulus* (Gravenhorst)	x					**AB, BC, MB, ON**; CA, CT, DC, ID, IL, IN, KY, MA, ME, MD, MI, MT, ND, NE, NH, NJ, NM, NV, OH, OR, PA, RI, TX, UT, VA, VT, WA, WI, WV	Palaearctic also in Mexico	1887	<1875, 1882, 1885, 1886, 1898	Found in rotting plant material, such as compost, debris around human settlements, fallen leaves and debris on forest floor, moss, under low vegetation	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1995
44. *Gabronthus thermarum* (Aubé)	x					**ON**; CT, DC, FL, IL, KS, MA, MI, MO, NC, NH, NJ, OH, OK, PA	Palaearctic	1933, 1968	1915	Found in rotting plant material and organic debris	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1995
45. *Geostiba circellaris* (Gravenhorst)		x			x	-	Palaearctic	1949, 1951, 2004	1949	Found along river margins, in flood debris and drift material	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Gusarov 2002; Klimaszewski 2000; Lohse and Smetana 1988; Muona 1984; Webster et al. 2009a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
46. *Gnypeta caerula* C.R. Sahlberg	x	x	x	x	x	**AB, MB, ON, NW, SK, YK**; AK	Palaearctic or Holarctic (status uncertain, provisionally included in this account)	1949, 1951, 1962, 1983, 2001	1949	Boreal species found in riparian habitats and debris in marshes, and near water	Campbell and Davies 1991; Klimaszewski 2000; Klimaszewski et al. 2008a; Majka and Klimaszewski 2008a; Muona 1984
47. *Gymnusa brevicollis* (Paykull)	x				x	MA, ME	Palaearctic	<1924, 1975	<1924, 1975	In *Sphagnum* bogs	Campbell and Davies 1991; Gouix and Klimaszewski 2007; Klimaszewski 1979, 1982, 2000; Klimaszewski and Génier 1985; Muona 1984
48. *Gyrohypnus angustatus* Stephens	x	x	x		x	**BC, ON**; CA, NY, OR, WA	Palaearctic	1860, 1913, 1926	1860	Found in decaying organic matter, such as compost, grass pile, leaf litter, and wet detritus around water, under stones and in beaver houses	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1982
49. *Gyrohypnus fracticornis* (O.F. Müller)	x	x	x	x	x	**AB, BC, MB, ON**; AR, AK, CA, CO, DC, IA, ID, IL, KS, MA, MD, ME, MI, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OR, PA, RI, SD, TN, UT, VA, VT, WA, WI, WV, WY	Palaearctic, also in Chile	1952, 1977, 1972,	<1846	Found in decaying organic matter, such as compost, grass piles, rotting plant debris, and in mammal dung	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1982
50. *Gyrophaena affinis* C.R. Sahlberg	x	x	x			**BC, MB, ON**; DC, IA, IL, IN, KY, MA, ME, MI, MN, MO, NC, NH, NJ, NM, NY, PA, TN, WA, WI, WV	Palaearctic	1946, 1977, 2002	1910	Obligatory fungivore, found on gilled mushrooms, on forest floor, and on logs	Campbell and Davies 1991; Gouix and Klimaszewski 2000; Klimaszewski et al. 2007, 2009; Majka and Klimaszewski 2008a; Muona 1984; Seevers 1951

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
51. *Habrocerus capillaricornis* (Gravenhorst)	x		x		x	**BC, ON**; widespread in the USA	Palaearctic	1951 (CNC), 1994	1931	Found in forests in leaf litter, fungi, under bark, etc.	Assing and Wunderle 1995; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a
52. *Halobrecta flavipes* C.G. Thomson		x				NY, VA	Palaearctic, Chile, Atlantic Inaccessible Islands	2006	<1910	A marine littoral species, found under large, deep-set rocks 1-3 meters below the mean high tide mark, and occasionally in seaweed in upper littoral zone	Gusarov 2004; Klimaszewski et al. 2002b, 2008b
53. *Homalota plana* (Gyllenhal)		x	x			**AB, ON**; AK, AZ, CA, CO, FL, IA, ID, IN, MT, NY, OH, PA, TX, WA	Palaearctic	1980, 2002, 2005	<1889, 1911, <1975	Found under bark of coniferous trees and poplars	Bernhauer 1907; Fauvel 1889; Gouix and Klimaszewski 2007; Hamilton 1889; Klimaszewski et al. 2004, 2007; Majka and Klimaszewski 2004, 2008b
54. *Ilyobates bennetti* (Donisthorpe)	x	x	x				Palaearctic	1981, 2005, 2007	1981	In forest litter at the bases of trees in a silver maple swamp, flood debris, compost, pastures and blueberry fields	Assing 1999; Gouix and Klimaszewski 2007; Majka and Klimaszewski 2008c; Webster et al. 2009a
55. *Lathrobium fulvipenne* (Gravenhorst)	x	x			x	**AB, BC**	Palaearctic, also in Greenland	1968 (CNC), 1984 (CNC), 1986 (CNC), 1991, 1992, 2006	1968	In soil, in marsh litter, under leaves in forests	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008c; Moore and Legner 1975

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
56. *Leptacinus intermedius* Donisthorpe	x	x		x	x	**AB, BC, MB, ON, SK**; AZ, CA, CO, CT, IL, IN, MA, NE, NH, NM, NV, NY, OH, OR, PA, WA	Palaearctic	1903, 2003, 2004	1903	Found in newly cut Manitoba maple, in moss tamarack swamp, horse and cow dung, manure, compost, decaying vegetable debris and on the ground in and around granaries	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a,c; Smetana 1982, 1988a
57. *Leptacinus batychrus* (Gyllenhal)	x					**BC, MB, ON**; IA, IL, MA, MI, NJ, NY, OR	Palaearctic	1895	<1880, 1889, 1895	Synanthropic species, found around farm buildings, in ground debris, under stones, and under wood on ground	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1982
58. *Leptacinus pusillus* (Stephens)	x					**ON, SK**; AZ, CA, CO, IA, IL, MA, MI, NH, NJ, NM, NV, NY, PA, SC, WA, WI	Palaearctic	1905, 1913	1874, 1889, 1894	Synanthropic species, associated with rotting plant and other organic debris, manure, etc.	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1982
59. *Lithocharis ochracea* (Gravenhorst)	x	x	x			**BC, ON, SK**; CA, FL, ID, IN, MN, NY, WA	Palearctic	1969, 1977, 1992	<1886, <1905	Synanthropic species, found in fields, parks, litter, decomposing hay, and in compost	Campbell and Davies 1991; Cervenka and Moon 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Moore and Legner 1975
60. *Medon fusculus* (Mannerheim)	x						Palaearctic	-	-	Found in damp straw, vegetable litter, dead leaves, moss, and in mole's nest	Campbell and Davies 1991; Klimaszewski 2000

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
61. *Meotica exilis* (Erichson)			×				Palaearctic	1998	1998	Found in moist situations with rich soils, shores, leaf litter under *Salix*, and in *Sphagnum* bogs	Majka and Klimaszewski 2008c
62. *Meotica "pallens"* (Redtenbacher)			×			**BC, ON**; NJ, RI	Palaearctic	1981, 1996, 2007	1899	Found in muskrat nests, gypsum sinkhole, animal burrows, flood refuse, soil around trees	Gusarov 2002; Klimaszewski et al. 2007; Majka and Klimaszewski 2008c
63. *Mocyta fungi* (Gravenhorst)	×	×	×	×	×	**AB, BC, ON, YK**; CA, CO?, MA, ME, MN, NY, RI, OR, WA	Cosmopolitan	<1925 1989, 1999, 2003	1893	Found in litter, fungi, rotten wood, mosses, and decaying plants	Bernhauer 1907; Campbell and Davies 1991; Gouix and Klimaszewski 2007; Gusarov 2003; Hatch 1957; Keen 1895; Klimaszewski 2000; Klimaszewski et al. 2008c; McLean et al. 2009a,b; Majka and Klimaszewski 2008b; Muona 1984
64. *Mycetoporus lepidus* (Gravenhorst)				×		**AB**	Palaearctic	~1991, 1994 (CNC), 2000, 2003 (CNC)	1991	Found in moist forests, in peat bogs, heaths, leaf litter, rotting fungi, and rotting plants	Campbell and Davies 1991; Majka and Klimaszewski 2008a
65. *Nehemitropia lividipennis* (Mannerheim)	×	×	×	×		**ON**; CA, MA, MN, NM, NE, NY, PA, TX, VT	Palaearctic	1912, 1959, 1977, 1988, 2003	1912	Found in open fields, open marshes, forest edge, in organic debris, mammal dung, and nests	Gouix and Klimaszewski 2007; Klimaszewski et al. 2007; Majka and Klimaszewski 2008a; Muona 1984
66. *Neobisnius lathrobioides* (Baudi)	×					CA, IL, MA, NV, NY	Palaearctic	1940	1940, 1941	-	Campbell and Davies 1991; Frank 1981; Klimaszewski 2000

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
67. *Neobisnius villosulus* (Stephens)	x	x	x			**ON**; MN, NY, OR	Palaearctic	1850, 1860, 1994, 2004	1850, 1860	In moist habitats along margins of rivers, marshes, and lakes	Bain 1999; Campbell and Davies 1991; Frank 1981; Klimaszewski 2000; Majka and Klimaszewski 2008a,c
68. *Ochthephilum fracticorne* (Paykull)	x	x	x		x	**BC, ON**; CT, MA, ME, MI, NH,	Palaearctic	1982, 1983	<1975	Found under coastal flotsam, a hydrophilic, Synanthropic species	Assing 2009; Campbell and Davies 1991; Majka and Klimaszewski 2008a
69. *Oligota parva* Kraatz				x		CA, MA, MO, TX	Palaearctic	2003	<1975	Found in coastline drift, compost, dung, decomposing organic materials, old hay, and grass	Frank et al. 1992; Majka et al. 2008b; Moore and Legner 1975
70. *Omalium rivulare* (Paykull)	x	x	x		x	**BC, ON**; AK, AL, CA, ID, IN, MA, ME, MI, NH, NY, NJ, OR, PA, PA, RI, VA, WA	Palaearctic	<1957, 1999, 2001	1878	Forest litter	Campbell and Davies 1991; Klimaszewski 2000; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a; Moore and Legner 1975; Peck and Thayer 2003; Sikes 2003
71. *Omalium excavatum* Stephens	x					Greenland	Palaearctic	-	-	Partly synanthropic, found in decaying plant matter, manure, in moss, under stones, in beach drift, and carrion	Campbell and Davies 1991; Klimaszewski 2000
72. *Ontholestes murinus* (Linnaeus)					x		Palaearctic	1949, 1979	1949	Found on a disturbed meadow, and in a barn with goats and chickens, and in cow manure in a pasture	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1981b

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
73. *Oxypoda brachyptera* (Stephens)	x	x	x			**ON**	Palaearctic	1977, 1982, 2005	1977, 1982, 2005	Found in litter, soil, etc.	Gouix and Klimaszewski 2007; Klimaszewski et al. 2006; Majka and Klimaszewski 2008a
74. *Oxypoda opaca* (Gravenhorst)		x	x			**ON, BC**; AK, NC, NY, SC, TN, VT	Palaearctic	1981, 2002	1936	Found in decaying organic material, e.g., pile of grass, fungi, compost, under animal carcasses, and in chicken litter	Gouix and Klimaszewski 2007; Hoebeke 1990; Klimaszewski et al. 2006; Majka and Klimaszewski 2008a; McLean et al. 2009a; Webster et al. 2009a
75. *Oxypoda operta* Sjöberg	x		x			**AB, ON**; NH	Palaearctic	1970, 1984	1970, 1973, 1984, 1987, 1999	Found in sphagnum and dwarf *Betula* sp. litter, and in boreal forest	Gouix and Klimaszewski 2007; Klimaszewski et al. 2006; Majka and Klimaszewski 2008a
76. *Oxytelus laqueatus* (Marsham) [some distribution data listed under synonymic name *O. fuscipennis*]	x	x	x			**AB, BC, MB, ON, SK, YK**; AK, CA, ID, IL, NM, OR, PA, KS, WA	Palaearctic	1931, 1999	1918	In forest litter, red spruce forest, compost, carrion, decaying mushrooms	Campbell and Davies 1991; Klimaszewski 2000; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a; McLean et al. 2009a,b
77. *Oxytelus sculptus* Gravenhorst	x		x			**BC, MB, ON**; CA, CT, FL, IA, ID, IN, NY, OR, PA, WA, WI	Palaearctic	1825-1875	1670	Synanthropic species, found in gardens, pastures, fields, under stones, manure, and in compost	Bain 1999; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008c; Moore and Legner 1975
78. *Phacophallus parumpunctatus* (Gyllenhal)	x					**ON**; CA, DC, IL, KS, MA, MN, NH, NJ, NY, PA, SC	Cosmopolitan	1957, 1968	<1880 1889, 1891	Synanthropic species, found in compost, manure, and decaying organic material around farm buildings	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1982

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
79. *Philonthus carbonarius* (Gravenhorst) [often listed as *P. varius* (Gyllenhal)]	x	x	x	x	x	**BC, MB, ON, SK, YK**; throughout the USA	Palaearctic	1905, 1909, 1977, 1981	1905, 1908, 1922, 1927	Found in moist meadows, fields, disturbed land around human settlements, along edges of ponds and lakes and in marshes and swamps	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Majka et al. 2006a; Smetana 1965, 1995
80. *Philonthus caucasicus* Nordmann	x					**AB, BC, MB, ON, SK**; CA, CO, CT, ID, MA, MN, MT, NV, NY, OR, TX, UT, WA, WI	Palaearctic	1917, 1942, 1928	1910, 1915, 1916,	Found in disturbed habitats near human settlements, in rotting plant debris such as compost, grass clippings, and in cow dung	Klimaszewski 2000; Smetana 1995
81. *Philonthus cognatus* Stephens [often listed as *P. fuscipennis* (Mannerheim)]	x	x	x	x	x	**AB, BC, ON**; AR, CA, CO, CT, ID, IL, IA, MA, MD, ME, MT, NC, ND, NH, NJ, NY, OH, OR, PA, TN, UT, WA, WI	Palaearctic	1905, 1906, 1949, 1952, 1977	1884, 1896, 1910, 1912, 1924	Occurs in forested and open areas, in wet moss, leaf litter and other plant debris	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a,c; Smetana 1965, 1995
82. *Philonthus concinnus* (Gravenhorst)	x	x	x	x	x	**AB, BC, SK, MB, ON**; widespread in the USA	Palaearctic	1906, 1927, 1932, 1934	1906, 1909, 1916, 1918, 1927	Ubiquitous species, found in disturbed habitats such as fields, pastures, farm land, in cow and horse dung, also in forest floor litter and animal nests	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1965, 1995

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
83. *Philonthus cruentatus* (Gmelin)	x	x	x	x	x	**AB, BC, MB, ON, SK,** widespread in the USA	Palaearctic, Mexico	early 1900s	1907, 1908, 1909, 1914	Frequently found in cow and horse dung and on carrion	Campbell and Davies 1991; Mason and Huber 2002; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1965, 1995
84. *Philonthus debilis* (Gravenhorst)	x	x	x	x	x	**AB, BC, MB, ON, SK**; widespread in the USA	Palaearctic	1850, 1882	late 1700s-early 1800s, 1857, 1874, 1882, 1896, 1902	Found in various organic debris, compost, manure, animal droppings, mainly in disturbed habitats near human settlements	Bain 1999; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1965, 1995
85. *Philonthus discoideus* (Gravenhorst)	x	x				**ON**; AZ, CA, CO, CT, DC, FL, GA, HI, ID, IL, MA, MD, ME, MI, MN, NH, NJ, NV, NY, PA, TX, UT	Cosmopolitan	1895, 1900	1846	Synanthropic species associated with compost, manure and various organic debris	Cervenka and Moon 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Moore and Legner 1975; Smetana 1995
86. *Philonthus jurgans* Tottenham	x	x			x	**BC, ON**; CA, ID, IL, MA, ME, MI, NH, NY, OR, PA, VT, WA	Palaearctic	1901, 1905, 1912, 1924, 1925, 1977	1881, 1899, 1901, 1905, 1912, 1924, 1925, 1927, 1929	Found in various decaying organic matter, such as rotting vegetables and weeds	Klimaszewski 2000; Majka and Klimaszewski 2008c; Smetana 1995
87. *Philonthus longicornis* Stephens	x	x	x		x?	**MB, ON**; AL, CA, throughout the USA	Cosmopolitan	1887, 1910	1840, 1870, 1889, 1890	Found in rotting organic matter, such as decaying plant debris, compost, grass clippings, animal droppings, and carcasses	Campbell and Smetana 1991; Klimaszewski 2000; Moore and Legner 1975; Smetana 1995

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
88. *Philonthus politus* (Linnaeus)	×	×	×		×	**AB, BC, MB, NT, ON, SK**; throughout the USA	Cosmopolitan	1837, 1879, 1890, 1891, 1900, 1904	1670	Found in various decaying organic matter, such as rotting plant debris, compost, rotting grass piles, decaying mushrooms and animal droppings	Campbell and Davies 1991; Klimaszewski 2000; Majka et al. 2006a; Majka and Klimaszewski 2008a; Smetana 1965, 1995
89. *Philonthus rectangulus* Sharp	×	×	×	×	×	**AB, BC, MB, ON, SK**; throughout the USA	Cosmopolitan	1916, 1917, 1952, 1977, 2006	1908, 1911, 1915-1918,	Found in decaying organic matter, particularly in synanthropic situations; common in dung, compost and rotting plant debris	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a,c; Smetana 1995
90. *Philonthus umbratilis* (Gravenhorst)	×	×	×	×		**AB, BC, MB, ON**; DC, ID, IL, IN, KY, MA, ME, MI, NH, NJ, NY, OH, OR, PA, WA, WI	Palaearctic	1850, 1860, 1926, 1932	1850, 1860, 1877, 1884, 1907, 1932	-	Bain 1999; Campbell and Davies 1991; Klimaszewski 2000; Morris 1983; Smetana 1965, 1995
91. *Philonthus varians* (Paykull)	×	×	×	×	×	**AB, BC, MB, ON, SK**; CA, CT, DE, IA, ID, IL, IN, KS, KY, MA, ME, MI, MN, NC, NH, NY, OH, OR, PA, VT, WA, WI	Palaearctic	1901, 1900-1907, 1931, 1942, 1965, 1974-1983	1899, 1913, 1917, 1927, 1931	Found in decaying organic matter, such as rotting vegetables and weeds, compost, grass clippings, and animal droppings; mainly near human settlements	Campbell and Davies 1991; Klimaszewski 2000; Smetana 1965, 1995

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
92. *Philonthus ventralis* (Gravenhorst)	x					**ON**; AZ, CA, DC, FL, IA, IL, KS, MA, MD, MI, MO, NC, NH, NJ, NV, NY, PA, SC, TN, TX, WA, WV	Cosmopolitan	1907, 1911	1802, 1857, 1889, 1896, 1897	Found regularly on organic debris in wet habitats, such as marshes, edges of streams and lakes and on cow dung	Moore and Legner 1975; Klimaszewski 2000; Smetana 1995
93. *Phloeocharis subtilissima* Mannerheim	.		x			-	Palaearctic	2001	2001	Found in subcortical habitats, under rotten bark, in rotten wood, and in litter consisting of deep layers of decomposing leaves, it may be predaceous in galleries of scolytines	Majka and Klimaszewski 2004
94. *Phyllodrepa floralis* (Paykull)	x		x		x	**AB, BC, MB, ON**; CA, ID, IN, NY, OR, PA, WA	Palaearctic	1963	1860	Found in forest litter	Campbell and Davies 1991; Klimaszewski 2000; Majka et al. 2006a; Moore and Legner 1975
95. *Placusa incompleta* Sjöberg	x	x	x			**BC**; WA	Palaearctic or Holarctic (status undetermined)	1983	1968	Found in conifer and mixed wood stands, on fungi and under bark	Klimaszewski et al. 2001; Majka and Klimaszewski 2008a; Webster et al. 2009a
96. *Placusa tachyporoides* (Walt)	x	x	x			**BC, ON**; CA, MA, MN	Palaearctic or Holarctic (status undetermined)	<1911, <1957, 1977, 1997	<1889, <1890, <1911	Adults found in mixed and hardwood forests, and on tree trunks	Fauvel 1889; Hamilton 1890; Klimaszewski et al. 2001; Majka and Klimaszewski 2008a; Moore and Legner 1975

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
97. *Quedius cinctus* (Paykull)		×				MA, NJ, NY, WA	Palaearctic	2007	1942	Synanthropic species, found on carrion, decomposing plant material, such as compost, often near human settlements	Majka et al. 2009b; Smetana 1971, 1990a
98. *Quedius cruentatus* (Olivier)	×					MA, ME, MI, NJ, NY, OH, PA	Palaearctic	2006	1983	-	Gusarov 2001; Hoebeke 2008
99. *Quedius curtipennis* Bernhauer		×	×			**BC**; NH, OR, WA	Palaearctic	1949, 1954, 1984, 2002	1934	Found in leaf litter near ponds, near human settlements, under debris and in compost	Campbell and Davies 1991; Majka and Smetana 2007; Majka and Klimaszewski 2008a; Majka et al. 2009b; Smetana 1965, 1971, 1978, 1990a
100. *Quedius fuliginosus* (Gravenhorst)			×				Palaearctic	<1957, 1996	1996	-	Hatch 1957; Majka and Smetana 2007; Majka and Klimaszewski 2008a; Majka et al. 2009b
101. *Quedius mesomelinus* (Marsham)	×	×	×		×	**AB, BC, ON, MB**; AK, CA, CO, CT, FL, GA, IA, IL, IN, MA, ME, MI, MO, MT, NC, NH, NJ, NV, NY, OH, OR, PA, UT, VA, WI, WV	Cosmopolitan	1620, 1621-1673, ~1713, 1850, 1904, 1909, 1916, 1927	1670, 1886	Synanthropic, in cellars, stables, barns, storehouses, in various debris and decaying organic matter e.g., compost, mushrooms, on trees	Bain 1999; Bain and Prévost 2010; Bain et al. 2009; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Majka and Smetana 2007; Majka et al. 2009b; Smetana 1965, 1971
102. *Quedius molochinus* (Gravenhorst)	×		×	×	×		Palaearctic	1949, 1969, 2002, 2006	1949, 1969, 1970	Found on land affected by cultivation	Campbell and Davies 1991; Klimaszewski 2000; Majka 2007c; Majka and Klimaszewski 2008a; Majka et al. 2009b; Smetana 1971, 1973, 1976, 1981a, 1990a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
103. *Rugilus angustatus* Geoffroy [previously cited as *R. fragilis* (Gravenhorst)]	x		x			**ON**; ME, NY	Palaearctic	1950, 1984	1950	In decaying organic matter along banks of watercourses, in meadows, and forest borders	Campbell and Davies 1991; Hoebeke 1995b; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 2004
104. *Rugilus rufipes* Germar	x					ON; WA	Palaearctic	1971	-	In decaying organic matter, compost heaps, leaves in both dry and wet habitats	Bousquet 1991; Campbell and Davies 1991; Hoebeke 1995b; Moore and Legner 1975
105. *Sepedophilus littoreus* (Linnaeus)	x	x	x		x	**AB, BC, MB, ON, SK**; broadly distributed in eastern and central USA	Palaearctic	<1957, <1901 (CNC), 1965,	1866, 1877, 1895, 1957	In moldy wood chips, decaying mushrooms, inside beaver houses and in decaying seaweeds	Campbell and Davies 1991; Campbell 1976; Klimaszewski 2000
106. *Sepedophilus marshami* (Stephens)	x	x	x			**ON**?	Palaearctic	1959, 1962, 1965, 1974	1959	Adults found under bark, on bracket fungi, decaying logs, forest leaf litter, moss, grass, often near streams	Campbell 1976; Campbell and Davies 1991; Hoebeke and Wheeler 1983; Klimaszewski 2000; Majka and Klimaszewski 2008a
107. *Sepedophilus testaceus* (Fabricius)	x	x	x		x	**AB, ON, SK**; AR, CT, IA, IL, IN, MA, MD, ME, MI, MO, MT, NE, NH, NJ, NY, OH, PA, VT, WI	Palaearctic	1894 (CNC), <1976, 1929	1844, 1910, 1959, 1962, 1965, 1974	In rotting logs, under loose bark of deciduous trees, in decaying organic matter, on fungi, and in beaver houses	Campbell 1976; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
108. *Stenus clavicornis* (Scopoli)	x	x	x	x		ME, NH	Palaearctic	1968, 1990, 2007	1968	In open and forested areas, marshes, moist places, under stones, fallen leaves and other plant debris, mosses and forest litter	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a
109. *Stenus lustrator* Erichson	x	x				-	Palaearctic	1975	-	Riparian habitats	Campbell and Davies 1991; Klimaszewski 2000
110. *Sunius melanocephalus* (Fabricius)	x					NY	Palaearctic	<1991	1924	In damp litter, under bark	Campbell and Davies 1991; Hoebeke 1991; Klimaszewski 2000
111. *Tachinus corticinus* Gravenhorst	x	x	x	x		**ON**	Palaearctic	1967, 1991, 2004	1967, 1970, 1972	In mixed and deciduous forests, under fallen leaves, in mosses, compost and rotting organic matter	Campbell 1975, 1988; Hoebeke and Wheeler 1983; Majka and Klimaszewski 2008a
112. *Tachinus rufipes* (Linnaeus)	x	x	x	x	x	**BC, ON**; ME	Palaearctic	1949, 1951, 1965, 1966	1949, 1951, 1965, 1966, 1983	Adults found in plant debris, leaf litter and rotting mushrooms	Brown 1967; Campbell 1973, 1988; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a
113. *Tachyporus dispar* (Paykull)	x	x	x	x	x	**BC, ON**; MA, OR, PA, RI, WA	Palaearctic	1943, 1947, 1949, 1951, 1953, 1964	1928, 1954, 1948	Adults found in decaying leaf litter, compost, moss, and floating debris	Brown 1967; Campbell 1979b; Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a
114. *Tachyporus nitidulus* (Fabricius)	x	x	x	x	x	**AB, BC, ON, MB, NT, SK, YK**; throughout the USA	Palaearctic	1898 (CNC), 1997, 1999	<1834	Found under rotting debris, compost, fallen leaves, moss, mushrooms and mammal nests	Campbell 1979b; Campbell and Davies 1991; Majka and Klimaszewski 2008a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
115. *Tachyporus transversalis* Gravenhorst	x					**ON**; IL, NY	Palaearctic	1963	-	Hygrophilous, found in marshes and bogs, in moss and debris	Campbell 1979b; Campbell and Davies 1991; Klimaszewski 2000
116. *Tasgius ater* (Gravenhorst)	x	x	x	x	x	**BC, ON**; CA, CT, ID, IN, LA, MA, ME, NE, NH, NJ, NY, OR, PA, RI, WA	Palaearctic	1913, 1949, 1990	1802	Mostly synanthropic, in various habitats near human settlements, less frequently in free nature	Campbell and Davies 1991; Downie and Arnett 1996; Klimaszewski 2000; Majka and Klimaszewski 2008a; Newton 1987; Smetana 1965
117. *Tasgius melanarius* (Heer) [often misidentified as *Ocypus globulifer* Fourc, in NA records]	x	x	x			**ON**; CT, MA, WA	Palaearctic	1935, 1991, 1999	1935	Mostly synanthropic, in various habitats near human settlements, less frequently in free nature such as debris along seashores	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Newton 1987
118. *Tinotus morion* (Gravenhorst)	x	x	x			**BC, ON; AB**; CT, NV	Palaearctic	1929, 1997, 1999	1929	Found on feces, animal carcasses and on decaying fungi	Gouix and Klimaszewski 2007; Klimaszewski et al. 2002a; Majka and Klimaszewski 2008a; Moore and Legner 1975
119. *Trichophya pilicornis* (Gyllenhal)	x	x	x		x	**AB, BC, ON**; CO, MN, MO, NY, VA, WA	Palaearctic	<1975, 1983, 1999	1897	Found in leaf litter, debris near streams, in fungi and caves	Campbell and Davies 1991; Klimaszewski 2000; Klimaszewski et al. 2005; Majka and Klimaszewski 2008a; Moore and Legner 1975

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
120. *Xantholinus linearis* (Olivier)		x	x	x	x	**BC**; CA, ID, MA, NH, NV, NY, OR, PA, RI, UT, WA	Palaearctic	1930, 1949, 2002, 2003	1930, 1931, 1976, 1979, 1984	Found in decaying organic matter such as compost, decaying vegetation, leaf litter, on low vegetation, and on dung	Campbell and Davies 1991; Klimaszewski 2000; Majka and Klimaszewski 2008a; Smetana 1982, 1988a, 1990b

Series Scarabaeiformia

Superfamily Scarabaeoidea Latreille, 1802

7. Family **Geotrupidae** Latreille, 1802 [the earth-boring scarab beetles]

(Fig. 82, Table 8)

Length 5.0-45.0 mm. Tarsal formula 5-5-5

Diagnosis. Body oval to round, yellow, brown, reddish or black, sometimes with metallic reflections. Head not deflexed; antennae with 11 antennomeres, last three forming tomentose club; eyes partially or completely divided by canthus. Pronotum convex, at base at least as wide as elytral base, with or without tubercles, horns, ridges or sulci. Elytra entire, convex with or without striae, pygidium concealed, scutellum large and triangular. Abdomen with 6 free ventrites. Legs with coxae transverse, protibiae with serration on outer margin, apex with one spur.

Bionomics. Diverse food habits, from saprophagous, coprophagous to mycetophagous, some adults do not feed (Jameson 2002). Most adults live secretive in their burrows. Larvae feed on dead leaves, decaying fungi, and dung or humus. Some geotrupid burrows may cause damage to lawns (Jameson 2002).

Faunal Composition. One species in genus *Geotrupes*.

Selected References. Brown 1940a, Jameson 2002, McNamara 1991a.

Table 8. Adventive species of Geotrupidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NF	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Geotrupes stercorarius* (Linnaeus)	x	x		x	x	ME	Palaearctic?	1915	1915	Decaying organic matter, often under cow dung	Brown 1940a; McNamara 1991a

8. Family **Scarabaeidae** Latreille, 1802 [the scarab beetles]

(Figs. 83-87, Table 9)

Length 2.0-50 mm. Tarsal formula 5-5-5

Diagnosis. Stout-bodied beetles, oval or elongate, varying greatly in form and size; usually brown or black, but occasionally brightly coloured; antennae 8-11-articled with club, not elbowed, club usually with 3, 4, or 5 antennomeres, lamellate antennomeres appearing as elongate or oval lobes, articles of club capable of being held tightly together to form a compact and asymmetrical club. Legs modified for digging with teeth, spines and bristles; abdomen with 6 ventrites.

Bionomics. Many species are important pests because of the damage to plants done by larvae and adults.

Faunal Composition. 21 species in 20 genera, spread across genera. Most genera derived from the former genus *Aphodius* (*sensu lato*).

Selected References. Brown 1940a, 1950, 1967, CFIA 2004, Chantal 2003, Clausen 1978, Gordon 1983, Gordon and Cartwright 1988, Gordon and Skelley 2007, Hoebeke and Beucke 1997, LeConte 1883; Majka and Klimaszewski 2004, Mattson et al. 1994, McNamara 1991a, Westcott et al. 2006.

Table 9. Adventive species of Scarabaeidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Acrossus rufipes* (Linnaeus)	×					**ON**	Palaearctic	-	-	In decaying organic matter	Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
2. *Aegialia arenaria* (Fabricius)			×			MA, NH	Palaearctic	1966	1927	In coastal decaying organic matter	Gordon and Cartwright 1988; McNamara 1991a
3. *Aegialia rufa* (Fabricius)	×		×		×	**ON**; MA, MI, PA	Palaearctic	1949	1949	In coastal decaying organic matter	Gordon and Cartwright 1988; McNamara 1991a
4. *Amphimallon majalis* (Razoumowsky)	×					**BC, ON**; CT, MA, ME, NY, RI, VT	Palaearctic	1989, 2001	1940	Turf pest	Clausen 1978; McNamara 1991a
5. *Aphodius fimetarius* (Linnaeus)	×	×	×	×	×	**AB, BC, MB, ON, NT, SK**; FL, GA, IL, IN, MA, MD, ME, MI, MN, MO, NH, PA, RI, VA, WI	Palaearctic	1859	1835, 1838	In decaying organic matter	Brown 1940a; Gordon 1983; Gordon and Skelley 2007; LeConte 1883; McNamara 1991a; Morris 1983
6. *Calamosternus granarius* (Linnaeus)	×	×	×			**AB, BC, MA, MB, ON, SK**; NH, RI, VT	Palaearctic	-	1650-1700	In decaying organic matter	Bain 1998; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
7. *Chilothorax distinctus* (Müller)	×		×			**AB, BC, MB, ON, SK**; CO, ID, IN, ME, MT, NH, NV, NY, OR, RI, WA	Palaearctic	-	-	In decaying organic matter	Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
8. *Colobopterus erraticus* (Linnaeus)	×	×	×		×	**MB, ON**; IN, MD, ME, MI, NH, NY, PA, RI	Palaearctic	1897, 1869	1844	In decaying organic matter	Brown 1940a; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
9. *Eupleurus subterraneus* (Linnaeus)	×	×	×			**ON**; ME	Palaearctic	1922	1922	In decaying organic matter	Brown 1940a; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
10. *Maladera castanea* (Arrow)	×					CT, DE, GA, MA, MD, MI, NC, NY, PA, RI, SC, VA, VT, WV	Palaearctic	1996	1921	Defoliates young trees	Chantal 2003; Mattson et al. 1994

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
11. *Melinopterus prodromus* (Brahm)	x	x	x			**BC, MB, ON, SK**; ME	Palaearctic	1887	1878	In deacaying organic matter	Brown 1940a, 1950; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
12. *Onthophagus nuchicornis* (Linnaeus)	x	x	x		x	**AB, BC, MB, ON**; IN, MD, MT, NH, NY, PA, RI, VA, WA, WI	Palaearctic	1897	1844	In animal droppings	Brown 1940a, 1950; Hoebeke and Beucke 1997; McNamara 1991a; Westcott et al. 2006
13. *Otophorus haemorrhoidalis* (Linnaeus)	x	x	x		x	**AB, BC, MB, ON, SK**; ID, IN, MA, ME, MT, NH, NJ, NY, OR, RI, WA	Palaearctic	1925	1915	In decaying organic matter	Brown 1940a, 1967; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a
14. *Oxyomus silvestris* (Scopoli)	x					**BC**; NY, OR, PA, WA	Palaearctic	-	1871	-	Hatch 1971; McNamara 1991a; Westcott et al. 2006
15. *Pleurophorus caesus* (Creutzer)	x					**BC, ON**; widely distributed in the USA	Palaearctic	-	-	-	McNamara 1991a
16. *Popillia japonica* Newman	x		x			**ON**; eastern USA, areas in AR, IA, MO	Palaearctic	1928 or 1929, 1939, 1945	1916	Serious defoliator of a wide variety of plants (ornamentals, turf, field crops, fruits, vegetables)	CFIA 2004; Clausen 1978; Majka and Klimaszewski 2004; Mattson et al. 1994; McNamara 1991a
17. *Psammodius pierottii* Pittino	x					Northeastern USA	Palaearctic	-	-	-	McNamara 1991a
18. *Rhysothorax rufa* (Fabricius)	x		x		x	**ON**	Palaearctic	-	-	-	McNamara 1991a
19. *Rhyssemus germanus* (Linnaeus)	x					**ON**; Eastern US and OR	Palaearctic	1925, 1927	-	-	Brown 1950; McNamara 1991a Westcott et al. 2006
20. *Teuchestes fossor* (Linnaeus)	x	x	x	x	x	**AB, BC, MB, ON, SK**; AK, IA, IN, MA, ME, MI, MT, NH, NY, OR, PA, RI, WA	Palaearctic	1858	1858	In decaying organic matter	Brown 1940a; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
21. *Trichonotulus scrofa* (Fabricius)	x	x			x	NJ, NY, PA	Palaearctic	1928	1928	In decaying organic matter	Brown 1940a; Gordon 1983; Gordon and Skelley 2007; McNamara 1991a

Series Elateriformia

Superfamily Scirtoidea Fleming, 1821

9. Family **Eucinetidae** Lacordaire, 1857 [the plate-thigh beetles]

(Fig. 88, Table 10)

Length 3.0-9.0 mm. Tarsal formula 5-5-5

Diagnosis. Usually soft-bodied, small beetles, body streamlined, elliptical, uniformly brownish or black, with fine decumbent pubescence; head deflexed, concealed from above and resting against procoxae; antennae often serrate; prothorax reduced; elytra tapering posteriad, often with fine cross-striations and longitudinally impressed lines; procoxae projecting, their cavities open behind; metacoxae expanded, with oblique metacoxal plates enlarged and partly concealing 1st ventrite. Adults are capable of jumping using their modified hind legs.

Bionomics. Adults are found on flowers, foliage in moist shady places, under bark, in fungi, in rotten debris; larvae live in the ground. Both adults and larvae are probably predaceous.

Faunal Composition. One species in genus *Eucinetus*.

Selected References. Campbell 1991b.

Table 10. Adventive species of Eucinetidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Eucinetus haemorrhoidalis* (Germar)	x	x	x			**AB, BC, MB, NT, ON, SK**	Palaearctic or Holarctic (status undetermined)	-	-	On fungi	Campbell 1991b

10. Family **Clambidae** Fischer von Waldheim, 1821 [the minute beetles or fringe-winged beetles]

(Fig. 89, Table 11)

Length 0.8-1.4 mm. Tarsal formula 4-4-4

Diagnosis. Body minute, globular, capable of partially rolling into a ball, strongly glossy, with sparse and indistinct pubescence; head large and strongly deflexed, as broad as ¾ of maximum pronotal width; eyes simple or divided by a genal canthus into dorsal and ventral halves; antennae with 10 antennomeres, and with 2 antennomeres in club; scutellum, large, triangular; procoxae projecting, their cavities open; metacoxae with expanded plates concealing first ventrite; legs short and slender.

Bionomics. Most species live in decaying vegetable matter, and some in ant nests.

Faunal Composition. Three species in genus *Clambus*.

Selected References. Campbell 1991c, Majka and Langor 2009.

Table 11. Adventive species of Clambidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Clambus armadillo armadillo* (DeGeer)	x	x			x	**ON**; IN, NY, PA, WA	Palaearctic	1928 (CNC)	1928	On fungi	Campbell 1991c; Majka and Langor 2009
2. *Clambus gibbulus* (LeConte)	x					**AB, BC, MB, ON**; CA, DC, FL, GA, MA, ME, MI, MN, NC, OR, PA, TN, WI, WY	Palaearctic?	-	<1850	On fungi	Campbell 1991c; Majka and Langor 2009
3. *Clambus pubescens* Redtenbacher	x				x	**AB, BC, MB, ON, SK**; DC, IL, IN, MA, PA	Palaearctic	1921	<1863	On fungi	Majka and Langor 2009

Superfamily Buprestoidea Leach, 1815

11. Family **Buprestidae** Leach, 1815 [the metallic wood-boring beetles]

(Fig. 90, Table 12)

Length 3.0-20 mm. Tarsal formula 5-5-5

Diagnosis. Body hard, usually bullet-shaped, parallel-sided, elongate or oval, pointed at elytral tip; metallic green, bronze or black; strongly glossy; head strongly deflexed and deeply inserted into prothorax; prothorax closely applied to elytra; antennae short, serrate or thread-like, rarely pectinate; procoxae globose, their cavities open; mesosternum with a large cavity for reception of prosternal process; first two abdominal ventrites strongly connate, the suture between them vaguely defined. Tarsal articles 1-4 lobed below.

Bionomics. Buprestid larvae generally bore under bark, in wood, in roots of trees and shrubs, or occur in leaves, and attack living, dying or dead plants. The larvae are often called flat-headed borers and some are serious pests in orchards, of ornamental plants, and of forest trees. Adults feed on foliage and bark, or are attracted to flowers.

Faunal Composition. Three species in the genus *Agrilus*, one species not officially recorded.

Selected References. Bellamy and Westcott 2003, Bright 1987, Maier 2005, Mattson et al. 1994, Nelson and MacRae 1990, Nelson et al. 1981, Poland and McCullough 2006

Table 12. Adventive species of Buprestidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Agrilus cuprescens* (Ménétries)	x	x	x			**ON, SK**; CT, CO, IA, IL, IN, MA, ME, MI, MO, NH, ND, NE, NJ, NY, PA, VT, WV	Palaearctic	1927	1914, 1923	-	Bellamy and Westcott 2003; Bright 1987; Jendek and Grebennikov 2009; Mattson et al. 1994; Nelson and MacRae 1990; Nelson et al. 1981
2. *Agrilus cyanescens* (Ratzeburg)	x					**ON**; CO, CT, IL, IN, MA, ME, MI, NH, OH, PA, RI, UT, VA, WV, WI	Palaearctic	1927	1920, 1921	-	Bright 1987; Maier 2005; Mattson et al. 1994; Nelson et al. 1981, 1996
3. *Agrilus planipennis* Fairmaire	x					**ON**; IL, IN, MI, OH	Palaearctic	2002	2002	Attacks and kills ash trees	Haack et al. 2002; Lavallée et al. 2009; Poland and McCullough 2006; Emerald Ash Borer. 2010.; Emerald Ash Borer (*Agrilus planipennis*) 2010

Superfamily Byrrhoidea Latreille, 1804

12. Family **Byrrhidae** Latreille, 1804 [the pill beetles]

(Fig. 91, 92, Table 13)

Length 1.2-10 mm. Tarsal formula 4-4-4 or 5-5-5

Diagnosis. Body oval, strongly convex, pill-shaped, with strongly deflexed head nearly concealed from above; dorsal surface usually glabrous and strongly glossy, rarely dull and pubescent with patches of hairs and bristles; black, brown, or greyish, sometimes metallic green; antennae 10 or 11-articled, and often weakly clubbed; elytra often pointed posteriad; prosternum with a broad process fitting into cavity of mesosternum; procoxae transverse with cavities open; legs often retractable into cavities of mesosternum; tarsal article 3 bearing an anteriorly directed membranous appendage below.

Bionomics. Adults and larvae are plant feeders. Adults are found under logs and other objects on the ground, often occur in sandy places or are associated with mosses; larvae live in moist soil, sand, mosses and under logs.

Faunal Composition. Two species in two genera, *Chaetophora* and *Simplocaria*.

Selected References. Brown 1967, Johnson 1990b, 1991, Leng 1917, Majka et al. 2006c, 2007g.

Table 13. Adventive species of Byrrhidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Chaetophora spinosa* (Rossi)	x	x	x	x		**BC, ON**; OH north to southern ON and QC, across NY and north to southern ME; ID-BC border, CT	Palaearctic	1961, 1990, 2007	1917	-	Johnson 1990b, 1991; Leng 1917; Majka et al. 2006c, 2007g
2. *Simplocaria semistriata* (Fabricius)	x		x	x	x	**BC, ON**; south to MD and OH, MN	Palaearctic	1913, 1957	1913, 1957	-	Brown 1967; Johnson 1990b, 1991; Majka et al. 2006c

13. Family **Dryopidae** Billberg, 1820 [the long-toed beetles]

(Fig. 93, Table 14)

Length 3.0-5.0 mm. Tarsal formula 5-5-5

Diagnosis. Body oval or elongate-oval, bluntly triangular posteriad; brown, black or dull gray, glossy, usually covered with long decumbant pubescence; antennae short, with a comb-like asymmetrical club consisting of 7 articles; front coxae transverse with open cavities; prosternal process broadly and deeply received into mesosternum; legs usually long, well developed with strong claws, last article enlarged and often as long as 3 or all remaining articles.

Bionomics. Adults usually occur on partly submerged sticks and stones in moving water or riffle area of streams. Some adults are terrestrial and phytophagous.

Faunal Composition. One species in the genus *Dryops*.

Selected References. Chantal 1972, LeSage 1991a.

Table 14. Adventive species of Dryopidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Dryops viennensis* (Laporte)	x					-	-	1962	1962	On/under cobblestones along rivers	Chantal 1972; LeSage 1991a; Webster pers. comm.

Superfamily Elateroidea Leach, 1815

14. Family **Elateridae** Leach, 1815 [the click beetles]

(Figs. 94, 95, Table 15)

Length 3.0-45 mm. Tarsal formula 5-5-5

Diagnosis. Body elongate-narrow, usually parallel-sided, cylindrical to flattened, posterior corners of pronotum with hind angles acutely produced posteriad; integument pubescent or glabrous and often glossy; labrum sclerotized, visible and free, and clypeus not distinct; antennae 11-articled, near but not between eyes, usually serrate, thread-like or comb-like, never clubbed; prosternum with an elongate lobe extending posteriad into a mesosternal depression (click mechanism); prothorax loosely joining mesothorax and capable of rapid movement on basal joint, which produces a jumping movement; procoxae globose, their cavities open behind; tarsi simple, sometimes with setal brushes or membranous appendages; abdomen with 5-6 ventrites, all usually well separated, the last two connected by a membranous suture.

Bionomics. Adults occur on foliage, flowers, under bark, in rotting wood or organic litter, and larvae (wireworms) are hard-bodied, feeding on plant (roots, seeds) or animal materials, and are found in rotten wood or soil; some are predaceous but most feed on roots or seeds. Some larvae are injurious to agricultural crops.

Faunal Composition. Five species in three genera, most in genus *Agriotes* (3).

Selected References. Becker 1956, Bousquet 1991b, Brown 1940a, Eidt 1953, Majka and Johnson 2008, MacNay 1952a,b, 1954a-c, Quate and Thompson 1967, Vernon and Pats 1997.

Table 15. Adventive species of Elateridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Agriotes obscurus* (Linnaeus)			×		×	**BC**; ME	Palaearctic	1859, 1895-1900, June 1922, 1923	1859, 1895-1900, June 1922, 1923	Damages crops	Becker 1956; Brown 1940a; Eidt 1953; MacNay 1952a,b, 1954a-c; Majka and Johnson 2008; Vernon and Pats 1997
2. *Agriotes sputator* (Linnaeus)		×	×	×		-	Palaearctic	1939, 1949, 1997	1939, 1949	Damages crops	Becker 1956; Bousquet 1991b; Brown 1940a; Eidt 1953; Majka and Johnson 2008
3. *Agriotes lineatus* (Linnaeus)			×	×	×	**BC**	Palaearctic	1840, 1947, 1949	1840	Damages cereal and vegetable crops, ornamental plants, young trees	Bousquet 1991b; Becker 1956; Eidt 1953; Majka and Johnson 2008;Vernon and Pats 1997
4. *Athous campyloides* Newman	×		×	×		MA	Palaearctic	1865, 1927, 1958	1865	-	Bousquet 1991b; Majka and Johnson 2008
5. *Melanotus castanipes* (Paykull)	×	×	×	×	×	**MB, ON**; AZ, CO, IL, MA, ME, MI, MN, NH, NM, NY, NC, OH, PA, RI, UT, WI	Holarctic with some Palaearctic populations	1892	<1846	-	Bousquet 1991b; Quate and Thompson 1967

15. Family **Lampyridae** Latreille, 1817 [the fireflies, lightningbugs, glowworms]

(Fig. 96, Table 16)

Length 5-20 mm. Tarsal formula 5-5-5

Diagnosis. Body soft, flattened, loosely formed, similar to Cantharidae; usually brown or black, frequently with yellow or orange markings; head concealed from above by pronotum; light organs often present on 2nd or 3rd sternites in one or both sexes.

Bionomics. Adults are found on vegetation, foliage of trees shrubs usually in wooded areas; larvae live under bark, on the ground, and in swampy places, they feed on other invertebrates including snails. All larvae and most adults are luminescent.

Faunal Composition. One species in the genus *Phosphaenus*.

Selected References. Brown 1950, Majka and MacIvor 2009b, McNamara 1991b.

Table 16. Adventive species of Lampyridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Phosphaenus hemipterus* (Goeze)	x		x			-	Europe	1947, 1989	1947	Forested habitats	Brown 1950; Majka and MacIvor 2009b; McNamara 1991b

16. Family **Cantharidae** Imhoff, 1856 [the soldier beetles]

(Figs. 97, 98, Table 17)

Length 1.0-15 mm. Tarsal formula 5-5-5

Diagnosis. Body soft, elongate, parallel-sided or narrowly oval, brown or black, often with yellow or orange markings; head large, deflexed but only partially concealed from above, eyes protruding; labrum membranous and inconspicuous; antennae filiform or serrate, their insertions well separated; elytra narrowly oval, usually subparallel, loosely covering abdomen or shortened exposing terminal tergites; procoxae projecting, their cavities open; legs long and slender; tarsal article 4 bilobed.

Bionomics. Adults are frequently found on flowers or foliage, many feed on pollen or nectar; larvae live under bark or on the ground and feed on other insects.

Faunal Composition. Two species in two genera, *Cantharis* and *Rhagonycha*.

Selected References. Brown 1940c, 1950, McNamara 1991c, Ramsdale 2002

Table 17. Adventive species of Cantharidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Cantharis rufa* Linnaeus	x	x	x	x	x	**ON**; ME, NH, NY, VT, WI	Palaearctic	1950	1950	On plants in open fields	Brown 1950; McNamara 1991c; Ramsdale 2002
2. *Rhagonycha fulva* (Scopoli)	x					**BC**	Palaearctic	1948	1948	On plants in open fields	Brown 1950; McNamara 1991c; Ramsdale 2002

Series Derodontiformia

Superfamily Derodontoidea LeConte, 1861

17. Family **Derodontidae** LeConte, 1861 [the tooth-necked fungus beetles]

(Fig. 99, Table 18)

Length 2.0-3.2 mm. Tarsal formula 5-5-5

Diagnosis. Body elongate, approximately oval, dorsally convex and ventrally flattened, brown or black, sometimes mottled, moderately glossy, with inconspicuous pubescence; head with paired ocelli and usually with elaborate depressions; antennae 11-articled, the basal two articles enlarged, last three articles forming a club; eyes protruding and coarsely faceted; pronotum with lateral margins strongly toothed or broadly flattened and reflexed upward; elytra broadly oval with rows of striae bearing punctures; procoxae projecting with cavities usually closed; metacoxae transverse and with well-developed plates.

Bionomics. Adults and larvae usually occur together in shelf fungi, under bark, and in slime molds. Some species are predators on other insects. *Laricobius erichsoni* Rosenhauer was intentionally introduced into North America for biocontrol of *Adelges piceae* (Ratzeburg) (Hemiptera) (Leschen 2002a).

Faunal Composition. One species in the genus *Laricobius*.

Selected References. Bright 1991a, Bryant 1963, Clark et al. 1971, Clark and Brown 1958, Clausen 1978, Dowden 1962, Humble 1994, Leschen 2002a, Majka 2007a, McGugan and Coppel 1962, Mitchell and Wright 1967, Schooley et al. 1984.

Table 18. Adventive species of Derodontidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Laricobius erichsoni* Rosenhauer		x	x		x	**BC**; NH, OR, VT, WA	Palaearctic	1951, 1954, 1955	1951-1955, 1958-1969	Feeds on *Adelges piceae* on balsam fir	Bright 1991a; Bryant 1963; Clark et al. 1971; Clark and Brown 1958; Clausen 1978; Dowden 1962; Humble 1994; Majka 2007a; McGugan and Coppel 1962; Schooley et al. 1984

Series Bostrichiformia

Superfamily Bostrichoidea Latreille, 1802

18. Family **Dermestidae** Latreille, 1804 [the skin and larder beetles]

(Figs. 100-105, Table 19)

Length 1.0-12 mm. Tarsal formula 5-5-5

Diagnosis. Body compact, oblong or broadly oval, usually brown to black, often covered with scales or clothed with short or long, erect or decumbent hair, sometimes patterned; head deflexed and more or less concealed from above, usually with median ocellus; antennae filiform or pectinate, short and clubbed, the club usually 3-articled but sometimes 4-8-articled, antennae often fitting into grooves below sides of pronotum; pronotum transverse, narrower than elytra, sometimes strongly convex medioapically, usually with sharp lateral margins; procoxae transverse or globose and often projecting, their cavities open; metacoxae usually excavated for reception of femora; tarsal articles simple.

Bionomics. Adults of some species occur on flowers where they feed on pollen and nectar. Larvae of most species are scavengers, feeding on dried plant and animal material, including upholstery, fur coats, rugs and carpets, mounted birds and mammals, museum specimens of plants and insects, cereal products, grains, and various stored food products (Kingsolver 2002). A number of species occur in bee and wasp nests, where they feed on old pollen stores or dead insect remains, but a few species feed on the larvae. Some species are known from bird and mammal nests where they feed on old feathers, hairs and other organic debris (Kingsolver 2002). Many species are serious pests and most of the damage is done by the larvae. Larvae are sub-cylindrical, brownish and densely clothed with long hairs.

Faunal Composition. 16 species in five genera, most in *Anthrenus* (4), *Attagenus* (4), and *Dermestes* (5).

Selected References. Beal 2003, Becker 1977, Bousquet 1990a, 1991c, Coulson et al. 1986, Kingsolver 2002a, MacNay 1954a-c, Majka 2007a, Westcott et al. 2006.

Table 19. Adventive species of Dermestidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NF	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
1. *Anthrenus fuscus* Olivier	×		×	×		**ON**; CO, GA, MI, MT, NH, NJ, NY, OH, VT, WV	Palaearctic	1961, 1993	1907	House pest, found in insect collections	Beal 2003; Becker 1977; Bousquet 1990a, 1991c; Majka 2007a
2. *Anthrenus museorum* (Linnaeus)	×		×	×	×	**ON**; CT, MA, ME, RI, WI	Cosmopolitan	1938, 1996	-	On/in woollens, furs, insect collections; egg predator of *Lymantria dispar* (L.)	Beal 2003; Bousquet 1990a, 1991c; Majka 2007a
3. *Anthrenus scrophulariae* (Linnaeus)	×	×	×			**BC, ON**; CO, CT, IA, IN, KS, MA, ME, MI, MN, MO, NC, NE, NH, NJ, NY, OH, OR, RI, UT, WI, WV	Palaearctic	1928, 1948, 1971	1855	House pest, found on/in dried plants, flour, dried proteinaceous materials	Beal 2003; Bousquet 1990a, 1991c; Majka 2007a
4. *Anthrenus verbasci* (Linnaeus)	×	×	×	×		**AB, BC, MB, ON**; through-out the USA and Canada	Palaearctic	1948	1850	On/in dried stored products of animal origin, insect collections, alfalfa leafcutting bee; egg predator of *L. dispar*	Beal 2003; Bousquet 1990a, 1991c; Coulson et al. 1986; Majka 2007a
5. *Attagenus brunneus* Faldermann	×					**ON**; throughout the USA	Palaearctic	-	Before 1900	House pest, in dried milk factories and peanut storage areas	Beal 1970, 2003; Bousquet 1991c; Westcott et al. 2006
6. *Attagenus pellio* (Linnaeus)	×	×	×			**BC, ON**; KY, MA, ME, NH, RI	Cosmopolitan	1827, 2003	1827	House pest	Beal 1970, 2003; Bousquet 1990a, 1991c; Majka 2007a

Taxon	QC	NB	NS	PE	NF	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
7. *Attagenus unicolor japonicus* Reitter	×	×	×	×	×	**BC, MB, ON, SK**; ID, MI, MT, ND, NV, OR, SD, UT, WA, WY	Cosmopolitan	1870, 1901, 1950, 1960	1870	House pest, on/ in grain and seed storage, flour mills, in nests of the alfalfa leafcutting bee	Bain 1999; Beal 2003; Bousquet 1990a, 1991c; Majka 2007a
8. *Attagenus unicolor unicolor* (Brahm)	×		×	×	×	**BC, MB, ON, SK**; throughout the USA	Cosmopolitan	1922	<1825	House pest, on/in grain, seed, peanut and dried fruit storage and insect remains	Beal 1970, 2003; Bousquet 1990a, 1991c; Majka 2007a
9. *Dermestes ater* DeGeer	×					**Coast to coast in Canada**; CA, CO, CT, FL, GA, LA, MD, MI, NE, NH, OK, PA, SC, WI	Cosmopolitan	1947	1933	House pest, in dried mushrooms, cheese, dried fish, and other materials of animal origin	Beal 2003; Bousquet 1991c; Majka 2007a
10. *Dermestes frischii* Kugelann	×		×			**BC, ON**; throughout the USA	Cosmopolitan	1926	1919	Pest on dried fish, mills, beehives	Beal 2003; Bousquet 1991c; Majka 2007a
11. *Dermestes lardarius* Linnaeus	×	×	×	×	×	**AB, BC, MB, NT, ON, SK**; throughout the USA	Cosmopolitan	1827, 1876, 1970	~1670	House pest, in dried meats and fish, cheese, poultry, beehives, animal materials (dry or decomposing); predator on eggs of *L. dispar*	Beal 2003; Bousquet 1991c; Majka 2007a
12. *Dermestes maculatus* DeGeer	×		×	×		**AB, BC, MB, ON, SK**; throughout the USA	Cosmopolitan	-	<1916, 1975, 1982,	House pest, in association with baled skins and other products of animal origin	Beal 2003; Bousquet 1991c; Majka 2007a

Taxon	QC	NB	NS	PE	NF	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
13. *Dermestes undulatus* Brahm			x			**ON**; CO, DE, MA, NH, NJ, WV	Palaearctic	<1837, 2002	1827	-	Beal 2003; Majka 2007a
14. *Thylodrias contractus* Motschulsky	x		x			**AB, MB, NT, ON**; MA, RI	Palaearctic	1930, 1978	1902	House pest, found in grocery stores, meat markets, insect collections	Beal 2003; Bousquet 1991c; MacNay 1954a-c; Majka 2007a
15. *Trogoderma glabrum* (Herbst)	x					**AB, ON**; throughout the USA	Palaearctic	1948	-	In stored grains and dry proteinaeous materials including fish meal and dried milk; parasitized by *Mattesia trogodermae* Canning	Beal 2003; Bousquet 1991c; Majka 2007a
16. *Trogoderma variabile* Baillon				x		**AB, SK, ON**; throughout the USA	Palaearctic	1940	1935	Economically serious pest of stored products in US; found in animal feeds, cereals, dried milk, and other dried proteinaceous materials, museum specimens	Beal 2003; Bousquet 1991c; Majka 2007a

19. Family **Bostrichidae** Latreille, 1802 [the bostrichid beetles or the horned powder-post beetles]

(Fig. 106, Table 20)

Length 1.5-7.0 mm. Tarsal formula 5-5-5

Diagnosis. Body broadly to narrowly cylindrical, or depressed, black, various shades of yellow and red-brown; pubescence absent or sparse to dense or patchy and fine to scale-like; head decumbant and nearly or completely concealed from above; antennae with 2-, 3- or 4-articled loose club, rarely antennal club consisting of lamellate articles; pronotum usually tuberculate or with rasp-like teeth anteriorly; elytra subparallel, broader than pronotum and with distinct humeri; tarsi with elongate basal article, usually as long as the two following combined.

Bionomics. Larvae of most species are wood borers, attacking living trees, dead twigs and branches, or dry timber. A few species are found in stored grain and tubers. Several species are of great economic importance because they feed on grain, and some species are pests of living wild and cultivated trees and vines.

Faunal Composition. Four species in three genera, *Dinoderus*, *Rhyzopertha* and *Lyctus*.

Selected References. Dodds et al. 2004, Mattson et al. 1994, McNamara 1991d, Spillman 1982.

Table 20. Adventive species of Bostrichidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Dinoderus minutus* (Fabricius)			x			CA, DC, FL, IL, ME, MN, NH, OH	-	1988		In dried bamboo in the tropics, also in dried stored food	Majka 2007a; Spillman 1982
2. *Rhyzopertha dominica* (Fabricius)	x		x	x		**BC**, MB, ON; NH, RI	-	1861, 1975, 1995	1861	In stored wheat, corn, and other dried products	Majka 2007a; McNamara 1991d
3. *Lyctus brunneus* (Stephens)	x	x	x	x		**BC**; AL, CA, DC, FL, NY, WA	Palaearctic	1976, 1983, 1984	<1891	Associated with wood, causes serious damage to wood products	Majka 2007a; Mattson et al. 1994; McNamara 1991d
4. *Lyctus linearis* (Goeze)	x	x	x			**BC, ON**; RI, WI	Palaearctic	1900, 1903	<1844	Causes serious damage to wood products	Majka 2007a; Mattson et al. 1994; McNamara 1991d

20. Family **Ptinidae** Latreille, 1802 (including Anobiinae Fleming) [the ptinid beetles]

(Figs. 107-112, Table 21)

Length 1.1-9.0 mm. Tarsal formula 5-5-5

Diagnosis. Body elongate and cylindrical to oval and globular, strongly convex or spider-like; brown, tan or black, sometimes with lighter patches of pubescence or scales forming various patterns; pubescence fine, recumbent or erect or mixed; head deflexed, inserted into prothorax, in some species covered by pronotum; antennae serrate, pectinate, or flabellate, 10-11-articled, with 1-2 antennomeres in club; pronotum hood-like, usually enclosing head and concealing it from above; legs often contractile; procoxae small, globular to conical, and mostly contiguous; mesocoxae small, subconical, nearly contiguous; metacoxae small, near contiguous, transverse, grooved for reception of femora.

Bionomics. Most species feed on plant material as larvae and adults. They bore in bark, dry wood, twigs, seeds, woody fruits, fungi, or rarely young stems or shoots of growing trees or pine cones. Some species cause damage to furniture, the woodwork of houses, and book bindings.

Faunal Composition. 17 species in 11 genera, most in *Ptinus* (7).

Selected References. Arbogast et al. 2003, Bousquet 1990a, 1991d, Brown 1940b, Majka 2007a, Mattson et al. 1994, Seybold, 2001, Seybold and Tupy 1993, White 1990

Table 21. Adventive species of Ptinidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
1. *Anobium punctatum* (DeGeer)	×		×		×	**AB, BC, MB**; CA, GA, ID, IL, IN, KS, MA, MD, NJ, NY, PA, TX, VA, WA	Cosmopolitan	1919, 1970	1846	Damages furniture, homes, etc.	Bousquet 1990a, 1991d; Majka 2007a; Mattson et al. 1994
2. *Ernobius mollis* (Linnaeus)	×	×	×	×	×	**ON**; FL, LA, MA, ME, MI, NH, NY, OH, RI, TX, VA	Palaearctic	1875, 1901, 1954, 1958	1846	Minor pest of infected and declining trees	Bousquet 1991d; Majka 2007a; Mattson et al. 1994; Seybold 2001, Seybold and Tupy, 1993
3. *Epauloecus unicolor* (Piller and Mitterpacher)		×	×			**MB, ON**	Palaearctic	<1620, 1850, 1938	~1620	In warehouses	Bain 1999; Bousquet 1990a, 1991d; Brown 1940b, 1959; Majka 2007a
4. *Gibbium psylloides* (Czempinski)	×	×	×			**ON**	Cosmopolitan	1985	1889	Scavenger, in flour mills, warehouses, and hospitals	Bousquet 1990a, 1991d; Majka 2007a
5. *Lasioderma serricorne* (Fabricius)	×	×	×	×		**AB, MB, ON**; widely distributed in the USA	Cosmopolitan	1929, 1985, 1987	1886	Stored products pest	Arbogast et al. 2003; Bousquet 1990a, 1991d; Majka 2007a; White 1990
6. *Mezium affine* Boieldieu	×	×	×	×		**BC, ON, SK**; IN, NH, NY, PA, VT	Palaearctic	1940, 1950, 1986	1904	In warehouses and dwellings	Bousquet 1990a, 1991d; Brown 1940b; Majka 2007a
7. *Microbregma emarginatum* (Duftschmid)	×		×	×		**AB, BC, MB, ON, SK**; CO, ID, MA, ME, MI, MN, NH, WA	Palaearctic	1837, 1968, 1993, 2001	<1837	Under bark of coniferous and deciduous trees	Bousquet 1991d; Majka 2007a
8. *Niptus hololeucus* (Faldermann)	×	×	×	×	×	**AB, BC, MB, ON, SK**; MA	Cosmopolitan	~1890, 1899, 1938, 1955	~1890	In warehouses and in flour on cargo ships	Bousquet 1990a, 1991d; Brown 1940b, 1959; Majka 2007a
9. *Pseudeurostus hilleri* (Reitter)	×	×				**AB, BC, ON**; IN, NY, WI	Palaearctic	1936, 1938	1921	In warehouses, and feed mills	Bousquet 1990a, 1991d; Brown 1959; Majka 2007a
10. *Ptinus bicinctus* Sturm	×	×	×			**AB, BC, MB, ON, SK**; IL, IN, MA, ME, NE, NH	Palaearctic	1915	1915	Occasionally found in warehouses and dwellings	Bousquet 1990a, 1991d; Brown 1940b; Majka 2007a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
11. *Ptinus clavipes* Panzer	×	×	×			**BC, ON**; IL, IN, NY, PA, VA	Cosmopolitan	1938, 1990	<1905	Found in warehouses, and in cargo ships carrying wheat	Bousquet 1990a, 1991d; Majka 2007a
12. *Ptinus fur* (Linnaeus)	×	×	×	×	×	**AB, BC, ON**; ME, NH, RI, WA	Cosmopolitan	1620-1670, 1621-1673; ~1713, <1795, 1850, 1902, 1912, 1924	~1620	Found in warehouses, dwellings, granaries, museums	Bain 1999; Bain and Prévost 2010; Bain et al. 2009; Bousquet 1990a, 1991d; Brown 1940b; Majka 2007a
13. *Ptinus raptor* Sturm	×	×	×		×	**BC, MB, ON, SK**; IN, NY	Palaearctic	1930, 1975, 1981	1930	Found in cereals in warehouses and in cargo ships carrying cereals and flour	Bousquet 1990a, 1991d; Brown 1940b; Majka 2007a
14. *Ptinus sexpunctatus* Panzer			×				Palaearctic	2003	2003	Found in nests of bees	Majka 2007a; Majka et al. 2007a
15. *Ptinus tectus* Boieldieu	×	×	×		×	**AK, BC, MB, ON, SK**	Palaearctic	1927	1927	Found in warehouses, grain elevators, and flour mills	Bousquet 1990a, 1991d; Brown 1940b
16. *Ptinus villiger* (Reitter)	×		×	×	×	**AB, BC, MB, ON, SK**; NH, NY	Palaearctic	1952, 1982	<1905	Serious pest of cereal products, found in mills, granaries, and warehouses	Bousquet 1990a, 1991d; Brown 1940b; Majka 2007a
17. *Stegobium paniceum* (Linnaeus)	×	×	×	×	×	**AK, BC, MB, ON, SK**; widely distributed in the USA	Cosmopolitan	1910, 1951, 1952	<1825	Stored products pest	Bousquet 1990a, 1991d; Majka 2007a; Mattson et al. 1994

Series Cucujiformia

Superfamily Cleroidea Latreille, 1802

21. Family **Cleridae** Latreille, 1802 [the checkered beetles]

(Fig. 113, Table 22)

Length 2.0-24.0 mm. Tarsal formula 5-5-5 (4^{th} tarsomere minute in some)

Diagnosis. Body shape variable, suboval, elongate, broad or narrow, moderately covex; integument usually with long, dense erect pubescence and bright and often contrasting colours. Head strongly deflexed, prominent, at least as wide as pronotum; antennae with 9-11 antennomeres clubbed or capitate, serrate, pectinate or rarely filiform; apical palpomere often large. Pronotum as wide as head or narrower, subquadrate or elongate, sometimes constricted apically and basally, pleural region large. Elytra elongate, broader than pronotum, often broadening posteriad and rounded. Abdomen with 5-6 ventrites, their sutures entire. Procoxae conical and prominent, their cavities closed or open behind; mesocoxae rounded and not prominent; metacoxae transverse. Legs slender, tarsomeres 1-3 or 4 mostly lobed beneath.

Bionomics. Most species are predaceous on other insects as larvae and adults. They are mostly found on woody plants, under bark, in tunnels of wood- and cone-borers, in galls or on plant foliage and dead twigs. Some species are believed to be important in natural control of bark beetles (Opitz 2002).

Faunal Composition. Three species in the genus *Necrobia*.

Selected References. Majka 2006, McNamara 1991e, Opitz 2002.

Table 22. Adventive species of Cleridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Necrobia ruficollis* (Fabricius)	x					**BC, ON**	-	-	<1920	On dry carrion	McNamara 1991e
2. *Necrobia rufipes* (DeGeer)	x		x	x	x	**AB, BC, ON**; ME, NH	Cosmopolitan	1895, 1940, 2002	1895	On dry carrion	McNamara 1991e
3. *Necrobia violacea* (Linnaeus)	x	x	x		x	**AB, BC, MB, NT, ON, SK, YK**; AK, MA, ME, NH	Cosmopolitan	1875, 1900, 1945,	1875	On dry carrion	McNamara 1991e

22. Family **Melyridae** Leach, 1815 [the soft-winged flower beetles]

(Fig. 114, Table 23)

Length 2.0-10 mm. Tarsal formula 5-5-5, rarely 4-4-4 or 4-5-5

Diagnosis. Body form variable, graciliform to robust, convex to flattened; often brightly coloured with red and blue; pubescence decumbent or erect; head large and slightly deflexed with distinct clypeus; antennae 10-11 articled, second antennomere very small, antennomeres serrate, pectinate or filiform, sometimes terminal antennomere enlarged; pronotum typically quadrate or rarely elongate; elytra in most species entire, elongate and apically rounded, but in some species truncate and exposing three or more abdominal tergites, punctation confused and usually not organized into striae; procoxae conical, prominent, and near contiguous, with exposed trochantins, their cavities open behind; mesosternum short and transverse; mesocoxae conical, prominent, nearly contiguous; and metacoxae transverse, and contiguous.

Bionomics. Most adults are believed to be polyphagous, feeding on plant and animal material. Many feed on pollen of cone bearing and flowering plants. Malachinae are omnivorous scavengers and/or predators, feeding on pollen, nectar, and on small arthropods. The larvae are poorly known, some are scavengers or predators, feeding on detritus, fungi or small arthropods (Mayor 2002).

Faunal Composition. Two species in two genera, *Anthocomus* and *Malachius*.

Selected References. Bright 1991b, LeConte 1852, Majka 2005, Mayor 2002

Table 23. Adventive species of Melyridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Anthocomus equestris* (Fabricius)	x					**ON**; DC, IN, PA	Palaearctic	-	-	In buildings	Bright 1991b
2. *Malachius aeneus* (Linnaeus)	x	x	x	x	x	**AB, BC, ON**; CT, MA, ME, NH, NY, RI, VT	Palaearctic	1953, 1971, 1978	1852	In open habitats, frequently associated with cereal crops	Bright 1991b; LeConte 1852; Majka 2005

23. Family **Trogossitidae** Latreille, 1802 [the bark-gnawing beetles]

(Fig. 115, Table 24)

Length 1.9-22.4 mm. Tarsal formula 5-5-5

Diagnosis. Body form diverse, elongate and parallel-sided, sometimes cylindrical, oval or round, flattened to convex; colour various, dark brown to black, red-brown, to green or blue; pubescence variable, sometimes modified into scales; head wider than long; antennae with 11 antennomeres, with 3 antennomeres in club, sometimes asymmetrical, insertions hidden in dorsal view; pronotum widest near base or at middle, disc sometimes with depressions, anterior angles sometimes produced; elytra completely covering abdomen and only exceptionally shortened exposing three tergites; abdomen with five freely articulated ventrites; procoxae transverse and not projecting far below sternum, their cavities externally open or closed; mesocoxae narrowly to widely separated, their cavities circular to transverse, usually open laterally.

Bionomics. Most adults are predators on other arthropods, and are found under bark and in galleries of wood boring beetles. *Tenebroides mauritanicus* (Linnaeus), is a widespread species that may feed on stored products such as grain, and is considered a minor pest.

Faunal Composition. One species in genus *Tenebroides*.

Selected References. Bousquet 1990a, 1991e, Leschen 2002b.

Table 24. Adventive species of Trogossitidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Tenebroides mauritanicus* (Linnaeus)	x	x		x	x	**AB, BC, MB, ON, SK**; FL, ME, NH	Cosmopolitan	1900-1907, 1912, 1984	1650-1700, <1862	Pest of grain and cereal products	Bain 1998; Barron 1971; Bousquet 1990a, 1991e

Superfamily Cucujoidea Latreille, 1802

24. Family **Kateretidae** Erichson, 1846 (formerly Brachypteridae Erichson) [the kateretid beetles]

(Figs. 116, 117, Table 25)

Length 1.5-12.0 mm. Tarsal formula 5-5-5 or 4-4-4

Diagnosis. Body elongate oval, depressed, pale to piceous. Head prognathous and much narrower than pronotum; antennae with 11 antennomeres, last 3 forming a feeble club; eyes large and with large facets. Pronotum slightly narrower than elytra. Elytra truncate posteriorly exposing pygidium and at least one abdominal tergite, its epipleura narrow; scutellum large and usually triangular. Procoxal cavities open behind.

Bionomics. Adults and larvae are phytophagous; adults feed on pollen and flower petals and larvae develop in seed capsules of various plants (Habeck 2002).

Faunal Composition. Two species in two genera, *Brachypterus* and *Brachypterolus*.

Selected References. Habeck 2002a, Majka and Cline 2006a, Majka et al. 2008c, Mason and Huber 2002, McNamara 1991f, Sing et al. 2005, Smith 1959.

Table 25. Adventive species of Kateretidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Brachypterolus pulicarius* (Linnaeus)	x	x	x	x	x	**AB, MB, ON, SK**, in USA: south to PA and west to IA and WI, also in CO, ID, MT, NY, OR, SD, UT, WA, WY	Palaearctic	1951, 1966, 1979	1918	-	Majka et al. 2008c; Majka and Cline 2006a; McNamara 1991f; Sing et al. 2005; Smith 1959
2. *Brachypterus urticae* (Fabricius)	x	x	x		x	**AB, BC, MB, NT, ON, SK**; in USA: Atlantic seaboard south to the Smoky Mountains National Park in NC and TN and west to MO, IA and WI; CA, CO, WA	Palaearctic	1994, 2004	1843	Found on nettle, *Urtica* sp.	Majka and Cline 2006a; Majka et al. 2008c; Mason and Huber 2002; McNamara 1991f

25. Family **Nitidulidae** Latreille, 1802 [the sap-feeding beetles]

(Figs. 118-122, Table 26)

Length 1.5-12 mm. Tarsal formula 4-4-4 or 5-5-5

Diagnosis. Body narrowly to broadly oval, or narrowly subparallel, flattened, usually glabrous but sometimes with short and sparse pubescence or bristles; glossy to matt; pale to black with red or yellow markings; head prognathous with surface smooth, punctate or rugose, usually abruptly constricted behind eyes; antennae with an abrupt ball-like club, usually with 3 antennomeres; pronotum with lateral borders explanate and arcuate; elytra usually short, truncate and exposing some apical tergites or entirely covering abdomen; procoxae transverse with exposed troachantins, procoxal cavities transverse and open or closed; mesosternum short, sometimes carinate, mesocoxal cavites closed; metasternum large and broad, with cavities closed; tarsomeres dilated, with pads or setae beneath, tarsomere 4 minute and 5 elongate.

Bionomics. Nitidulids are primarily saprophagous and mycetophagous, some live in flowers, but the majority are found in association with decaying fruits, fermenting plant juices, and in fungi. Some species are myrmecophilous or occur in bee nests.

Faunal Composition. Ten species in five genera, most in *Carpophilus* (3) and *Nitidula* (3).

Selected References. Brown 1967, Habeck 2002b; Hoebeke and Wheeler 1996b, Majka and Cline 2006a, Majka and Klimaszewski 2004, Majka et al. 2008c; Mason and Huber 2002, McNamara 1991f, Smith 1959, Westcott et al. 2006.

Table 26. Adventive species of Nitidulidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Carpophilus dimidiatus* (Fabricius)	x	x				**BC, MB, ON, SK**; CA, FL, KS, MD, NY, OR, PA, TX, WA	Cosmopolitan	-	-	On overripe fruit	McNamara 1991f; Westcott et al. 2006
2. *Carpophilus hemipterus* (Linnaeus)	x	x				**AB, BC, MB, ON**; AK, CA, CO, DE, FL, ID, IN, IL, KS, MA, ME, NC, NH, NY, OH, OR, TX, WA, WI	Palaearctic	2007	1650-1700	On overripe fruit, feeds on flesh of fruit contaminated with fungi and yeasts	Bain 1998; Connell 1957; Majka et al. 2008c; McNamara 1991f
3. *Carpophilus marginellus* Motschulsky	x	x	x	x		**MB, ON**; AL, CA, FL, GA, NH, NJ, NV, OH, VT	Oriental	1998, 2006, 2007	<1910	On dried stored products, in compost heaps, in peach and nectarine orchards	Majka and Cline 2006a; Majka et al. 2008c; McNamara 1991f
4. *Meligethes viridescens* (Fabricius)	x	x	x	x		ME	Palaearctic	1945, 1995, 2000, 2007	1945, 1947	Adults and larvae destroy a large number of flowers and flower buds; harmful to brassica seed crops	Brown 1967; Hoebeke and Wheeler 1996b; Majka and Klimaszewski 2004; Majka and Cline 2006a; Majka et al. 2008c
5. *Nitidula bipunctata* (Linnaeus)	x	x	x			**AB, BC, MB, NT, ON, SK, YK**; AK, IA, ID, IN, KS, ME, MI, MN, MO, NC, NH, OH, OR, RI, TX, VA, WA	Palaearctic	-	1878	Associated with dried carrion	Bousquet 1990a; Majka and Cline 2006a; Majka et al. 2008c; McNamara 1991f
6. *Nitidula carnaria* (Schaller)	x		x			**BC, ON**; CA, IN, MA, MI, NJ, NY, OR, PA, WA, WI	-	1995	1894	Associated with dried carrion	Majka and Cline 2006a; Majka et al. 2008c; McNamara 1991f

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
7. *Nitidula rufipes* (Linnaeus)	x	x	x	x	x	**AB, BC, MB, NT, ON, SK, YK**; AK, CO, ID, IN, KS, ME, MI, MT, NH, NY, OR, PA, VA, WA, WI	Palaearctic	1825, 1928, 1961	1825	Associated with dried carrion	Majka and Cline 2006a; Majka et al. 2008c; McNamara 1991f
8. *Omosita colon* (Linnaeus)	x	x	x	x	x	**AB, BC, MB, ON, SK**; FL, ID, IN, KS, MA, ME, MO, NH, OR, RI, TX, WA; also in Mexico	Palaearctic	1860, 1899, 1920, 2003	1600-1700, 1860	Feeds on carrion, and found also in dwellings and empty granaries, compost	Bain 1998; Bousquet 1990a; Majka and Cline 2006a; Majka et al. 2008c; McNamara 1991f
9. *Omosita discoidea* (Fabricius)	x	x	x		x	**AB, BC, MB, ON, NT**; AZ, CA, CO, MD, ME, NH, NJ, NM, NY	Palaearctic	1825, 1991, 2005	1825	Feeds on carrion, and found also in dwellings and empty granaries	Bousquet 1990a; Majka and Cline 2006a; Majka et al. 2008c; McNamara 1991f
10. *Soronia grisea* (Linnaeus)			x		x		Palaearctic	1989, 1990	1989, 1990	On sap flows under bark of trees, and on flowers	Majka and Cline 2006a; McNamara 1992

26. Family **Monotomidae** Laporte, 1840 [the root-eating beetles]

(Fig. 123, Table 27)

Length 1.5-4.5 mm. Tarsal formula usually 5-5-5 in females and 4-5-5 in males, or 5-5-5 or 4-4-4

Diagnosis. Body slender, elongate, parallel-sided, subcylindrical to flattened; pubescence short and sparse or body glabrous; colour dull; head prognathous, usually constricted posteriad; antennae with 10 antennomeres, and 1-2-articled club; labrum indistinct; pronotum subquadrate to elongate, with smooth or denticulate lateral margins; elytra truncate exposing tip of abdomen; abdomen with five visible sternites; procoxae usually globular and usually with hidden trochantins (exception *Rhizophagus*), their cavities closed behind; mesocoxae narrowly to widely separated, their cavities open laterally.

Bionomics. Most species occur under bark, with some found in decaying vegetable matter, including anthropogenic materials such as compost and haystacks. Larvae and adults of *Rhizophagus* are predators of xylophagous insects and they also may feed on fungi (Bousquet 2002). Other groups of monotomids may also feed on fungi.

Faunal Composition. Five species in two genera, most in genus *Monotoma* (4).

Selected References. Bousquet 1990a, 1991f, 2002, Bousquet and Laplante 2000, Majka and Bousquet 2010.

Table 27. Adventive species of Monotomidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Monotoma bicolor* A.Villa and G.B. Villa	x	x				**BC, ON, SK**; AR, AZ, CA, DC, IA, IL, IN, KY, MA, ME, MI, NC, NH, NY, OH, OK, OR, PA, TN, VT, WI	Palaearctic	1919	1916	In decaying vegetable matter and barnyard litter	Bousquet and Laplante 2000; Majka and Bousquet 2010
2. *Monotoma longicollis* (Gyllenhal)	x	x	x		x	**AB, BC, ON, SK**; AR, CT, DC, FL, IL, IN, MA, ME, MN, MS, NC, NH, NM, NV, NY, OK, OR, PA, VT, WA, WI	Palaearctic	1937, 1977, 1981	< 1879	In decaying vegetable matter and stored products such as wheat	Bousquet 1991f; Bousquet and Laplante 2000; Majka and Bousquet 2010
3. *Monotoma picipes* Herbst	x	x	x	x	x	**AB, BC, MB, ON**; AZ, CA, CO, CT, DC, FL, ID, IL, IN, KY, LA, MA, ME, MI, MN, MT, NE, NH, NM, NV, NY, OK, OR, PA, TN, TX, VA, VT, WA	Cosmopolitan	1850, 1911, 1917, 1981, 1982	1650-1700, < 1844-	In decaying vegetable matter, under pine bark, in moss, seaweed, and, in association with ants	Bain 1998, 1999; Bousquet 1991f; Bousquet and Laplante 2000; Majka and Bousquet 2010
4. *Monotoma testacea* Motschulsky	x					**AB, ON, SK**; AZ, CA, IA, IL, KS, MA, MD, NH, NY, OK, OR	Palaearctic	1919	1916	In decaying vegetable matter, granaries, and mill feeds	Bousquet and Laplante 2000
5. *Rhizophagus parallelocollis* Gyllenhal	x		x		x	**BC, ON**; DC, IN, KY, MA, ME, NJ, NY, PA, RI, WA	Palaearctic	1897, 1094, 1947, 1965	1895	On fungi, in soil, in mammal nests, on mould, plants, refuse, old bones, rotten logs, and in sap	Bousquet 1990b, 1991f; Majka and Bousquet 2010

27. Family **Silvanidae** Kirby, 1837 [the silvanid flat bark beetles]

(Figs. 124-127, Table 28)

Length 2.0-15 mm. Tarsal formula 5-5-5

Diagnosis. Body usually strongly dorsoventrally flattened, elongate-oval or parallel-sided; brown to blackish, sometimes with a pattern; pubescence usually conspicuous; head large, constricted behind eyes; labrum small, broadly rounded; antenna with 11 antennomeres, filiform, with elongate scape and an inconspicuous club, or moderately elongate, with a short scape and distinct club; pronotum transverse to elongate, usually constricted basally and often with lateral spines or teeth; elytra usually completely covering abdomen, with broad epipleural fold, with longitudinal punctate striae; abdomen with five visible sternites, sutures entire; procoxae round, narrowly to broadly separated, their cavities open or closed posteriorly; mesocoxae round, broadly to narrowly separated and with cavities open laterally; metacoxae transverse.

Bionomics. Adults and larvae of Brontini occur under bark where they probably feed on ascomycete and other fungi; those of Psammoecini are found primarily on plants and in plant debris where they probably feed on fungi. Silvaninae are present under bark or in leaf litter where they also feed on fungi (Thomas 2002a). Some species are known as pests of stored grains and grain products.

Faunal Composition. Six species in five genera, two in *Oryzaephilus*.

Selected References. Bousquet 1990a, 1991g, MacNay 1952a,b, 1954a-c, Majka 2008b, Thomas 2002a.

Table 28. Adventive species of Silvanidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Ahasverus advena* (Waltl)	×		×	×		**AB, BC, MB, ON, SK**; AL, AR, AZ, CA, FL, GA, IA, ID, IN, KS, KY, MA, MD, ME, MO, NC, NH, NJ, NY, OH, OK, OR, SC, TX, VT, WA, WI	Cosmopolitan	1860, 1984, 1986	1860	Feeds on surface molds, associated with moldy copra, lima beans, pigeon peas, stored grain, corn, cereals, rice, beans, damp flour, soybeans, fruit, nuts	Bousquet 1990a, 1991g; Majka 2008b
2. *Cryptamorpha desjardinsii* (Guérin-Méneville) [intercepted in eastern Canada but not established]			×			AL, FL	Oriental	2002	-	Associated with plant molds, adult and larvae feed on sugarcane smut	Majka 2008b
3. *Nausibius clavicornis* (Kugelann) [intercepted in eastern Canada but not established]	×	×				**ON**; CA, FL, MD, NC, NY, PA, SC, TX	Palaearctic	1825-1875, 1902, 1968	1670	Pest of stored products, also reported from bees' nests	Bain 1999; Bousquet 1991g; Majka 2008b
4. *Oryzaephilus mercator* (Fauvel)	×	×	×	×	×	**AB, BC, MB, ON, SK**; CT, FL, NH	Cosmopolitan	1952, 1954, 1971, 1985	1670	On cereal products, including oatmeal, bran, sunflower seeds, rolled oats, and brown rice	Bousquet 1990a, 1991g; Loschiavo and Sabourin 1982; MacNay 1952a,b, 1954a-c; Majka 2008b
5. *Oryzaephilus surinamensis* (Linnaeus)	×	×	×		×	**AB, BC, MB, ON, SK**; CA, CT, FL, IN, MA, ME, NH, RI, WA	Cosmopolitan	1620, 1621-1673, 1902, 1960	1620	Stored product pest, in granaries, grain elevators, flour mills, adults and larvae attack damaged grain and processed cereals	Bain and Prévost 2010; Bousquet 1990a, 1991g; MacNay 1954a-c; Majka 2008b

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
6. *Silvanus bidentatus* (Fabricius)	x	x	x			**BC, ON**; CA, ME, NH, NY, RI, TX	Palaearctic	1925, 1928, 1968	1910	Found under bark of logs and dead trees, some are known to feed on fungi	Bousquet 1991g; Majka 2008b

28. Family **Laemophloeidae** Ganglbauer, 1899 [the lined flat bark beetles]

(Fig. 128, Table 29)

Length 1.0-5.0 mm. Tarsal formula 5-5-4, 5-5-5 (males), and 5-5-5 (females)

Diagnosis. Body usually strongly flattened (rarely sub-cylindrical), ovate to elongate; brown to black, sometimes bicoloured or maculate; pubescence usually inconspicuous; head mostly large, broadest across eyes, disc usually bordered by carinate or grooved sublateral lines; antenna with 11 (rarely 10) antennomeres, mostly filiform (rarely moniliform), with modified scape in males, and a poorly to well defined club; pronotum quadrate to elongate, usually constricted basally and with disc bordered by carinate or grooved sublateral lines; elytra often with cells and humeral carina, epipleural fold moderate to broad; abdomen with five visible sternites, sutures entire; procoxae obliquely transverse, their cavities open or closed posteriorly; mesocoxae globular, broadly separated and with cavities mostly open laterally; metacoxae transverse, their cavities moderately to broadly separated.

Bionomics. Adults and larvae occur under bark and are reported to be predaceous or feed on fungi, especially ascomycetes (Thomas 2002). Species with a sub-cylindrical body are associated with scolytid galleries and possibly prey on bark beetles. Other species are pests of stored grain and grain products.

Faunal Composition. Three species in the genus *Cryptolestes*.

Selected References. Bousquet 1990a, 1991g, MacNay 1952a,b, 1954a-c, Majka 2008b, Thomas 2002b.

Table 29. Adventive species of Laemophloeidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Cryptolestes ferrugineus* (Stephens)	x		x	x	x	**AB, BC, MB, ON, SK**; CA, FL, LA	Cosmopolitan	1965, 1973, 1985	1884	Serious pest of stored grain, found in granaries, grain elevators, and mills	Bousquet 1990a, 1991g; Majka 2008b
2. *Cryptolestes pusillus* (Schönherr)	x	x	x			**BC, MB, ON**; CA, FL, ME	Cosmopolitan	1988, 1989	1854	Found in grain elevators and flour mills, feeds on damaged grains	Bousquet 1990a, 1991g; Majka 2008b
3. *Cryptolestes turcicus* (Grouvelle)	x		x			**AB, BC, MB, ON, SK**; FL	Cosmopolitan	1986	1884	Feeds on fungi growing on damaged grains, found in grain elevators, flour mills, and warehouses	Bousquet 1990a, 1991g; Majka 2008b

29. Family **Cryptophagidae** Kirby, 1837 [the silken fungus beetles]

(Fig. 129, Table 30)

Length 0.8-5.2 mm. Tarsal formula 5-5-5 in females, 5-5-4 (Cryptophaginae), 5-5-5 in males

Diagnosis. Body elongate and parallel-sided, oval or rounded, moderately flattened or convex; yellowish brown, brown or black; pubescence long or short, decumbent or appressed, suberect to erect, often clothed with silky hairs; head elongate, retracted into thorax; mandible without a cavity; antennae with 11 antennomeres, and usually with 3-articled clubs (rarely 1-2), antennal insertions exposed and approximated or well separated; pronotum subquadrate or rounded, with well developed lateral carinae, lateral margins with or without teeth, processes or angularities; elytra completely covering abdomen, punctation random or in poorly defined rows; abdomen with five freely articulated ventrites, basal ventrite longer than remaining ones; procoxae rounded and separate, their cavities open or closed; mesocoxal cavities closed laterally by metasternum; metasternum elongate or short.

Bionomics. Found on flowers, foliage, in fungi and decaying vegetable matter promoting fungal growth. Some species are stored product pests. Most species feed on fungal hyphae, spores, and conidia, and others are saprophagous. The adventive *Telmatophilus typhae* (Fallen) is found on *Typha* sp. (Hoebeke and Wheeler 2002). Some species are known from wasp and bumblebee nests.

Faunal Composition. Ten species in four genera, most in *Cryptophagus* (5) and *Atomaria* (3).

Selected References. Bousquet 1990a, 1991h, Hoebeke and Wheeler 2000, Leschen and Skelley 2002, Majka and Langor 2010, Majka et al. 2010.

Table 30. Adventive species of Cryptophagidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Atomaria lewisi* Reitter		x	x			**ON**; CT, ME	Cosmopolitan	<1900, 1920,	<1900	In forests, grasslands, compost, vegetable refuse	Majka et al. 2010
2. *Atomaria pusilla* (Paykull)	x	x	x			**BC**; AK, CT, ID, IN, NY, OH, OR, WA	Palaearctic	<1961	<1910, 1920	In grasslands, compost, vegetable refuse	Bousquet 1991h; Majka et al. 2010
3. *Atomaria testacea* Stephens		x	x			CA	Palaearctic	1988, 2004	1920	In grasslands, farms, gardens, parks, compost, vegetable refuse, rarely in dung	Majka et al. 2010
4. *Cryptophagus cellaris* (Scopoli)	x					**AB, BC, MB, ON, SK**; AZ, CA, CO, DC, FL, IA, IL, KS, MI, MN, MO, NC, NJ, NV, NY, OR, PA, TN, UT, WA, WI	Cosmopolitan		1920	In cargo ships carrying wheat, flour, soybean meal, and beans	Bousquet 1990a, 1991h
5. *Cryptophagus fallax* Balfour-Brown		x	x	x		ME	Palaearctic	1967, 1982, 1983	-	In buildings on stored products and in Ipswich Sparrow nest	Majka and Langor 2010
6. *Cryptophagus laticollis* Lucas			x			**AB, BC**; CA, OR, WA	Cosmopolitan	1997	1990	In stored products and vegetable refuse	Majka and Langor 2010
7. *Cryptophagus scanicus* (Linnaeus)					x	-	Palaearctic	1949	1949	In wild habitats and stored products	Bousquet 1990a, 1991h; Majka and Langor 2010
8. *Cryptophagus subfumatus* Kraatz	x					**AB, BC, ON, SK**; AR, AZ, FL, ID, IL, ME, MI, NH, NY, OH, WA	Palaearctic	1899	-	On dried fruit and grain	Bousquet 1990a, 1991h; Majka and Langor 2010

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
9. *Pteryngium crenatum* (Fabricius)	x		x			**BC**; IN, MI, NH, OR, WA	Palaearctic	1997	1900	In coniferous forests on bracket fungi	Bousquet 1991h; Leschen and Skelley 2002; Majka and Langor 2010
10. *Telmatophilus typhae* (Fallén)		x	x	x			Palaearctic	1995, 1996, 1997	1986	In marshes on *Typha latifolia* and *T. angustifolia*	Hoebeke and Wheeler 2000; Majka and Langor 2010

30. Family **Erotylidae** Latreille, 1802 [the pleasing fungus beetles] [including Languriinae, Crotch 1873, the lizard beetles]

(Fig. 130, Table 31)

Length 2.0-10 mm. Tarsal formula 5-5-5

Diagnosis. Body narrowly elongate and parallel-sided, moderately flattened or slightly convex, usually glabrous and glossy, colour variable, dark or light brown, blue, red or green, some with dark or light spots; head and pronotum nearly equal in width; head elongate and retracted into thorax, usually with stridulatory file; eyes well developed and coarsely faceted; antennal club with three antennomeres, antennal insertions concealed in dorsal view; mandible without a deep cavity; pronotum with lateral margins simple, sometimes slightly crenulate, base of the disc sometimes with two small depressions; elytra often elongate and with well defined epipleura and punctation random or seriate; abdomen with five freely articulate ventrites, basal ventrite equal in length to remaining ventrites; procoxae globose, their cavities open or closed; mesocoxal cavities closed laterally.

Bionomics. Adults are found on flowers, leaves, and stems of various plants. Larvae are stem borers of composites and legumes. Some species are considered pests of stored grain and herbaceous crops. Many species are phytophagous while others are associated with decaying plant material and are saprophagous, mycophagous, or pollen feeders.

Faunal Composition. One species in the genus *Cryptophilus*.

Selected References. Campbell 1991d

Table 31. Adventive species of Erotylidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Cryptophilus integer* (Heer)	x					**ON**; AL, CA, FL, IN, LA, MS, PA, SC, TX	Cosmopolitan	1913	-	-	Campbell 1991d

31. Family **Endomychidae** Leach, 1815 [the handsome fungus beetles]

(Fig. 131, Table 32)

Length 4.0-8.0 mm. Tarsal formula 4-4-4 or 3-3-3

Diagnosis. Body oval to elongate-oval or round, pubescence fine or reduced, black with reddish or pale markings, glossy; head slightly deflexed and proganthous; antenna usually with 11 antennomeres, and with a club consisting of 1-2 antennomeres; pronotum usually much broader than head with anterior angles prolonged and partly enclosing head, borders margined; elytra entire and apically rounded, punctate, epipleuron well developed; abdomen with 5-6 ventrites; procoxal cavities open behind; mesosternum short, its cavities open or closed; metasternum with subcostal fovae in many species.

Bionomics. Adults and larvae occur in fungi, under bark, beneath logs, and in rotting wood, and feed on fungi or rotten wood.

Faunal Composition. One species in genus *Mycetaea*.

Selected References. Bain 1999, Bousquet 1990a, Campbell 1991g

Table 32. Adventive species of Endomychidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Mycetaea subterranea* (Fabricius)	x		x	x	x	**BC, ON**; CA, CT, DC, MA, MD, MI, NY, OR, PA, RI	Palaearctic	1621-1673, ~1713, <1759, 1825-1875, 1966, 1971	<1920	Associated with stored products in granaries, mills, warehouses and cellars	Bain 1999; Bain and Prévost 2010; Bain et al. 2009; Bousquet 1990a, Campbell 1991g

32. Family **Coccinellidae** Latreille, 1807 [the ladybird beetles or ladybugs]

(Figs. 132-134, Table 33)

Length 0.8-11.0 mm. Tarsal formula 4-4-4 (third tarsomere minute), or 3-3-3

Diagnosis. Body usually compact, broadly oval to nearly spherical, strongly convex dorsally and nearly flat ventrally; often brightly coloured and spotted: yellow, orange, and red with black markings or black with yellow to reddish markings; usually strongly glossy; head partly or completely concealed by pronotum and deeply inserted into prothorax; antennae short with 8-11 antennomeres, club with 3-6 antennomeres; pronotum broader than head, transversely oval to quadrate, with deep or shallow anterior emargination; elytra entire, glossy, finely to moderately punctate, non-striate, epipleural fold entire or obsolete; abdomen with 5-7 ventrites (visible sternites); procoxal cavities usually closed behind; mesosternum short, trapezoidal to subquadrate; metasternum long and broad.

Bionomics. Adults and larvae of most species are predaceous on aphids, scale insects, mites, and other soft-bodied insects. Some species have been intentionally introduced or used commercially for control of scale insects. Adults often overwinter in congregated groups. Two species of *Epilachna* are plant feeders and are serious garden pests. Some adventive species have caused the demise of related native coccinellid species.

Faunal Composition. Eight species in six genera, *Coccinella* (2) and the rest spread singly among the other genera. Two species, *Aphidecta conglomorata* (Linnaeus) and *Scymnus impexus* Mulsant, are recorded from eastern Canada as intentional introductions, but as far as we know, are not established. They are listed here only as historical records.

Selected References. Brown 1940a, 1950, Brown and Clark 1959, Chapin and Brou 1991, Clark and Brown 1961, Clark et al. 1971, Clausen 1978, Day et al. 1994, Dowden 1962, Evans 1991, Gordon 1982, 1985, Gordon and Vandenberg 1991, Hoebeke 1984, Hoebeke and Wheeler 1983, 1996a, Humble 1991, 1994, Kelleher and Hulme 1984, Majka and Klimaszewski 2004, Majka and McCorquodale 2006, 2010, McNamara 1991g, Mason and Huber 2002, McCorquodale 1998, McGugan and Coppel 1962, McNamara 1992, Mitchell and Wright 1967, Schooley et al. 1984, Wheeler 1990, 1993, Wheeler and Hoebeke 1995, 2008, Wheeler and Stoops 1996, Wheeler et al. 1973, Yanega 1996.

Table 33. Adventive species of Coccinellidae recorded from eastern Canada. * This species now extirpated from the region except for relict populations on Brier Island and Sable Island in Nova Scotia (Wheeler and Hoebeke 2008).

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Adalia conglomerata* (Linnaeus) [previously listed as *A. ronina* (Lewis)] [intentionally introduced into eastern Canada but not established]	.	x				**BC**; DE, FL, GA, MD, ME, NC, NJ, OH, OR, PA, SC, VA, WA	Palaearctic	1941, 1951-1969, 1958, 1962	1941-1951, 1958	Predator on soft-bodied insects	Brown and Clark 1959; Clausen 1978; Dowden 1962; Gordon 1985; Humble 1994; Kelleher and Hulme 1984; Majka and McCorquodale 2006, 2010; McGugan and Coppel 1962; Mitchell and Wright 1967; Schooley et al. 1984
2. *Coccinella septempunctata* Linnaeus	x	x	x	x		**AB, BC, MB, ON, SK**; CT, DE, GA, ME, NY, OK, PA	Palaearctic	1982	1973	Predator on soft-bodied insects; beneficial for control of aphids; has displaced several species of native ladybeetles	Day et al. 1994; Evans 1991; Gordon 1985; Gordon and Vandenberg 1991; Hoebeke and Wheeler 1983; Humble 1991; Majka and McCorquodale 2006, 2010; McCorquodale 1998; McNamara 1991g
3. *Coccinella u. undecimpunctata* Linnaeus *	x	x	x	x	x	**BC, ON**; CT, DE, MA, ME, NJ, NY, OH, OR, PA, RI, VT, WA	Palaearctic	1939, 1945	1912	Predator on soft-bodied insects	Brown 1940a; Day et al. 1994; Gordon 1985; Majka and McCorquodale 2006, 2010; McNamara 1991g; Wheeler and Hoebeke 1995, 2008
4. *Harmonia axyridis* (Pallas)	x	x	x	x		**BC**; throughout North America except for AZ, SK, WY	Palaearctic	1995, 1998, 2000	1988	Intentionally introduced predator on soft-bodied insects; has potential to displace native coccinellid species	Chapin and Brou 1991; Day et al. 1994; Gordon 1985; Gordon and Vandenberg 1991; Hicks et al. 2010; Hoebeke and Wheeler 1996a; Majka and McCorquodale 2006, 2010; Mason and Huber 2002; McCorquodale 1998

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
5. *Hippodamia variegata* (Goeze)	x	x	x	x		**ON**; CT, MA, ME, NH, NJ, NY, PA, RI, VT	Palaearctic	1984, 1993, 1995	1984	Predator on soft-bodied insects	Day et al. 1994; Gordon 1985; Gordon and Vandenberg 1991; Hoebeke and Wheeler 1996a; Majka and McCorquodale 2006, 2010; McCorquodale 1998; McNamara 1991g; Wheeler 1993; Wheeler and Stoops 1996
6. *Propylea quatuordecim-punctata* (Linnaeus)	x	x	x	x		**BC, ON**; CT, MA, ME, NC, NH, NY, PA, RI, VT	Palaearctic	1968, 1950, 1990, 1994	1968	Predator on soft-bodied insects	Day et al. 1994; Gordon 1985; Gordon and Vandenberg 1991; Hoebeke and Wheeler 1983, 1996a; Majka and McCorquodale 2006, 2010; McCorquodale 1998; McNamara 1991g; Wheeler 1990, 1993; Wheeler and Stoops 1996; Yanega 1996
7. *Scymnus impexus* Mulsant [intentionally introduced into eastern Canada but not established]		x	x		x	**BC**; CT, MI, NY, PA	Palaearctic	1951-1955, 1960-1969	1951-69, 1955, 1959, 1960, 1962	Predator on soft-bodied insects	Clark and Brown 1961; Clark et al. 1971; Clausen 1978; Gordon 1985; Hoebeke and Wheeler 1983; Humble 1994; Majka and McCorquodale 2006, 2010; McNamara 1991g; McGugan and Coppel 1962; Mitchell and Wright 1967; Schooley et al. 1984; Smith and Coppel 1957
8. *Scymnus suturalis* Thunberg	x		x			CT, MA, MI, NY, PA, RI, VA	Palaearctic	1983, 1993	~1915, ~1990	Predator on soft-bodied insects, potentially beneficial	Gordon 1982, 1985; Hoebeke 1984; Hoebeke and Wheeler 1983, 1996a; Majka and Klimaszewski 2004; Majka and McCorquodale 2006, 2010; McNamara 1991g, 1992

33. Family **Corylophidae** LeConte, 1852 [the minute hooded beetles]
(Fig. 135, Table 34)

Length 0.6-2.3 mm. Tarsal formula 4-4-4

Diagnosis. Body minute, usually oval and depressed, nearly hemispherical or slightly elongate, with head small, quadrate to elongate, usually completely concealed by pronotum from above, colour usually testaceous to piceous in some with paler pronotum or spots on elytra; head small, quadrate to elongate, and usually completely concealed by expanded pronotum forming a hood anteriorly; antennae with 9-11 antennomeres, and with 3-articled club; pronotum with the anterior margin emarginated or entire and completely covering the head; elytra mostly truncate apically, exposing the apex of abdomen; abdomen with six ventrites, basal ventrite very long and bearing subparallel femoral lines; procoxae from short and globose to elongate, their cavities closed internally; mesocoxae variable in shape, round to elongate, their cavities closed internally; metacoxae widely separated; tarsi with first and second articles large, third very small and fourth narrow and elongate.

Bionomics. Adults and larvae feed on fungal spores, and are usually found under decaying bark, in rotten fungi, leaf litter, and other decaying vegetable matter. Many species are also found on leaves and flowers of various plants and in nests of birds and caterpillars.

Faunal Composition. One species in the genus *Sericoderus*.

Selected References. Campbell 1991e, Majka and Cline 2006b.

Table 34. Adventive species of Corylophidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Sericoderus lateralis* (Gyllenhal)	x		x			**BC, MB, ON**; FL, IN, MA, ME, MI, NY, OR, WA	-	-	1949	Associated with fungi	Campbell 1991e; Majka and Cline 2006b

34. Family **Latridiidae** Erichson, 1842 [the minute brown scavenger beetles]

(Figs. 136-140, Table 35)

Length 1.0-3.0 mm. Tarsal formula 3-3-3

Diagnosis. Body elongate oval, moderately convex, brown to black; pubescence moderately long, long or absent; head oval or trapezoidal, slightly deflexed; antennae with 10-11 antennomeres, and with 2-3-articled club; pronotum oval or trapezoidal, wider than head, and narrower than base of elytra, dorsal surface with or without punctures, often with ridges and depressions and explanate laterally; elytra oval, widest in the middle, apically rounded, usually regularly striate with striae setose, and interstriae raised or carinate; abdomen with five or six ventrites; procoxae conical or rounded, their cavities open or closed behind; mesocoxae conical or rounded, separate; metacoxae transverse, widely separate.

Bionomics. Adults and larvae feed on conidia of fungi and Myxomycetes. Adults are mostly associated with leaf litter, rotting vegetation, but can also be found on low-lying vegetation, mammal nests, and flowers.

Faunal Composition. Twenty species in nine genera, most in *Corticaria* (5), and *Dienerella* (5).

Selected References. Becker 1977, Bousquet 1990a, 1991i, Brown 1950, 1967, Hoebeke and Wheeler 1983, MacNay 1954a-c, Majka et al. 2009a

Table 35. Adventive species of Latridiidae beetles recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
1. *Adistemia watsoni* (Wollaston)	x					**ON**; DC; also in Mexico	Palaearctic	1974	< 1920	In stored products	Becker 1977; Bousquet 1991i; Hoebeke and Wheeler 1983
2. *Cartodere bifasciata* (Reitter)			x			-	Australia	1989	1989	Larvae and adults feed on moulds	Majka et al. 2009a
3. *Cartodere constricta* (Gyllenhal)	x	x	x	x	x	**AB, BC, MB, ON, SK**; AZ, CA, FL, ID, IL, IN, MA, MI, MN, NC, NH, OR, RI, SC, VA, WA, WY	Cosmopolitan	1916, 1951, 1981, 2001	<1855	Associated with fungi and stored products, including grain, feed mills	Bousquet 1990a, 1991i; Majka et al. 2009a
4. *Cartodere nodifer* (Westwood)	x		x	x		**BC, MB, ON**; CA, ME, NC, NH, OR, RI, VA, WA	Palaearctic	1919, 1952, 1982	<1894	In stored products, grains, vegetable refuse, compost, mouldy wood, Hymenoptera nests	Bousquet 1991i; Majka et al. 2009a
5. *Corticaria elongata* (Gyllenhal)	x		x		x	CA, FL, IA, ID, IN, MA, MI, NH, NJ, NY, OR, PA, WA	Palaearctic?	1966, 1980	< 1899		Majka et al. 2009a
6. *Corticaria impressa* (Olivier)		x	x				Palaearctic	1951, 1983	1951, 1983	In seashore and coastline habitats	Majka et al. 2009a
7. *Corticaria pubescens* (Gyllenhal)	x		x			**BC, ON**; IA, ID, IL, MA, MI, NY, PA, WA	Palaearctic	2002	< 1855	Associated with stored products, including grain, granaries, haystacks, flood debris near streams, decaying seaweed, moss, houses, and on tree bark	Bousquet 1990a, 1991i; Majka et al. 2009a
8. *Corticaria saginata* Mannerheim		x	x				Palaearctic	1924, 1967	1924	In decomposing hay, and on broom	Majka et al. 2009a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
9. *Corticaria serrata* (Paykull)	×		×	×	×	**AB, BC, ON**; CA, CT, FL, IL, IN, MA, ME, MI, MN, NE, NH, NJ, NM, NY, OR, PA, RI, WA; Greenland	Palaearctic	1975	< 1824	Associated with stored products, including grains, and in mouldy plant debris, fungi, and in dead wood; in Canadian cargo ships carrying wheat and barley	Bousquet 1990a; Majka et al. 2009a
10. *Cortinicara gibbosa* (Herbst)	×	×	×	×	×	**AB, BC, MB, ON, SK**; CA, ID, IN, MA, ME, MI, NH, NJ, NY, OR, RI, WA, WV	Palaearctic	1916, 1926, 1928, 1985, 1974	<1899	Often found in damp habitats, probably occurs in stored products at least occasionally	Bousquet 1990a, 1991i; Majka et al. 2009a
11. *Dienerella arga* (Reitter)	×	×	×	×		**ON**; CA, IN, KY, ME, MI, MT, NH, OR, WA	Palaearctic	1932	1899	Associated with stored grains and in wheat fields	Bousquet 1990a, 1991i; Majka et al. 2009a
12. *Dienerella costulata* (Reitter)	×		×	×		**ON, MB**; MA, ME, MI, NH, ON, PA	Palaearctic	1916, 1986, 1988	<1899	Probably similar to the previous species	Bousquet 1990a, 1991i; Majka et al. 2009a
13. *Dienerella filiformis* (Gyllenhal)	×		×			**AB, MB, ON, SK**; MI, MO, PA, SK, WA	Palaearctic, New Zealand	1981	<1855	Feeds on filamentous fungi and slime moulds, found in granaries, grain elevators, old flour barrels, wine cellars and homes	Bousquet 1990a, 1991i; Majka et al. 2009a
14. *Dienerella filum* (Aubé)	×		×		×	**BC, MB, ON**; AR, CA, CO, MI, NY, WA; Greenland	Palaearctic	1919	<1899	Feeds on filamentous fungi and slime molds, reported as potential pest in air conditioning and refrigeration systems	Bousquet 1990a, 1991i; Majka et al. 2009a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	Date Canadian records	Date NA records	Habitat/Damage	References
15. *Dienerella ruficollis* (Marsham)	x		x	x	x	**BC, ON**; CT, IN, MA, NH, NJ, NY, OR, PA, VA	Palaearctic, New Zealand	1922, 1980	<1899	In granaries, grain elevators, flour mills, in bird nests, fungi, and mouldy papers	Bousquet 1990a, 1991i; Majka et al. 2009a
16. *Enicmus histrio* (Joy and Tomlin)			x				Palaearctic	1956, 1996	1996	In damp and mouldy straw, hay, cut grass, and on stored wheat	Majka et al. 2009a
17. *Latridius hirtus* Gyllenhal	x					**BC, MB, ON**; MT, NJ, NY	Palaearctic	-	-	Recorded from under bark of poplar	Bousquet 1991i; Hatch 1961
18. *Latridius minutus* (Linnaeus)	x		x	x	x	**AB, BC, MB, SK**; AK, CA, CO, DC, ID, IL, IN, LA, MA, MD, ME, MI, MN, NH, NJ, NY, OR, PA, TX, WA, WI, WY	Palaearctic	1620, 1621-1673, ~1713, <1759, 1910, 1951, 1976	1620	Feeds on filamentous fungi, often found in stored products, decaying hay and grass, in decomposing fungi and mouldy objects	Bain and Prévost 2010 [in press]; Bain et al. 2009; Bousquet 1990a; Majka et al. 2009a
19. *Stephostethus lardarius* (DeGeer)					x	**BC**	Palaearctic	1897, 1949	1897	In households, vegetable refuse, and moss	Brown 1950; Bousquet 1991i; Majka et al. 2009a
20. *Thes bergrothi* (Reitter)	x	x	x			**BC, MB, SK**; ME, Greenland	Palaearctic	1916	-	Associated with stored products, and mouldy food, dried plants, etc.	Bousquet 1990a, 1991i; Brown 1967; MacNay 1954a-c; Majka et al. 2009a

Superfamily Tenebrionoidea Latreille, 1802

35. Family **Mycetophagidae** Leach, 1815 [the hairy fungus beetles]

(Fig. 141, Table 36)

Length 1.0-6.5 mm. Tarsal formula 4-4-4 or 3-4-4

Diagnosis. Body oblong to ovate, somewhat flattened, evenly pubescent or hairy, brownish or black and often with orange or reddish markings, moderately glossy; head short, triangular, narrower than pronotum and slightly deflexed; antennae with 11 antennomeres, insertions exposed, antennomeres 7-11 enlarged or apical 2-3 forming club; pronotum transverse, arcuate laterally, sometimes with minute serration, streamlined with elytra; elytra entire, broadly oval, the apices rounded, striae punctate and intervals rugose; abdomen with five ventrites; procoxae elongate, globular, with elevated keel between them, their cavities open behind; mesocoxae subconical, narrowly separated; metacoxae transverse and contiguous.

Bionomics. Adults feed largely on fungi and are found under bark, in shelf fungi, and in mouldy vegetable materials; some feed on pine pollen.

Faunal Composition. One species in the genus *Typhaea*.

Selected References. Bousquet 1990a, 1991j, Parsons 1975.

Table 36. Adventive species of Mycetophagidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Typhaea stercorea* (Linnaeus)	x	x	x	x		**BC, ON**; AR, AZ, CA, CO, CT, DC, FL, GA, IA, ID, IL, IN, KS, MA, ME, MO, NC, NM, NY, OR, SC, TX, VT, WA, WY	Cosmopolitan	1951, 1954, 1966	<1920	In stored products, granaries, dairy barns, mills, stores, warehouses and dwellings, also occurs in compost	Bousquet 1990a, 1991j; Parsons 1975

36. Family **Ciidae** Leach, 1819 [the minute tree-fungus beetles]

(Fig. 142, Table 37)

Length 1.0-3.0 mm. Tarsal formula 4-4-4

Diagnosis. Body oval to elongate, convex, often cylindrical, brown to black, with erect pubescence; head subglobular, without temples, partly concealed from above; antennae with 8-10 antennomeres and the last 2-3 forming a club, insertions well separated; pronotum transverse to nearly quadrate, sometimes with teeth or horns; elytra entire, without punctate striae but punctures sometimes in rows, epipleura very narrow; abdomen with 5 free ventrites; procoxae slightly transverse or conical, contiguous or separated, their cavities externally open or closed; mesocoxae globose, contiguous or narrowly separated and open; metacoxae transverse, contiguous or narrowly separated.

Bionomics. Adults and larvae are found under bark, in shelf fungi, and in wood. A few species occur in galleries of bark beetles (Scolytinae). Adults and larvae feed on fungi.

Faunal Composition. One species in the genus *Hadraule*.

Selected References. Majka 2007b; McNamara 1991h.

Table 37. Adventive species of Ciidae beetles recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Hadraule elongatula* (Gyllenhal)		x					?	1967	1967	In conks of *Piptoporus betulinus*	Bousquet 1991; Majka 2007b; McNamara 1991h

37. Family **Tetratomidae** Billberg, 1820 [the polypore fungus beetles]

(Fig. 143, Table 38)

Length 2.0-17 mm. Tarsal formula 5-5-4

Diagnosis. Body oblong to elongate, strongly convex to slightly flattened, brownish to black, sometimes with orange or reddish markings; pronotum usually with two depressions at base; head short, triangular, slightly deflexed; antennae with 11 antennomeres, clavate, or with apical 3-4 antennomeres forming a loose club; pronotum broader than head, subquadrate or narrowed in front, with anterior margins rounded, posterior margin entire or sinuate, laterally narrowed toward head; elytra covering all of abdomen, ovate, the apices rounded, punctation usually confused; scutellum arcuate or subtriangular; abdomen with five ventrites, the sutures entire or the two first ventrites connate; procoxae transverse or oval; mesocoxae narrowly separated, their cavities open; metacoxae transverse and contiguous; legs long, first article of metatarsus longer than any other.

Bionomics. Adults and larvae feed largely on the fruiting bodies of hymenomycete fungi, especially species in the Polyporaceae and Tricholomataceae. They are commonly found under bark and on softer shelf fungi.

Faunal Composition. One species in the genus *Hallomenus*.

Selected References. LeSage 1991b; Young and Pollock 2002.

Table 38. Adventive species of Tetratomidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Hallomenus binotatus* (Quensel)	x						Palaearctic	-	-	On fungi growing on trees	LeSage 1991b

38. Family **Zopheridae** Solier, 1834 (including Colydiinae Erichson) [the zopherid beetles]

(Fig. 144, Table 39)

Length 1.2-15 mm. Tarsal formula 4-4-4 or 3-3-3

Diagnosis. Body slender, elongate cylindrical to depressed and parallel-sided, or broadly oval; black or brown; head usually visible from above; eyes present or absent; antennae with 10-11 antennomeres, and with 2-3-articled club, insertions under frontal margin; pronotum quadrate, elongate or transverse, often with ridges or grooves; elytra entire, covering pygidium, plane, carinate, costate, tuberculate, and often with up to eleven punctuate striae; abdomen with five ventrites; procoxal cavities usually open; mesocoxal cavities narrowly to broadly separated and closed laterally.

Bionomics. Zopherids may be found under or on bark, on dead branches and twigs, in forest litter, in galleries of ambrosia beetles or other wood borers, in shelf fungi, or in ant nests. They feed on fungi and some are predaceous on insect larvae and some are believed to be parasitic or feed on plant tissue.

Faunal Composition. One species in genus *Bitoma*.

Selected References. Campbell 1991g, Westcott et al. 2006.

Table 39. Adventive species of Zopheridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Bitoma crenata* (Fabricius)	x					**ON**; IN, NY, OH, OR, VT, WA	Palaearctic	1967	1950	Associated with fungi under bark of conifers and hardwoods	Campbell 1991g; Westcott et al. 2006

39. Family **Tenebrionidae** Latreille, 1802 [the darkling beetles]

(Figs. 145-147, Table 40)

Length 2.0-35 mm. Tarsal formula 5-5-4 (mostly), 4-4-4, or 3-3-3

Diagnosis. Body typically heavily sclerotized, form variable in shape and size, elongate and cylindrical to slightly flattened, sometimes short and broad, many species superficially resemble ground beetles but are usually less glossy, dull black to brown; head smaller than pronotum, with frontoclypeal suture present; eyes rarely separated by epistomal canthus into upper and lower portions; antennae thread-like, bead-like or slightly clubbed, mostly with 11 antennomeres (rarely 9-10), concealed from above by epistomal canthus; pronotum typically carinate or explanate laterally; elytra if striate then with scutellary striole; abdomen with five ventrites, 1-3 connate, and 4 and 5 movable; procoxal cavities closed behind externally and open or closed internally; mesocoxal cavities closed laterally; legs with tarsomeres sometimes lobed.

Bionomics. Many species are active at night, found on the ground, on and under logs or tree trunks, under bark, in rotten wood, in fungi, in ants' nests with many species in arid habitats. Some species are pests of stored products, grain and flour. Adults and larvae are scavengers, feeding on decaying vegetation, fungi, seeds, organic material, and a few feed on living plants.

Faunal Composition. Ten species in six genera, most in the genus *Tribolium* (4).

Selected References. Becker 1982, Bousquet 1990a, Bousquet and Campbell 1991, Brown 1950, Campbell et al. 1989, Dunford and Young 2004, Dunford et al. 2005; Löbl et al. 2008, Matthews et al. 2010, Majka et al. 2008a, Sikes 2003, Steiner 2008

Table 40. Adventive species of Tenebrionidae from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Alphitobius diaperinus* (Panzer)	x	x	x	x	x	**AB, BC, MB, ON, SK**; AK, AZ, CA, CT, FL, GA, IN, MD, ME, MI, NH, NY, OH, PA, WA, WI	Cosmopolitan	<1930, 1934, 1964, 1975	<1866, <1910	In mouldy stored products, grain, cereals, animal food, and poultry houses; larvae may be vectors of poultry diseases	Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
2. *Gnatocerus cornutus* (Fabricius)	x		x			**BC, MB, ON**; AR, CT, FL, MA, MD, OH, RI	Cosmopolitan	<1889, 1938	1650-1700	Minor pest of stored products; occurs in cereals and animal products	Bain 1998; Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
3. *Latheticus oryzae* Waterhouse	x	x				**MB, SK**; FL, GA, MD, MI, OH	Cosmopolitan	1964	1870	Found in stored products	Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
4. *Palorus ratzeburgii* (Wissmann)	x		x			**BC, ON**; DC, FL, GA, IN, MD, MI, NY, OH, OR, WA	Cosmopolitan	1940	<1910	Adults and larvae feed on mouldy grain in granaries, flour mills, and warehouses; found also under bark	Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
5. *Tenebrio molitor* Linnaeus	x	x	x	x	x	**AB, BC, MB, ON, SK**; AK, FL, GA, IN, MA, MD, ME, MI, NH, OH, RI, WA, WI; Mexico	Palaearctic	~1713, <1759, ~1827, <1830, 1898, 1921-1924	~1827, <1830	Adults and larvae preferably feed on moist and decaying grain and cereal products	Bain and Prévost 2010 [in press]; Bain et al. 2009; Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
6. *Tenebrio obscurus* Fabricius	x		x			**AB, BC, ON**; CA, CT, FL, GA, IN, MD, ME, OH, RI, WI	Palaearctic	1860, 1869	1860	Pest of stored products; also subcortical on trees	Bain 1998; Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
7. *Tribolium castaneum* (Herbst)	x		x	x		**AB, BC, MB, ON, SK**; AL, AZ, FL, GA, IL, IN, MA, MD, MI, MS, NC, NH, NY, OH, PA, RI, SC, TN, VA, WA, WI	Cosmopolitan	<1917, 1950, 1960	1860	Adults and larvae feed on stored products, e.g., moist grain in granaries, flour mills, and in cargo ships	Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
8. *Tribolium confusum* Jacquelin du Val	x	x	x	x	x	**AB, BC, MB, ON, SK**; CT, FL, GA, IL, IN, MD, ME, MI, NH, NJ, NY, OH, PA, RI, VA, WA	Cosmopolitan	<1920, 1961, 1938, <1963	1860	Serious pest of stored products, found on cereals and grain, in flour and feed mills, warehouses and dwellings	Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
9. *Tribolium destructor* Uyttenboogaart	x	x	x	x	x	**AB, BC, MB, ON, SK**	Africa, Asia, Europe	1937, 1951, 1962, 1978,	1937	Found in stored products	Brown 1950; Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a
10. *Tribolium madens* (Charpentier)	x	x	x			**MB, ON**; KY, MI, MS, NM, NY, PA, TX, WI, WV; Mexico	Palaearctic	1937, 1979, 1980	<1897, 1937	Found in stored products	Becker 1982; Bousquet 1990a; Bousquet and Campbell 1991; Campbell et al. 1989; Majka et al. 2008a

40. Family **Oedemeridae** Latreille, 1810 [the pollen-feeding beetles or the false blister beetles]

(Fig. 148, Table 41)

Length 5.0-20 mm. Tarsal formula 5-5-4

Diagnosis. Body soft, slender, elongate, convex to slightly flattened, finely and uniformly pubescent, colour variable, pale to black, satiny or metallic, often with red, orange or yellow markings; head small, moderately deflexed, elongate before eyes, about equal to width of pronotum; antennae with 11 antennomeres, filiform or serrate, inserted in deep emargination of eyes or anterior to eyes; pronotum broadened anteriorly, lacking margin on lateral borders, posteriad narrower than the elytra; elytra with five to fewer distinct rows of punctures, irregularly punctate or glabrous, usually entirely covering abdomen; abdomen with five ventrites with sutures complete; procoxae projecting, their cavities open; mesosternum short, mesocoxal cavities open and contiguous; legs slender and long; tarsi with penultimate article bilobed.

Bionomics. Adults are found on flowers and foliage, under driftwood, in rotting logs, many species are attracted to light. Adults feed on pollen and nectar; larvae feed in moist decaying wood, conifers and driftwood.

Faunal Composition. One species in the genus *Nacerdes*.

Selected References. Campbell 1991h, Mattson et al. 1994.

Table 41. Adventive species of Oedemeridae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Nacerdes melanura* (Linnaeus)	x	x	x		x	**AB, BC, MB, ON**; CA, IN, MA, ME, MO, NH, OR, RI, TX, WA	Palaearctic	1897, 1901	-	Feeds on driftwood along lakeshores, river margins and seashores	Campbell 1991h; Mattson et al. 1994

41. Family **Anthicidae** Latreille, 1819 [the ant-like flower beetles]

(Fig. 149, Table 42)

Length 2.0-7.0 mm. Tarsal formula 5-5-4

Diagnosis. Body ant-like, elongate, convex, with elytra much broader than head and pronotum, clothed with decumbent and erect hairs; black, brown, rust brown, or bicoloured, sometimes with bright spots; head approximately as wide as pronotum, abruptly constricted behind forming long or short neck; antennae filiform, serrate, with 11 antennomeres, with or without weak club; pronotum oval or quadrate, widest in the anterior half, constricted near the base, base narrower than elytra; elytra elongate oblong to elongate or subparallel, much broader than pronotum or head; abdomen with five ventrites, basal ventrites freely articulated; procoxae projecting, their cavities open behind and confluent; mesocoxae oval, their cavities narrowly separated; metacoxae transverse and separated; tarsi with penultimate article lobed.

Bionomics. Adults are omnivorous scavengers and predators of small arthropods, and some may also feed on plants, pollen, and fungi. They often occur under objects on the ground, some are found on flowers. Larvae live in soil and in decayed vegetation on the ground.

Faunal Composition. Three species in two genera, most in the genus *Omonadus* (2).

Selected References. Bousquet 1990a, 1991k.

Table 42. Adventive species of Anthicidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Omonadus floralis* (Linnaeus)	x	x			x	**AB, BC, MB, ON, SK**; AZ, CT, FL, IN, MA, ME, NH, NY, RI	Cosmopolitan	-	<1920	Associated with stored products	Bousquet 1990a, 1991k
2. *Omonadus formicarius* (Goeze)	x	x				**AB, BC, MB, ON, SK**; CT, MA, ME	Cosmopolitan	-	-	Associated with stored products	Bousquet 1990a, 1991k
3. *Stricticomus tobias* (Marseul)	x					AL, AZ, CA, CT, DC, FL, IN, IL, MA, NE, NH, OR, PA, TX, WI	-	-	-	Scavenger	Bousquet 1991k

42. Family **Aderidae** Winkler, 1927 [the ant-like leaf beetles]

(Fig. 150, Table 43)

Length 1.0-4.0 mm. Tarsal formula 5-5-4

Diagnosis. Body ant-like (similar to Anthicidae), oval to elongate, black to reddish-yellow, pubescence variable; head transverse, strongly deflexed, and abruptly constricted at base; eyes coarsely faceted, and usually notched; antennae filiform, subserrate, clavate or flabellate in some males, with eleven antennomeres; pronotum trapezoidal to transversely oval, often narrowed at apex, and usually narrower than elytra at base; elytra entire, with confused punctation; abdomen with five ventrites, first two basal ventrites fused with suture partially visible; procoxae conical, prominent, their cavities open; mesocoxae transverse with cavities narrowly to moderately widely separated; metafemora often enlarged and bearing setal brushes or setose sulci.

Bionomics. Adults are found on foliage of trees and shrubs (mostly broad leaves), and on flowers. Larvae are known to occur in rotting wood, under bark, leaf litter and in bee and termite nests (Chandler 2002).

Faunal Composition. One species in the genus *Aderus*.

Selected References. Bousquet 1991l, Chandler 2002, Pollock 1998.

Table 43. Adventive species of **Aderidae** recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Aderus populneus* (Panzer)	x					**BC, MB, ON**; CA, DC, IA, ID, IL, IN, MD, NH, OH, OR, PA, UT, WA, WI, WV	Palaearctic	<1991	-	-	Bousquet 1991i; Pollock 1998

Superfamily Chrysomeloidea Latreille, 1802

43. Family **Cerambycidae** Latreille, 1802 [long-horn beetles]

(Figs. 151-153, Table 44)

Length 3.0-12.0 (rarely over) mm. Tarsal formula 5-5-5 (appearing 4-4-4 because of minute and concealed fourth tarsomere)

Diagnosis. Body usually elongate and cylindrical but sometimes flattened and wide, with broad shoulders, brown, black, or brightly coloured with or without spots or of a complex pattern, pubescent or subglabrous; head variable in form, long, from prognathous with strongly projecting mandibles to hypognathous; antennae long, at least half as long as body (often longer than body), filiform, usually with eleven antennomeres, antennal insertions exposed and often on two tubercles or swellings in emarginations of eyes (between eyes and mandibles in the Prioninae, and Spondylinae, or between eyes in the Cerambycinae and Lamiinae), antennae capable of being flexed backwards against body; pronotum variable, quadrate, oval, elongate, cylindrical, or flattened, with borders margined at least basally (Prioninae), or completely absent; elytra entire, sometimes very short exposing part or all of abdomen; abdomen usually with five ventrites (rarely six); procoxae from globular to transverse, their cavities open or closed.

Bionomics. Adults feed on wood, roots, pollen, or (rarely) are carnivorous (Turnbow and Thomas 2002) or may not feed at all, e.g., *Tetropium fuscum* (Juutinen 1955). Larvae feed on tissues of woody plants that range in condition from live and healthy to dead and decomposing, but most larval hosts are weakened or stressed (Hanks 1999). Some species are destructive to various trees and cut logs and can be serious economic pests (Gardiner 1975; Haack et al. 2010).

Faunal Composition. Six species in six genera.

Selected References. Allen and Humble 2002, CFIA 2004, Cope 1984, Duffy 1953, Haack 2006, Humble 2001, LaBonte et al. 2005, Landry 2001, Majka and Klimaszewski 2004, Majka et al. 2007f, McCorquodale and Bondrup-Nielsen 2004, McNamara 1991i, Smith and Hurley 2000, Sweeney et al. 2004, Turnbow and Thomas 2002, Webster et al. 2009b, Whitehead 1988.

Table 44. Adventive species of Cerambycidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Callidium violaceum* (Linnaeus)	x	x	x	x	x	**ON**; MA, ME, NH, NY, OH, PA	Palaearctic	1907, 1913, 1915, 1917, 1919, 1953	1907, 1912	In/on dry, seasoned wood, weakened, dying or dead trees in 20-60 year-old stands	Duffy 1953; Majka et al. 2007f; McNamara 1991i; Whitehead 1988
2. *Oberea erythrocephala* (Schrank)	x					**AB, ON, MB**: several northern states and CO, MT	Palaearctic	1980s, 1990s	?	Introduced intentionally as a biological control agent against leafy spurge (*Euphorbia esula*) in at least 15 states in northern USA	Officially not recorded from Canda but well established at least in ON and QC
3. *Phymatodes testaceus* (Linnaeus)	x	x	x			**ON**; FL, IA, IN, MA, MD, ME, MN, NH, NJ, NY, OH, OR, PA, WA	Palaearctic	1929	1903	Rarely found in forests; doesn't attack green timber	Cope 1984; Duffy 1953; Humble 2001; LaBonte et al. 2005; McCorquodale and Bondrup-Nielsen 2004; McNamara 1991i
4. *Tetropium fuscum* (Fabricius)			x			-	Palaearctic	2000	2000	In NS on live spruce trees of low vigour and fresh windfelled or cut spruce trees	Allen and Humble 2002; CFIA 2004; Duffy 1953; Juutinen 1955; Kimoto and Duthie-Holt 2006; Majka and Klimszewski 2004; McCorquodale and Bondrup-Nielsen 2004; Ottens 2005; Smith and Hurley 2000; Sweeney et al. 2004
5. *Tetrops praeustus* (Linnaeus)	x	x				ME, NH	Palaearctic	1999, 2005	1996	No reports of economic damage in NA	Duffy 1953; Haack 2006; Landry 2001; Webster et al. 2009b
6. *Trichoferus campestris* (Faldermann)	x					**ON**	south-eastern Palaearctic	2002, 2006	2002, 2006	May attack most woody plants, larvae live under bark	Grebennikov et al. 2010

44. Family **Megalopodidae** Latreille, 1802 [the megalopodid leaf beetles]

(Fig. 154, Table 45)

Length 3.3-4.5 mm. Tarsal formula 5-5-5 (appearing 4-4-4)

Diagnosis. Body shape variable, elongate, subparallel, subcylindrical to depressed, colour variable but mostly non-metallic in Nearctic species; hairs sparse to dense, and appressed to erect; head short to slightly elongate, exposed in dorsal view; eyes large, coarsely or finely faceted; antennae with 11 antennomeres, short to moderately long, 5-11 subserrate, insertion lateral between eyes and base of mandibles; pronotum subequal to broader than head, laterally weakly arcuate or strongly angled, with a weak to strong vessal constriction; elytra entire, apically rounded, surface smooth to punctuate, epipleura narrow throughout; abdomen with 5 free ventrites, 1-4 subequal in length, 5 somewhat longer. Procoxae contiguous, transverse and protruding, their cavities closed behind; mesocoxae subconical and small; metacoxae transverse; mesosternum with stridulatory file; all tibiae with paired apical spurs.

Bionomics. Adults and larvae foliovorous. Larvae are true leaf miners, legless and dorsoventrally flattened. Some species utilize willows and poplars (Salicaceae).

Faunal Composition. One species in genus *Zeugophora*, formerly listed in the family Chrysomelidae.

Selected References. LeSage 1991d; Mattson et al. 1994; Riley et al. 2003.

Table 45. Adventive species of Megalopodidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/ Damage	References
1. *Zeugophora scutellaris* Suffrian	x					**AB, BC, MB, NT, ON, SK**; wide-spread in USA	Palaearctic	-	-	Found on *Populus* and *Salix* spp.	LeSage 1991d ; Mattson et al. 1994; Riley et al. 2003

45. Family **Chrysomelidae** Latreille, 1802 (including Bruchinae Latreille) [the leaf beetles]

(Figs. 155-165, Table 46)

Length 1.0-17 mm. Tarsal formula 5-5-5 (appearing 4-4-4)

Diagnosis (excluding Bruchinae). Body form diverse, oval, elongate and subparallel, cylindrical, convex or flattened, usually subglabrous but sometimes pubescent or bearing scales; glossy or dull, brown, black, yellowish, or multicoloured with spots and stripes, often with metallic sheen; head usually short, oval convex or depressed, or elongate and cylindrical; antennae with 10-11 antennomeres, filiform, sometimes broadening apically, nearly always less than half as long as body, insertions close together on frons or well separated, never on prominences; eyes usually entire; pronotum variable in shape, usually broader than head; elytra usually entire and apically rounded; abdomen with five ventrites, basal ventrites not fused; procoxae round to transverse, often prominent, their cavities open or closed; mesocoxae subconical and small, mesosternum narrow to moderately wide and moderately long; metacoxae transverse, metasternum usually wide and long; legs short to moderately long; tarsi with fourth tarsal article minute and hidden at base of lobes of article 3, and first tarsal article often enlarged in males.

Diagnosis (Bruchinae). Body compact, oval, egg-shaped, to nearly quadrate, broadening posteriad, black or brown, often mottled or marked with patches of whitish or brownish pubescence; head prolonged into a short broad snout, closely applied to thorax in resting position, concealed from above; eyes shallowly to deeply emarginated at antennal insertions; antennae with eleven antennomeres, clubbed or serrate or pectinate; pronotum small, narrower than elytra; elytra short, exposing pygidium and separately rounded at apex, disc with ten punctate-striate; abdomen with five ventrites, first and fifth the longest; procoxae elongate, received in elongate cavities, partially closed behind.

Bionomics. Adults occur in the open on vegetation where they usually consume fresh foliage, sometimes pollen, various parts of flowers, or rarely dead plant material. The feeding habits of larvae are much more diverse. Many feed in the open, on leaves like the adults, but leaf or stem miners are common too. Almost all eumolpine larvae are subterranean, mining roots or feeding on other underground parts of their host plants. A large number of galerucine and alticine larvae are also root miners. Most cryptocephaline larvae feed on dead leaves and twigs in the leaf litter. Clytrine larvae

occur in ants' nests where they feed on eggs, and animal or plant detritus. The aquatic donaciine larvae feed on the submerged portion of their hosts, hooked to them with two long spines which also provide them with oxygen from the plant vessels.

Adults of Bruchinae are found on foliage, or in stored peas, beans, and other seeds; larvae of most species feed within seeds or seed envelopes, some species seriously damage beans and peas and are economic pests.

Faunal Composition. Forty-three species in 21 genera, most in *Longitarsus* (8).

Selected References. Allen and Humble 2002, Bain 1998, Bain and LeSage 1998, Batra et al. 1986, Becker 1979, Bridwell and Bottimer 1933, Blossey and Schat 1997, Bourchier et al. 2002, Bousquet 1990a, 1991, Brown 1940c, d, 1950, 1967, Burgess 1981, 1982, Campbell and McCaffrey 1991, CFIA 2004, Chantal 1972, Ciesla 2002, Clausen 1956, 1978, Cox 1995, Denoth and Myers 2005, Evans 1899, Frick 1970; Gassmann et al. 1996, Hansen et al. 1997, Harcourt et al. 1984b, Harris and Peschken 1971, Harris et al. 1969, Hendrickson et al. 1991, Hight et al. 1995, Hoebeke 1993, Hoebeke and Wheeler 1983, 2005, Jackson 1997, Johnson 1991, Jolivet 1990, Kingsolver 2002b, Kosior 1975, Lamb and Palaniswamy 1990, Landis et al. 2003, LeSage 1988, 1990, 1991a-d, LeSage and Majka 2009; LeSage and Paquin 1996, LeSage et al. 2007, 2008, Lindgren 2003, Maier 2005, Majka and Klimaszewski 2004, MacNay 1952a,b, 1954a,b, Majka and LeSage 2006, 2007, 2008a,b,c, Majka et al. 2007a, Mattson et al. 1994, McAvoy et al. 1997, McClanahan et al. 1968, McLeod 1962, Olfert et al. 2004, Palaniswamy and Lamb 1992, Pemberton and Rees 1990, Peschken 1971, 1984a,b, Peschken et al. 1970, 1993, Riley et al. 2003, Roehrdanz et al. 2006, Smith 1985, Staines 1984, 1997, 1999, Staines and Staines 2006, Taylor and Harcourt 1974, Ward and Pienkowski 1978, Wendt 1986, Westcott et al. 2006, Wheeler and Hoebeke 1994, White 1993, Wylie et al. 1984, Zwölfer 1965

Table 46. Adventive species of Chrysomelidae (including Bruchinae) recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Acanthoscellides obtectus* (Say)	×		×			**BC, MB, ON**; AL, CA, CT, DC, DE, FL, GA, HI, IA, IL, IN, KS, LA, MA, MD, ME, MO, MS, NE, NH, NJ, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, VA	Cosmopolitan	1943	<1873	Pest of beans, found in association with stored beans, also infests growing crops	Bousquet 1990a
2. *Altica carduorum* (Guérin-Méneville)			×			**AB, BC, ON**; CA, CO, DE, ID, IN, MD, MN, MT, NJ, NV, OR, SD, WA, WI	Palaearctic	1963	1963	Used for biocontrol of thistles *Cirsium arvense*, found also on *Carduus* sp. Probably not established.	Peschken 1971; Peschken et al. 1970; Zwölfer 1965
3. *Aphthona cyparissiae* (Koch)	×		×			**AB, BC, MB, ON, SK**; CO, IA, ID, MN, MT, ND, NE, NM, NV, OR, SD, WA, WI, WY	Palaearctic	1982	1982	Used for biocontrol of *Euphorbia esula* and *E. cyparissias*	LeSage 1996a; LeSage and Paquin 1996; Riley et al. 2003
4. *Aphthona flava* Guillebeau	×					**AB, BC, MB, ON, SK**; CO, IA, ID, MI, MN, MT, ND, NE, NH, NM, NV, NY, OR, RI, SD, UT, WA, WI, WY	Palaearctic	1982	1982	Used for biocontrol of *Euphorbia esula* and *E. cyparissias*	Bourchier et al. 2002; Gassmann et al. 1996; Hansen et al. 1997; LeSage 1996a; LeSage and Paquin 1996; Pemberton and Rees 1990; Riley et al. 2003
5. *Aphthona nigriscutis* Foudras			×			**AB, BC, MB, ON, SK**; CO, IA, ID, MI, MN, MT, ND, NE, NH, NM, NV, NY, OR, RI, SD, UT, WA, WI, WY	Palaearctic	1983	1983	Used for biocontrol of *Euphorbia esula* and *E. cyparissias*	Bourchier et al. 2002; Gassmann et al. 1996; Hansen et al. 1997; Jackson 1997; LeSage 1996a; LeSage and Paquin 1996; Riley et al. 2003; Roehrdanz et al. 2006

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
6. *Bruchus pisorum* (Linnaeus)	x	x	x	x	x	**AB, BC, MB, ON**; AL, CA, CO, CT, DC, FL, GA, ID, KS, KY, MA, MI, MN, MO, MS, MT, NC, NH, NJ, NM, NY, OR, PA, SC, SD, TX, UT, WA	Cosmopolitan	1621-1673, 1915	mid-1600-1675 in USA, 1670 in MA	Pest of cultivated peas	Bain 1998; Bain and Prévost 2010; Bousquet 1990a, 1991; Bridwell and Bottimer 1933; Clausen 1978; Kingsolver 2002b; McLeod 1962; McNamara 1991f; Wendt 1986
7. *Bruchus rufimanus* (Boheman)	x					**MB, ON, SK**; NJ	Cosmopolitan	1915	<1873	Pest of broad beans	Clausen 1978; Kingsolver 2002b; McNamara 1991f; Wendt 1986
8. *Cassida flaveola* Thunberg	x		x	x		**AB, BC, MB, NT, ON, SK, YT**; MD, MN, MT, ND, NH, NY, OH, PA, VT, WI, WV	Palaearctic?	1902, 1982, 2003	1896, 1911	Feeds on Caryophyllaceae: *Stellaria, Spergula,* etc.	Kosior 1975; Majka and LeSage 2008c; Riley et al. 2003
9. *Cassida rubiginosa* O.F. Müller	x	x	x	x		**AB, MB, ON, SK**; DE, NH, NJ, NY, OH, OR, MD, MI, VA, WV	Palaearctic	1902, 1939, 1948, 1957	1902	Found on *Arctium minus* and *Cirsium arvense*	Brown 1940c; Kosior 1975; LeSage 1991d; Majka and LeSage 2008c; Peschken 1984a,b; Riley et al. 2003; Ward and Pienkowski 1978; Westcott et al. 2006
10. *Chaetocnema concinna* (Marsham)	x	x	x	x		**ON**; MA, OR, TX	Palaearctic	1982, 1983, 1996	1979	Polyphagous, found on *Beta, Chenopodium*, etc.	Hoebeke and Wheeler 1983; LeSage 1990; Riley et al. 2003; Westcott et al. 2006
11. *Chrysolina staphylea* (Linnaeus)	x		x		x	-	Palaearctic	1897	1897	Found on *Aster tripolium, Plantago lanceolata, P. maritima, Achillea, Ranunculus*, etc.	Brown 1940c, 1950; Chantal 1972; Evans 1899; Jolivet 1990; Majka and Klimaszewski 2004; Majka and LeSage 2008a; Riley et al. 2003
12. *Chrysolina hyperici hyperici* (Forster)	x	x	x			**BC, ON**; CA, CO, ID, MN, MT, NV, NY, OR, WA	Palaearctic	1951	1945	Used for biocontrol of *Hypericum perforatum*	Campbell and McCaffrey 1991; Harris and Peschken 1971; Harris et al. 1969; Hoebeke 1993; LeSage 1996b; McLeod 1962; Riley et al. 2003
13. *Chrysolina quadrigemina* (Suffrian)		x	x			**BC, ON**; CA, CO, ID, MD, MN, MT, NJ, NV, NY, OH, OR, PA, UT, VA, WA, WV	Palaearctic	1951	1946	Used for biocontrol of *Hypericum perforatum*	Campbell and McCaffrey 1991; Harris and Peschken 1971; Harris et al. 1969; Hoebeke 1993; LeSage 1991d; McLeod 1962; Riley et al. 2003; Staines and Staines 2006

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
14. *Crioceris asparagi* (Linnaeus)	×	×	×	×		**AB, BC, MB, ON, SK**; AL, AR, AZ, CA, CO, CT, DC, DE, GA, IA, ID, IL, IN, KY, MA, MD, ME, MI, MN, MO, MT, NC, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, TN, TX, UT, VA, VT, WA, WI, WV	Palaearctic	1877	1860	Main pest of *Asparagus officinalis*; both larvae and adults feed on foliage	Beirne 1971; Clausen 1956, 1978; Hendrickson et al. 1991; LeSage et al. 2008; Riley et al. 2003; Taylor and Harcourt 1974; White 1993
15. *Crioceris duodecimpunctata* (Linnaeus)	×	×	×	×		**AB, BC, MB, ON, SK**; CA, CO, CT, DC, IA, ID, IL, IN, MA, MD, ME, MI, MN, MO, MT, NJ, NV, NY, OH, OR, PA, RI, SD, UT, VA, WA, WI, WV, WY	Palaearctic	1899	1881	Main pest of *Asparagus officinalis*; larvae feed inside berries, adults on foliage	Hendrickson et al. 1991; LeSage et al. 2008; Riley et al. 2003; White 1993
16. *Gastrophysa polygoni* (Linnaeus)	×	×	×	×		**AB, BC, MB, ON, SK**; CT, IA, IL, KS, KY, MA, ME, MI, MN, MO, ND, NE, , NJ, NY, PA, RI, SD, VT, WV, WY	Palaearctic	1827, 1864	1826	Beneficial, feeds on weeds: *Fallopia* sp., *Polygonum* sp., *Rumex* sp.; or harmful, when feeds on buckwheat, *Fagopyrum* sp.	Couper 1864; LeSage and Majka 2009; Say 1826
17. *Lema puncticollis* (Curtis)		×				**AB, SK**; SD	Palaearctic	1983	1983	Used for biocontrol of *Cirsium arvense*	Peschken 1984a,b; Riley et al. 2003; White 1993

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
18. *Lilioceris lilii* (Scopoli)	x	x	x			**MB, ON**; CT, MA, ME, NH, NY,VT	Palaearctic	1943, 1992, 2002, 2004	1826	On *Lilium* sp. and *Fritillaria* sp., pest to ornamental and native species of *Lilium* sp.	LeSage 1983; LeSage and Elliot 2003; Maier 2005; Riley et al. 2003
19. *Longitarsus ferrugineus* (Foudras)	x			x	x	**ON**; ID, IN, MI, OR,WA	Palaearctic	-	1925	On *Mentha* spp., pest of cultivated varieties	LeSage 1988, 1991d; Riley et al. 2003
20. *Longitarsus ganglbaueri* Heikertinger				x		**MB**; OR	Palaearctic	<1985, 1993	1945, 1978	On *Senecio* spp.	Hoebeke and Wheeler 2005; LeSage 1988
21. *Longitarsus jacobaeae* (Waterhouse)		x		x		**BC**; CA, OR, WA	Palaearctic	1974, 1983, 2001	1964, 1971	Used for biocontrol of *Senecio jacobaea*	Frick 1970; Hoebeke and Wheeler 2005; LeSage 1988, 1991d; Riley et al. 2003
22. *Longitarsus luridus* (Scopoli)	x	x	x	x	x	**ON**; CT, ME,VT	Palaearctic	1967, 1960, 1977, 1984	1967	Polyphagous, found on Ranunculaceae, Boraginaceae, etc.	Brown 1967; Hoebeke and Wheeler 1983; LeSage 1988, 1991d; Riley et al. 2003
23. *Longitarsus pellucidus* (Foudras)	x					**ON**	Palaearctic	1926	1926	Found mainly on *Convolvulus arvensis* and *Convovulus* spp.	LeSage 1988, 1991d; Riley et al. 2003
24. *Longitarsus pratensis* (Panzer)	x			x		**ON**; NC, NY,TN, VA,WV	Palaearctic	1977	1928	Found mainly on *Plantago* spp.	LeSage 1988, 1991d; Riley et al. 2003
25. *Longitarsus rubiginosus* (Foudras)	x		x			**ON**	Palaearctic	1957, 1994	1957	Mainly on Convolvulaceae, *Convolvulus* and *Clystegia* spp.	LeSage 1988, 1991d; Hoebeke and Wheeler 2005; Riley et al. 2003
26. *Longitarsus succineus* Foudras					x		Palaearctic	1926	1926	Polyphagous, found on Asteraceae, Convolvulaceae, etc.	Brown 1967; LeSage 1988, 1991d; Riley et al. 2003
27. *Mantura chrysanthemi* (Koch)	x	x	x		x	MA, MD, ME, NH, NJ, NY, OH, RI	Palaearctic	-	<1950	Found on *Rumex acetosella*	Brown 1950; LeSage 1991d

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
28. *Neogalerucella calmariensis* (Linnaeus)			×	×		**AB, BC, MB, ON, SK**; AL, CO, CT, DC, DE, IA, ID, IL, IN, KS, MA, MD, ME, MI, MN, MO, MT, NH, NY, OH, OR, PA, RI, SD, TN, UT, VA, VT, WA, WI, WV, WY	Palaearctic	1992	1992	Used for biocontrol of *Lythrum salicaria*	Batra et al. 1986; Blossey and Schat 1997; Denoth and Myers 2005; Hight et al. 1995; Landis et al. 2003; Lindgren 2003; McAvoy et al. 1997; Riley et al. 2003
29. *Neogalerucella pusilla* (Duftschmid)		×		×		**AB, BC, MB, ON**; AL, CO, CT, DC, DE, IA, ID, IL, IN, KS, MA, MD, ME, MI, MN, MO, MT, NH, NY, OH, OR, PA, RI, SD, TN, UT, VA, WA, WI, WV	Palaearctic	1992	1992	Used for biocontrol of *Lythrum salicaria*	Batra et al. 1986; Hight et al. 1995; Landis et al. 2003; McAvoy et al. 1997; Riley et al. 2003
30. *Oulema melanopus* (Linnaeus)	×	×	×	×		**AB, BC, ON**; AL, AR, CO, CT, DE, GA, IA, ID, IL, IN, KS, KY, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NH, NJ, NV, NY, OH, OR, PA, RI, SC, TN, UT, VA, WA, WI, WV, WY	Palaearctic	1965	1947	Important pest of cereals, grains and grass crops, vectors certain viruses affecting Graminaceae	CFIA 2004; Clausen 1978; Harcourt et al. 1984b; LeSage et al. 2007; McClanahan et al. 1968; Olfert et al. 2004; Riley et al. 2003; Staines 1984, 1997; Westcott et al. 2006; White 1993
31. *Phyllotreta aerea* Allard	×					**ON**; NY, PA, WI	Palaearctic	<1991	<1926	Found on Brassicaceae	LeSage 1991d; Riley et al. 2003
32. *Phyllotreta armoraciae* (Koch)	×	×		×		**BC, MB, ON, SK**; CT, DE, IA, ID, IL, IN, MA, ME, MI, MN, MO, MS, NE, NH, NJ, NY, OH, OR, PA, SD, WA, WI, WV	Palaearctic	1910	<1900	Found on *Armoracia rusticana* and other Brassicaceae	Burgess 1981; LeSage 1991d; Riley et al. 2003; Smith 1985

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
33. *Phyllotreta cruciferae* (Goeze)	x	x	x	x		**AB, BC, MB, ON, SK**; CA, CO, CT, DE, ID, IL, MD, ME, MN, MO, MT, ND, NH, NY, OH, OR, PA, RI, SD, UT, WI, WV, WY	Palaearctic	1921	1921	Major pest of canola, rape, and other Brassicaceae	Brown 1967; Burgess 1981; LeSage 1991d; Palaniswamy and Lamb 1992; Riley et al. 2003; Wylie et al. 1984
34. *Phyllotreta striolata* (Fabricius)	x	x	x	x	x	**AB, BC, MB, NT, ON, MA, SK, YT**; AK, AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NH, NJ, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, WA, WI, WV, WY	Palaearctic	1716-1760, 1899	1650-1700	Major pest of canola, rape, and other Brassicaceae	Bain 1998; Bain and LeSage 1998; Bain and Prévost 2010; Bain et al. 2009; Burgess 1981, 1982; Lamb and Palaniswamy 1990; LeSage 1991c; Palaniswamy and Lamb 1992; Riley et al. 2003; Smith 1985; Wylie et al. 1984
35. *Plagiodera versicolor* (Laicharting)	x	x				**MB, ON**; CT, DC, DE, IA, IL, IN, KY, MA, MD, ME, MI, MN, NC, NH, NJ, NY, OH, PA, RI, SC, TN, VA, WV	Palaearctic	Early 1940s	1915	On *Salix* spp., and *Populus* spp.	LeSage 1991d; Mattson et al. 1994; Riley et al. 2003; Staines 1999
36. *Psylliodes chrysocephalus* (Linnaeus)					x	NY	Palaearctic	1950	1950	Pest of cruciferous crops; attacks seedlings and older leaves	Brown 1967; MacNay 1952a,b, 1954a,b; Riley et al. 2003
37. *Psylliodes napi* (Fabricius)	x	x		x	x	**ON**; CT, DE, IN, MA, MD, NH, NY, OH, VA, WV	Palaearctic	-	-	Pest of various cruciferous crops, Brassicaceae	Hoebeke and Wheeler 1983; Riley et al. 2003

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
38. *Psylliodes affinis* (Paykull)	×					**ON**; MD, ME, MI, NH, NY, OH, PA, RI, WV	Palaearctic	1981	1981	Mainly on Solanaceae, and on *Humulus lupus, Rheum rhabarbarum* spp.	Hoebeke and Wheeler 1983; Riley et al. 2003
39. *Psylliodes cucullatus* (Illiger)	×	×				**ON**; NH	Palaearctic	-	-	On various species in the Poaceae	Cox 1995; Riley et al. 2003
40. *Psylliodes picinus* (Marsham)	×					**ON**; CT, NH, PA, WV	Palaearctic	-	1978	Polyphagous species	Hoebeke and Wheeler 1983; Mattson et al. 1994; Riley et al. 2003
41. *Pyrrhalta viburni* (Paykull)	×	×	×	×	×	**BC, ON**; CT, MA, ME, NY, OH, PA, VT	Palaearctic	1947	1947	Pest on native and ornamental *Viburnum*	Becker 1979; Hoebeke and Wheeler 1983; Maier 2005; Majka and LeSage 2007; Mattson et al. 1994; Riley et al. 2003; Wheeler and Hoebeke 1994
42. *Sphaeroderma testaceum* (Fabricius)			×				Palaearctic	1997	1997	Beneficial, feeds on weeds, mainly *Cirsium arvense*	Hoebeke and Wheeler 2003; Majka and LeSage 2006
43. *Xanthogaleruca luteola* (O.F. Müller)	×	×	×	×		**BC, ON**; AR, AZ, CA, CO, CT, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, WA, WV, WY	Palaearctic	1945	1830	Pest of ornamental elms (*Ulmus* spp.), minor impact in forests	Allen and Humble 2002; Ciesla 2002; Clausen 1978; Riley et al. 2003

* The northwestern, and possibly western populations of this species in North America probably represent native Holarctic ones. See Majka and LeSage (2008c) for further details.

Superfamily Curculionoidea Latreille, 1802

46. Family **Anthribidae** Billberg, 1820 [the fungus weevils]

(Fig. 166, Table 47)

Length 0.4-14 mm. Tarsal formula 5-5-5 (appearing 4-4-4)

Diagnosis. Body robust, elongate to oval, moderately to strongly convex, usually black or brown, and often mottled with white, gray, and straw-coloured hairs or scales forming patterns; head large, produced anteriorly into a short and broad rostrum (beak) with distinct labrum; antennae straight, not geniculate, with 2-3 articled club; pronotum usually trapezoidal, often with transverse sub-basal carina and lateral carinae, disc smooth, punctate, reticulate, rugose or tuberculate; elytra internally with a supracostal flange, and usually with scutellary striole; abdomen with five ventrites, the basal four fused together, pygydium exposed; procoxae globose, projecting, their cavities closed behind; mesocoxae globular and separate; metacoxae elongate and transverse, barely separate; legs robust to slender, trochantins not exposed.

Bionomics. Adults are usually found on dead branches and twigs, under bark, or on fungi. Larvae live in plant material on which adults are found, including stems of weeds, fungi, or dead or dying tree trunks or branches.

Faunal Composition. One species in genus *Araecerus*.

Selected References. Becker 1977, Bousquet 1990a, Bright 1993, McNamara 1991k, Valentine 1999.

Table 47. Adventive species of Anthribidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Araecerus fasciculatus* (DeGeer)	x					**BC, ON**; AL, AZ, CA, FL, GA, IL, LA, MA, MS, NC, NY, OH, SC, TX, WA	Asia	<1975	1853	Associated with stored products including coffee beans	Becker 1977; Bousquet 1990a; Bright 1993; McNamara 1991k; Valentine 1999

47. Family **Brentidae** Billberg, 1820 [the straight-snouted weevils or pear-shaped weevils]

(Fig. 167, Table 48)

Length 1.0-40.0 mm. Tarsal formula 5-5-5 (appearing 4-4-4)

Diagnosis. Body elongate or parallel-sided, head with long and straight rostrum (Brentinae, Cyphagoginae, Trachelizinae), or body pear-shaped, rostrum moderately long, legs with cylindrical trochanters attached to apex of femora (Apioninae, Nanophylinae), dark brown to black, sometimes with markings; head with straight, long or short rostrum; antennae filiform or bead-like, usually straight, sometimes with loosely formed club, insertions usually at the middle of the rostrum or rarely at the base, labrum not visible; pronotum without lateral carinae; elytra concealing pygidium; abdomen with two basal ventrites fused together and distinctly longer than remaining ventrites; procoxae projecting, their cavities closed; tarsi with penultimate antennomere bilobed.

Bionomics. Adults are found on a variety of plants, under bark, on living or dying hardwood trees, in worm-eaten wood where they feed on fungi and sap, or wood-eating insects. Larvae are wood borers and feed on wood and fungi, and some mine plant stems or develop in seeds.

Faunal Composition. Three species in three genera.

Selected References. Anderson and Kissinger 2002, Bright 1993, Brown 1967, MacNay 1952a,b, 1954a-c, Majka et al. 2007a-c, McNamara 1991l, Peschken et al. 1993.

Table 48. Adventive species of Brentidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Omphalapion hookerorum* (Kirby)			x			**AB, BC, MB, SK**	Palaearctic	1990	1990, 1992-1998	Associated with (Asteraceae), scentless chamomile (*Tripleurospermum maritima inodorum* (L.) Applequist), and *Anthemis cotula* L.	Anderson and Kissinger 2002; Majka et al. 2007a,c; Peschken et al. 1993
2. *Rhopalapion longirostre* (Olivier)	x		x			**BC, ON, SK**; AR, CA, CO, GA, IL, KY, MA, MD, MO, NC, NY, OH, OR, PA, SC, TN, VA, WA, WI	Palaearctic	1952, 2002	1914, 1922, 1966	Associated with hollyhock, *Athea rosea* L. (Malvaceae), feeds on flowers and seeds	Brown 1967; Bright 1993; MacNay 1952a,b, 1954a-c; Majka et al. 2007a,c; McNamara 19911
3. *Perapion curtirostre* (Germar)	x	x	x	x		ME, NY	Palaearctic	2001, 2002	1968	Associated with *Rumex* sp., some adults were found on foliage of balsam fir (*Abies balsamea* (L.))	Majka et al. 2007a-c

48. Family **Curculionidae** Latreille, 1802 [the weevils or snout beetles] (including Scolytinae) [the bark and ambrosia beetles]

(Figs. 168-189, Table 49)

Body length 1.0-40.0 mm. Tarsal formula 5-5-5 or 4-4-4

Diagnosis. Body highly variable in form, usually broadly oval to elongate, robust, strongly sclerotized, convex, subglabrous or with bristles and/or scales; head with long or short snout (rostrum) (e.g. short in Scolytinae), labrum absent, gular sutures fused; antennae geniculate, usually with a long scape and compact club consisting of three antennomeres; maxillae reduced, with short rigid palps; abdomen with two basal ventrites connate; procoxae projecting, contiguous or separated, their cavities closed; meso- and metacoxae variable in shape; tarsi with penultimate article minute and concealed at base of lobed third tarsomere.

Bionomics. Adults and larvae are plant feeders (phytophagous), and some species are pests of trees and cultivated plants. They are associated with a variety of plants in many terrestrial and freshwater habitats, but have a narrow range of suitable plant host species. There are two major feeding types: 1) adults and larvae are polyphagous (adults feeding on foliage and larvae on roots), and 2) adults and larvae have restricted range of host plants, with adults feeding on flowers, foliage or plant reproductive structures, and larvae feeding internally in the stems, roots, leaves or plant reproductive structures (Anderson 2002).

Faunal Composition. Eighty-five species in 46 genera, most in *Otiorhynchus* (11).

Selected References. Anderson 1973, 1988, 1989, 1992, 1997, 2002, Anderson and Howden 1994, Anderson and Korotyaev 2004, Atkinson et al. 1991, Balsbaugh 1988, Barstow and Getzin 1985, Batra 1980, Batra et al. 1986, Becker 1977, Blossey 1993, Bouchard et al. 2005, Bousquet 1990a, Brandt et al. 1995, 1996, Bright 1976, 1988, 1991c, 1994, Bright and Bouchard 2008, Bright et al. 1992, Brodeur et al. 2001, Brown 1940a, 1950, 1965, 1967, Campbell et al. 1989, Carcamo et al. 2001, CFIA 2004, Chamberlin 1939, Chantal 1972, 1998, Clark 1971, Clausen 1978, Côté and Bright 1995, Diehl et al. 1997, Duncan 1996, Galford 1987, Harcourt et al. 1984a, Harris and Zwölfer 1971, Hatch 1971, Hight et al. 1995, Hoebeke and Wheeler 1983, Hoebeke and Whitehead 1980, Kissinger 1964, Kuhlmann et al. 2002, Laffin et al. 2005, Lambdin and Grant 1992, Loan 1971, MacNay 1952a,b, 1954a-c, Majka and Anderson 2007, Majka et al. 2007b,c, Marchant and Borden 1976, Mason and Huber 2002, Mason et al. 2003, Mattson et al. 1994, McAvoy et al. 1983, McCorquodale et

al. 2005, McLeod 1962, McNamara 1991m, Morris 1997, Mudge et al. 2001, Otway et al. 2005, Palm 1996, Peschken 1984a,b, Pinski et al. 2005, Poinar and Gyrisco 1964, Puttler et al. 1961, Rabaglia 2003, Rabaglia and Cavey 1994, Rabaglia and Valenti 2003, Schat et al. 2007, Sheppard 1955, Sing et al. 2005, Sleeper 1954, 1955, Smith 1959, Warner 1971, Warner and Negley 1976, Weiss and Gillot 1993, Westcott et al. 2006, Wheeler 1999b, Wheeler and Whitehead 1985, Witter and Fields 1977, Wood 1977, 1982, 1992, Wood and Bright 1992b

Table 49. Adventive species of Curculionidae recorded from eastern Canada.

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
1. *Amalorrhynchus melanarius* (Stephens)	×					CT, MA, WV	Palaearctic	1984	1950	On *Nasturtium officinale*	Anderson 2002; Anderson and Korotyaev 2004
2. *Amalus scortillum* (Herbst)	×	×	×		×	**AB, BC, MB, ON, SK**; AR, AZ, CA, CT, IA, IN, MN, NY, OR, UT, WA	Palaearctic	1927, 1961	1923	Associated with *Polygonum* sp. (Polygonaceae)	Anderson 1997; Brown 1940a; Bouchard et al. 2005; Majka et al. 2007c; McNamara 1991m
3. *Anisandrus dispar* (Fabricius)	×		×	×		**BC, ON**; DC, ID, MA, MD, ME, MI, NC, NJ, NY, OH, OR, PA, RI, UT, VA, WA, WV	Palaearctic	1898, 1909	<1817	Attacks weakened hardwoods or healthy trees	Atkinson et al. 1990; Bright 1976; CFIA 2004; Haack 2006; Humble 2001; Mattson et al. 1994 Rabaglia 2003; Wood 1977, 1982
4. *Archarius salicivorus* (Paykull)	×						Palaearctic	~2002	~2002	Associated with galls on *Salix*	Anderson 2002
5. *Barynotus moerens* (Fabricius)			×				Palaearctic	1946	1946	Associated with Asteraceae, Euphorbiaceae, Lamiaceae, Liliaceae, Primulaceae, and Violaceae; larvae are root feeders	Brown 1950, 1967; Bright and Bouchard 2008; Campbell et al. 1989; Morris 1997; Majka et al. 2007c; McNamara 1991m
6. *Barynotus obscurus* (Fabricius)	×	×	×	×	×	**BC**	Palaearctic	1839-1842, 1884, 1890	1839-1842	Polyphagous	Brown 1940a, 1950, 1967; Majka et al. 2007c; McNamara 1991m; Morris 1997
7. *Barynotus schöenherri* (Zetterstedt)	×	×	×	×	×	MA, ME, NY	Palaearctic	1867, 1884	1876	Adults feed on foliage	Brown 1950; Bright and Bouchard 2008; Majka et al. 2007c; McNamara 1991m
8. *Barypeithes pellucidus* (Boheman)	×	×	×	×	×	**BC, MB, ON**; CA, CT, IL, IN, MA, ME, NH, NJ, NY, OH, OR, PA, RI, VA, VT, WA, WI	Palaearctic	1936	1886, 1931, 1936	Adults feed on foliage of Anacardiaceae, Asteraceae, Fagaceae, Rossaceae, and Ulmaceae	Balsbaugh 1988; Bright and Bouchard 2008; Bouchard et al. 2005; Brandt et al. 1996; Campbell et al. 1989; Galford 1987; Hatch 1971; Majka et al. 2007b,c; McNamara 1991m; Morris 1997
9. *Brachysomus echinatus* (Bonsdorff)	×				×		Palaearctic	1938	1938	Polyphagous	Balsbaugh 1988; Bright and Bouchard 2008; Brown 1940a; McNamara 1991m; Morris 1997
10. *Calomycterus setarius* Roelofs	×					**ON**; CT, DC, IA, IL, IN, KS, MA, MD, MI, MO, NE, NY, PA, SC, VA, WI, WV	Palaearctic	1974	1929	Polyphagous; on red clover, soybean, ivy, rose, geranium, and other plants	Becker 1977; Bright and Bouchard 2008; Hoebeke and Wheeler 1983; Kissinger 1964; Mattson et al. 1994; McNamara 1991m
11. *Ceutorhynchus erysimi* (Fabricius)	×	×	×	×		**AB, BC, ON**; CT, IN, KS, MA, MI, MN, MO, NC, NE, NJ, NY, OH, OR, SC, VA, WI	Palaearctic	1933, 1965	1922	Associated with the introduced mustard *Capsella bursa-pastoris* (L.) Medok. (Brassicaceae)	Brown 1950, 1967; Bouchard et al. 2005; Campbell et al. 1989; Majka et al. 2007b,c; McNamara 1991m; Sleeper 1953

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
12. *Ceutorhynchus obstrictus* (Marsham)	x					**AB, BC, ON, SK**; throughout most of the USA	Palaearctic	1931, 1995, 2000	1931, 1935, 1995, 2000	Canola and other plants in the Brassicaceae	Brodeur et al. 2001; Campbell et al. 1989; Carcamo et al. 2001; Kuhlmann et al. 2002; Laffin et al. 2005; Mason et al. 2003; McLeod 1962
13. *Ceutorhynchus pallidactylus* (Marsham)			x			CT, MA, NY, RI	Palaearctic	1994	1900	Associated with *Brassica* spp. (Brassicaceae)	Majka et al. 2007b,c
14. *Ceutorhynchus rapae* Gyllenhal	x				x?	**AB, BC, MB, ON, SK,YK**; throughout the USA	Palaearctic	-	<1916	Associated with various species of Brassicaceae	Anderson 1997; Campbell et al. 1989; McNamara 1991m; Morris 1983
15. *Ceutorhynchus typhae* (Herbst)	x	x	x		x	**ON**; CT, CO, DC, GA, IA, IL, IN, KY, LA, MA, MD, ME, MI, NJ, NY, PA, TN, VA, WI	Palaearctic	1957	1957	Associated with *Capsella bursa-pastoris* (Brassiocaceae)	Anderson and Korotyaev 2004; Brown 1967; Bright and Bouchard 2008; Majka et al. 2007c; McNamara 1991m
16. *Cleonis pigra* (Scopoli)	x	x				MI, NY, PA	Palaearctic	1933, 1947	1929	Associated with *Cirsium arvense* and *C. vulgare*	Bouchard et al. 2005; Brown 1940a; Campbell et al. 1989; Majka et al. 2007c; McNamara 1991m; Peschken 1984a,b
17. *Crypturgus pusillus* (Gyllenhal)	x	x	x	x	x	**ON**; CT, MA, ME, NH, NJ, NY, PA, RI	Palaearctic	1910, 1911, 1921	1868	Found on dead or dying conifers	Bright 1976; Brockerhoff et al. 2006; CFIA 2004; Chamberlin 1939; Majka et al. 2007c; Mattson et al. 1977; McNamara 1991m; Wood 1982; Wood 1977, 1982
18. *Euophryum confine* (Broun)					x		New Zealand	1978	1978	Bores in dead wood	Bright et al. 1992; McNamara 1991m
19. *Glocianus punctiger* (C.R. Sahlberg)	x	x	x	x	x	**AB, BC, MB, ON, SK,YK**; widespread in the USA except for the southwest	Palaearctic	1940	?	Associated with *Taraxacum officinale* G.H.Weber *ex* Wiggers (Asteraceae)	Anderson 1997, 2002; Bouchard et al. 2005; Campbell et al. 1989; Majka et al. 2007c; McAvoy et al. 1983
20. *Gymnetron pascuorum* (Gyllenhal)	x		x	x		**BC, ON**; CA, CT, DE, GA, ID, IN, KY, MA, MD, MI, MO, NC, OH, OR, PA, RI, TN, VA	Palaearctic	1994	1953, 1956	Associated with *Plantago lanceolata* L. (Plantaginaceae)	Anderson 1973; Majka et al. 2007c; McCorquodale et al. 2005; McNamara 1991m; Otway et al. 2005; Sleeper 1954
21. *Hylastes opacus* Erichson	x					**ON**: OR, NY	Palaearctic	1995	1987, 1989	-	Bright and Skidmore 1997; Brockerhoff et al. 2006; CFIA 2004; Haack 2006; Hoebeke 1994; LaBonte et al. 2005; Mudge et al. 2001; Rabaglia 2003; Rabaglia and Cavey 1994; Wood 1992
22. *Hylastinus obscurus* (Marsham)	x		x			**BC, ON**; CA, CT, GA, ID, IN, MA, MD, MI, NH, NJ, NY, OH, OR, UT, WA	Palaearctic	1896, 1905, 1929	<1878, 1929	Preferred hosts are *Trifolium* spp. although also found on other Fabaceae	Atkinson et al. 1991; Bright 1976; CFIA 2004; Chamberlin 1939; Marchant and Borden 1976; McNamara 1991m; Rabaglia 2003; Wood 1977, 1982

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
23. *Hylobius transversovittatus* (Goeze)			×			**AB, BC, ON, MB**: CO, MD, NY, OR, PA, VA, WA	Palaearctic	1992	1992, 1993	Beneficial: larvae mine the roots of purple loose-strife	Anderson 2002; Batra et al. 1986; Blossey 1993; Hight et al. 1995; Majka et al. 2007b
24. *Hypera meles* (Fabricius)	×	×	×	×		**ON**; AR, CT, IA, MA, NH, MO, NJ, NY, PA, SC	Palaearctic	1939	1907	Associated with *Trifolium*, *Medicago*, and *Lotus* spp. (Fabiaceae)	Brown 1940a; Campbell et al. 1989; Majka et al. 2007c; McNamara 1991m
25. *Hypera nigrirostris* (Fabricius)	×	×	×	×	×	**BC, ON**; AL, CA, CT, DC, DE, ID, IN, MA, MD, ME, MI, MN, MO, MT, NC, ND, NH, NJ, NY, OH, OR, PA, RI, SC, SD, VA, VT, WA	Palaearctic	1901, 1917 1957	1873	Associated with *Trifolium* spp.	Bouchard et al. 2005; Brown 1940a; Campbell et al. 1989; MacNay 1954a-c; Majka et al. 2007b; McNamara 1991m; Weiss and Gillot 1993
26. *Hypera postica* (Gyllenhal)	×	×	×	×		**AB, ON**; throughout the USA	Palaearctic	1954, 1961	1902,	Associated with *Medicago sativa*; larvae feed on the buds and are harmful to seed crops	Campbell et al. 1989; Clausen 1978; Harcourt et al. 1984a; Loan 1971; Majka et al. 2007b,c; McLeod 1962; McNamara 1991m; Poinar and Gyrisco 1964; Puttler et al. 1961
27. *Hypera zoilus* (Scopoli)	×	×	×	×	×	**BC, ON**; throughout the USA	Palaearctic	1853, 1902	1853, 1880, 1902	Larvae feed on *Trifolium* spp. and *Medicago sativa*; adults are associated with plants in family Fabiaceae	Bouchard et al. 2005; Brown 1940a; Campbell et al. 1989; Clausen 1978; Majka et al. 2007b,c; McNamara 1991m
28. *Isochnus populicola* (Silfverberg)	×	×	×			**ON**; CT, ID, ME, MI, NJ, NY	Palaearctic	1964, 1977	1922, 1925	Associated with *Salix* and *Populus* spp.	Anderson 1989; Majka et al. 2007c; McNamara 1991m
29. *Larinus planus* (Fabricius)			×			**BC**; NY, OH	Palaearctic	1992	1929	Associated with *Cirsium* and *Centaurea*	Majka et al. 2007c; Mason and Huber 2002; Wheeler and Whitehead 1985
30. *Mecinus janthinus* (Germar)			×			**AB, BC**; CO, ID, MT, ND, OR, SD, UT, WA, WY	Palaearctic	1991, 1995	1991	Found in toadflax-infested areas	Majka et al. 2007c; Mason and Huber 2002; Schat et al. 2007; Sing et al. 2005
31. *Orchidophilus aterrimus* (Waterhouse)			×			NY	Japan, Oriental, and Pacific regions	1984	>1982	Associated with *Angraecum*, *Dendrobium*, *Cymbidium*, *Phalaenopsis*, *Sacolabium*, *Spathoglottis*, and *Vanda* spp. (Orchidaceae)	Majka et al. 2007c

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
32. *Otiorhynchus desertus* Rosenhauer					x		Palaearctic	1957	1957	-	Bright and Bouchard 2008; Brown 1967; McNamara 1991m; Morris 1997; Warner and Negley 1976
33. *Otiorhynchus ligneus* (Olivier)	x	x	x	x	x	ME	Palaearctic	1917, 1927, 1962	1917	Associated with Asteraceae, Brassicaceae, and Resedaceae	Bright and Bouchard 2008; Brown 1940a; Campbell et al. 1989; Chantal 1998; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Palm 1996; Warner and Negley 1976
34. *Otiorhynchus ovatus* (Linnaeus)	x	x	x	x	x	**AB. BC, MB, NT, ON, SK, YK**; throughout contiguous USA	Palaearctic	1839-1842, 1884	1839-1842	Adults are associated with Begoniaceae, Boraginaceae, Ericaceae, Fabaceae, Polygonaceae, Rosaceae, and Vitaceae	Anderson 1988, 1997; Bouchard et al. 2005; Brandt et al. 1995, 1996; Bright and Bouchard 2008; Campbell et al. 1989; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Warner and Negley 1976; Wheeler 1999b
35. *Otiorhynchus porcatus* (Herbst)	x		x		x	**ON**	Palaearctic	1932, 1937, 1965, 2009	1932	On *Saxifraga, Primula, Aster, Prunus, Syringa,* and *Viburnum*	Brown 1940a, 1967; Bright and Bouchard 2008; Campbell et al. 1989; Majka and MacIvor 2009a; McNamara 1991m; Warner and Negley 1976
36. *Otiorhynchus raucus* (Fabricius)	x		x			**AB [CNC], BC [CNC], ON**; ME	Palaearctic	1936, 2002	1936	Adults are polyphagous, larvae feed on fruit trees, vegetables, rhubarb and a variety of ornamental plants	Anderson 1992; Bright and Bouchard 2008; Campbell et al. 1989; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Warner and Negley 1976
37. *Otiorhynchus rugifrons* (Gyllenhal)	x	x	x		x		Palaearctic	1884, 1890, 1894	1884, 1890, 1894	Found on strawberry and saxifrage	Bright and Bouchard 2008; Brown 1940a, 1950; Campbell et al. 1989; Majka et al. 2007b; McNamara 1991m; Morris 1997; Warner and Negley 1976
38. *Otiorhynchus rugosostriatus* (Goeze)	x		x			**BC, ON**; AZ, CA, CT, DC, GA, ID, IN, KY, MD, MI, MT, NC, NJ, NM, NV, NY, OH, OR, PA, RI, SC, SD, TN, UT, VA, WA, WI, WV	Palaearctic	1914	1876	Nursery pest	Bright and Bouchard 2008; Campbell et al. 1989; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Warner and Negley 1976; Wheeler 1999b
39. *Otiorhynchus scaber* (Linnaeus)			x			-	Palaearctic	1951, 1957	1951, 1957	Found on foliage and bark of fir, pine, larch, oak, and herbaceous plants	Bright and Bouchard 2008; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
40. *Otiorhynchus singularis* (Linnaeus)	x	x	x	x	x	**BC, ON**; CT, DC, ID, MA, ME, NH, NY, OR, PA, WA	Palaearctic	1902, 1904, 1937	1872	Recorded in association with conifers, *Alnus*, *Corylus* and *Fagus* spp.	Bright and Bouchard 2008; Brown 1940a; Campbell et al. 1989; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Warner and Negley 1976
41. *Otiorhynchus sulcatus* (Fabricius)	x	x	x	x	x	**AB, BC, MB, ON, SK**; throughout the USA	Palaearctic	1884	1831	Pest in nurseries and greenhouses, larvae feed on roots	Anderson 1988; Bouchard et al. 2005; Bright and Bouchard 2008; Campbell et al. 1989; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Warner and Negley 1976; Wheeler 1999b
42. *Pelenomus waltoni* (Boheman)	x					**ON**	Palaearctic	1986, 1999	1986	-	Anderson and Korotyaev 2004; Bouchard et al. 2005
43. *Pentarthrum huttoni* Wollaston	x				x		Palaearctic	1934, 1996	1934	Commonly infests flooring	Campbell et al. 1989; MacNay 1952a,b, 1954a-c; McNamara 1991m
44. *Philopedon plagiatum* (Schaller)	x	x	x	x	x	**ON**	Palaearctic	1934, 1939, 1940, 1970	1934	Found on variety of cultivated plants and trees	Brown 1940a, 1950; Bright and Bouchard 2008; Chantal 1998; McNamara 1991m; Morris 1997
45. *Phyllobius intrusus* Kono	x	x				**BC**; ME, NH, NJ, NY, PA, RI, VT	Palaearctic (Japan)	1991, 1994, 2005	1947, 1949	Associated with *Thuja* spp. (Cupressaceae), *Chamaecyparis* spp. (Cupressaceae), and *Juniperus* spp. (Cupressaceae)	Bouchard 2008; Bright and Bouchard 2008; Campbell et al. 1989; Côté and Bright 1995; Duncan 1996; Majka et al. 2007b,c; Mattson et al. 1994
46. *Phyllobius oblongus* (Linnaeus)	x	x	x	x		**BC, ON**; CT, OH, MI, NJ, PA	Palaearctic	1928, 1970, 1974	1923	Adults associated with foliage of *Acer*, *Betula*, *Populus*, *Salix*, *Tilia*, *Ulmus* spp., and some fruit trees, berries and shrubs; larvae are rhizophagous	Bouchard et al. 2005; Bright and Bouchard 2008; MacNay 1954a-c; Majka et al. 2007c; Mattson et al. 1994; McCorquodale et al. 2005; McNamara 1991m; Morris 1997; Pinski et al. 2005; Witter and Fields 1977
47. *Polydrusus cervinus* (Linnaeus)	x		x	x		NH, NJ	Palaearctic	1987, 2001, 2002	1963	Adults feed on *Acer*, *Alnus*, *Betula*, *Corylus*, *Populus*, *Prunus*, *Quercus*, and *Salix* spp., larvae feed on roots of orchard grass (Poaceae)	Bouchard et al. 2005; Bright 1988; Bright and Bouchard 2008; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Warner 1971
48. *Polydrusus impressifrons* (Gyllenhal)	x	x	x			**MB, ON**; CT, MA, MI, NY, OH, OR	Palaearctic	1926, 1965, 1994	1906, 1913, 1914	Associated with *Salix* spp. and *Populus* spp.	Bright and Bouchard 2008; Campbell et al. 1989; Majka et al. 2007b,c; Mattson et al. 1994; McNamara 1991m; Sheppard 1955; Sleeper 1957

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
49. *Polydrusus sericeus* (Schaller)	×	×	×	×		**ON**; CT, IL, IN, MA, MI, NY, OH	Palaearctic	1941, 1960, 1987, 1991, 1996, 2001	1934	Adults associated with foliage of *Acer*, *Alnus*, *Betula*, *Corylus*, *Populus* and *Salix* spp. and some fruit trees and shrubs, larvae are rhizophagous	Bouchard et al. 2005; Bright and Bouchard 2008; Hoebeke and Wheeler 1983; Mattson et al. 1994; McCorquodale et al. 2005; Majka et al. 2007c; McNamara 1991m; Pinski et al. 2005; Warner 1971
50. *Poophagus sisymbrii* (Fabricius)	×						?	26 June 1967	26 June 1967	Associated with *Nasturtium* sp.	Anderson 2002; McNamara 1991m
51. *Rhinocyllus conicus* (Frölich)	×		×		×	**AB, ON, SK**; MD, PA	Palaearctic	1968, 1990s-2003	1968, 1975-79	Controls nodding thistle in SK	Batra 1980; Harris and Zwölfer 1971; Lambdin and Grant 1992; Mason and Huber 2002; McNamara 1991m; Peschken 1984a,b
52. *Rhinoncus bruchoides* (Herbst)	×						?	-	-	-	Bouchard et al. 2005
53. *Rhinoncus castor* (Fabricius)	×	×	×	×	×	**BC, ON**; throughout the USA	Palaearctic	1900-1907, 1946, ~1950, 1960	1895	Associated with *Rumex* spp. (Polygonaceae), and *Oenathe* spp. (Apiaceae)	Brown 1950; Bouchard et al. 2005; Hoebeke and Whitehead 1980; Majka et al. 2007c; McNamara 1991m; Otway et al. 2005
54. *Rhinoncus pericarpius* (Linnaeus)	×	×	×	×	×	**AB, BC, ON**; MA, NY, OR, WA	Palaearctic	1968, ~1950, 2001, 2003	1928, 1929	Associated with *Rumex* spp. (Polygonaceae)	Brown 1950; Bouchard et al. 2005; Hoebeke and Whitehead 1980; Majka et al. 2007b,c; McNamara 1991m; Otway et al. 2005; Westcott et al. 2006
55. *Rhinoncus perpendicularis* (Reiche)	×					**ON**	Palaearctic	1999	-	-	Anderson and Korotyaev 2004; Bouchard et al. 2005
56. *Rhinus antirrhini* (Paykull)	×	×	×	×	×	**AB, BC, MA, ON, SK**; CA, CO, CT, ID, IL, IN, MA, MT, NC, NJ, VA, WA, WI	Palaearctic	1917, 1930	1909	Associated with *Linaria vulgaris* P. Mill. (Scrophulariaceae)	Anderson 1973; Majka et al. 2007b,c; McLeod 1962; McNamara 1991m; Sing et al. 2005; Smith 1959
57. *Rhinus tetrum* (Fabricius)	×	×	×	×		**BC, ON**; throughout the USA	Palaearctic	1900-1907	<1916	Recorded from mixed forest on foliage of *Verbascum thapsus* L. (Scrophulariaceae)	Anderson 1973; Majka et al. 2007b,c; McCorquodale et al. 2005; McNamara 1991m
58. *Sciaphilus asperatus* (Bonsdorff)	×	×	×	×	×	**AB, BC, MB, ON**; CT, ID, MA, MD, ME, NC, NH, NJ, NY, SD, VT, WI	Palaearctic	1884	1880, 1888	Adults associated with foliage of *Acer*, *Betula*, some fruit trees and shrubs; larvae are rhizophagous	Brown 1940a, 1967; Bouchard et al. 2005; Bright and Bouchard 2008; Campbell et al. 1989; Hatch 1971; Majka et al. 2007c; Mattson et al. 1994; McNamara 1991m; Morris 1997; Pinski et al. 2005; Witter and Fields 1977
59. *Scolytus mali* (Bechstein)	×					**ON**; CT, MA, NJ, NY, PA	Palaearctic	1945, 1949	<1868	Vector of Dutch elm disease fungus	Brockerhoff et al. 2006; Brown 1950; CFIA 2004; Mattson et al. 1994; McNamara 1991m; Rabaglia 2003; Wood 1977, 1982

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
60. *Scolytus multistriatus* (Marsham)	×	×	×			**BC, MB, ON**; throughout the USA	Palaearctic	1946, 1975, 2001	1909, 1934	Associated with *Ulmus* spp., major vector of Dutch elm disease fungus	Allen and Humble 2002; Bellows et al. 1998; Bright 1976; Brockerhoff et al. 2006; CFIA 2004; Chamberlin 1939; Clausen 1978; Majka et al. 2007c; Marchant and Borden 1976; Mattson et al. 1994; McNamara 1991m; Wood 1977, 1982
61. *Scolytus rugulosus* (P.W.J. Müller)	×	×	×	×	×	**BC, ON**; throughout the USA	Palaearctic	1917	1878, 1834	Associated with species of *Malus*, *Prunus*, and *Pyrus* and sometimes with *Crataegus*, *Cydonia* and *Ulnus* spp.; major pest; generally attacks damaged trunks	Bright 1976; Brockerhoff et al. 2006; CFIA 2004; Chamberlin 1939; Majka et al. 2007b,c; Marchant and Borden 1976; Mattson et al. 1994; McNamara 1991m; Rabaglia 2003; Wood 1977
62. *Sitona cylindricollis* (Fahraeus)	×	×	×	×		**AB, BC, MB, NT, ON, SK,YT**; throughout the USA	Palaearctic	1924, 1939, 1966	1924, 1925, 1933	Associated with *Melilotus*, *Medicago*, and *Trifolium* spp.	Bouchard et al. 2005; Bright 1994; Bright and Bouchard 2008; Brown 1940a; Campbell et al. 1989; Clausen 1978; Loan 1971; Majka et al. 2007c; McLeod 1962; McNamara 1991m; Morris 1997
63. *Sitona hispidulus* (Fabricius)	×	×	×	×	×	**AB, BC, ON, NT, SK**; NJ, TX	Palaearctic	1926, 1913, 1940, <1957, 1961	1875	Associated with many species of clovers, alfalfa, and other Fabaceae	Bouchard et al. 2005; Bright 1994; Bright and Bouchard 2008; Campbell et al. 1989; Majka et al. 2007c; McNamara 1991m; Morris 1997
64. *Sitona lepidus* Gyllenhal [previously listed as *S. flavescens* (Marsham)]	×	×	×	×	×	**AB, BC, MB, ON, SK?**; CA, CT, CO, DC, FL, IA, ID, IN, MI, MN, MT, NJ, NY, OH, OR, PA, SD, TX, WA, WI	Palaearctic	1839-1842, 1902, 1928, 1962	1839-1842	Associated with species of alfalfa, clovers, and numerous Fabaceae	Bouchard et al. 2005; Bright 1994; Bright and Bouchard 2008; Campbell et al. 1989; Gerard and Hackell 2005; Majka et al. 2007c
65. *Sitona lineellus* (Bonsdorff)	×	×	×	×	×	**AB, BC, MB, NT, ON, SK,YT**; AK	Palaearctic	<1759, 1925	<1830		Bain et al. 2009; Bouchard et al. 2005; Bright 1991m; Bright and Bouchard 2008; Brown 1967; Campbell et al. 1989; McNamara 1991i
66. *Sitophilus granarius* (Linnaeus)	×		×	×	×	**BC, MB, ON**; throughout the USA	Cosmopolitan	<1620 1621-1673, 1716-1760, 1910, 1970, 1975	<1620 <1876	Pest of stored grain, found in granaries, grain elevators and flour mills, feed on grain and flour	Bain and Prévost 2010; Bain et al. 2009; Campbell et al. 1989; Majka et al. 2007c; McCorquodale et al. 2005; McNamara 1991m
67. *Sitophilus oryzae* (Linnaeus)	×		×	×	×	**BC, ON**; throughout the USA	Cosmopolitan	1850, 1954, 1994	1670	Pest of stored grain, feed on grain and flour, found also in ripening cereal crops	Bain 1999; Campbell et al. 1989; Majka et al. 2007c; McCorquodale et al. 2005; McNamara 1991m

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
68. *Sitophilus zeamais* Motschulsky	?					**MB, ON**	Palaearctic	-	-	Pest of stored grain, feed on grain and flour, found also in ripening cereal crops	Campbell et al. 1989; McNamara 1991m
69. *Strophosoma melanogrammum* (Forster)	×		×	×	×	**BC, ON**; MA, NJ,	Palaearctic	1902, 1916, 1924, 1929, <1957, 1983	1885, 1888	Found on foliage of broad-leaved trees and shrubs	Bright and Bouchard 2008; Brown 1940a; Mattson et al. 1994; McNamara 1991m; Morris 1997
70. *Trachodes hispidus* (Linnaeus)					×		?	1951	1957	Boring in rotten wood of *Quercus* spp.	Brown 1967; Lindroth 1957; McNamara 1991d
71. *Trachyphloeus aristatus* (Gyllenhal)	×		×	×		**MB, ON, SK**; ME	Palaearctic	1964, 2003, 2005	1964, 2003	Found in poplar forest with *Fragaria* sp. in understory, and in *Quercus* seedlings	Bright and Bouchard 2008; Brown 1965; Majka et al. 2007c; McNamara 1991m; Morris 1997
72. *Trachyphloeus bifoveolatus* (Beck)	×	×	×	×	×	**AB, BC, ON**; CT, ID, ME, MI, NY, OR, WA	Palaearctic	1928, 1936, 1948, <1957	1876, 1917	Polyphagous	Barstow and Getzin 1985; Bouchard et al. 2005; Bright and Bouchard 2008; Brown 1940a, 1950, 1965; Majka et al. 2007c; McNamara 1991m; Morris 1997; Sleeper 1955
73. *Trachyphloeus spinosus* (Goeze) [previously listed as *T. asperatus* Boheman]			×			**ON**; MA, ME, NH, NY, OR, VT	Palaearctic	1916, 1924	1843	On *Rumex* and *Lotus* spp.	Alonso-Zarazaga 2008; Bright and Bouchard 2008; Brown 1965; Majka et al. 2007c; McNamara 1991m; Morris 1997; Sleeper 1955
74. *Trichosirocalus horridus* (Panzer)			×			**AB, BC**	Palaearctic	1980s	1980s	Beneficial: attacks nodding, plume-less and native thistles	http://www.cwf-fcf.org/invasive/chooseSC.asp
75. *Tropiphorus elevatus* (O.F. Müller) [the valid name for *T. carinatus* (O.F. Müller) is *T. elevatus* (O.F. Müller)]					×		Palaearctic	1951	1951	Phytophagous, found in shaded and damp woodlands	Brown 1967; Majka and Anderson 2007; McNamara 1991m; Morris 1997
76. *Tropiphorus obtusus* (Bonsdorff)			×				Palaearctic	1933	1933, 1947	Found in shaded and damp woodlands and alpine areas in Europe, adults associated with plants of the families Asteraceae, Plygonaceae and Euphorbiaceae	Brown 1940a, 1950; Bright and Bouchard 2008; Campbell et al. 1989; Majka and Anderson 2007; Majka et al. 2007c; McNamara 1991m; Morris 1997

Taxon	QC	NB	NS	PE	NL	Other Nearctic distribution	Original distribution	First Canadian records	First NA records	Habitat/Damage	References
77. *Tropiphorus terricola* (Newman)	x	x	x	x	x		Palaearctic	1913, 1917, 1936, 1990	1913, 1917, 1936	Associated with plants from the families Apiaceae (*Aegopodium podagrara* L.), and Asteraceae (*Centurea*, *Chrysanthemum* spp.)	Bright and Bouchard 2008; Brown 1940a, 1967; Campbell et al. 1989; Majka and Anderson 2007; Majka et al. 2007b,c; McNamara 1991m; Morris 1997
78. *Tychius meliloti* Stephens	x	x	x	x		**MB, ON, SK**	Palaearctic	1975, 1978, 1988, 1995	1975, 1978, 2000	Associated with sweet clovers, *Melilotus* spp.	Anderson and Howden 1994; Bouchard et al. 2005; Majka et al. 2007b,c; McCorquodale et al. 2005; Westcott et al. 2006
79. *Tychius picirostris* (Fabricius)	x	x	x	x	x	**AB, BC, MB, ON, SK**; throughout the USA	Palaearctic	1953	1908	Associated with *Trifolium repens* L. and *T. hybridum* L. (Fabaceae)	Anderson and Howden 1994; Bouchard et al. 2005; Campbell et al. 1989; Diehl et al. 1997; Majka et al. 2007b,c; McNamara 1991m
80. *Tychius stephensi* Schönherr	x	x	x	x		**AB, BC, ON**; throughout the USA	Palaearctic	1940	1913	Associated with *Trifolium pratense* L. (Fabaceae)	Anderson and Howden 1994; Bouchard et al. 2005; Campbell et al. 1989; Clark 1971; Majka et al. 2007c; McNamara 1991m
81. *Tomicus piniperda* (Linnaeus)	x					**ON**; MN to ME, OH	Palaearctic	1993	1991, 1992	Phytophagous; pest of Christmas trees; has displaced the native pine engraver in BC	Anderson 2002; Allen and Humble 2002; Brockerhoff et al. 2006; CFIA 2004; Chamberlin 1939; Ciesla 2003; Haack 2006; Hoebeke 1994; Humphreys and Allen 1998; Mattson et al. 1994; Rabaglia 2003
82. *Trypodendron domesticum* (Linnaeus)				x		**BC**	Palaearctic	1997, 1998	1997, 1998	In association with dead wood or dying trees	CFIA 1997, 1998, 2004; Humble 2001
83. *Xyleborinus saxesenii* (Ratzeburg)	x		x			**BC, ON**; AL, AR, AZ, CA, CT, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, NH, NJ, NY, OH, OR, PA, SC, TN, TX, UT, VA, WA	Palaearctic	1928, 1993	1890 [CNC], 1892 [CNC], 1915	Found on many trees and shrubs	Atkinson and Peck 1994; Chamberlin 1939; Humble 2001; Mattson et al. 1994; Rabaglia 2003; Wood 1977, 1982
84. *Xyleborus atratus* Eichhoff	x		x			**ON**; FL, GA, MD, ME, TN, VA, WV	Palaearctic (Asia)	1985	<1987	On pine and a wide variety of deciduous trees	Atkinson, et al. 1990; Bright 1976; CFIA 2003, 2004; Haack 2006; Humble 2001; Mattson et al. 1994;
85. *Xylosandrus germanus* (Blandford)	x		x			**BC, ON**; AL, CT, GA, IL, IN, KY, LA, MD, MI, MS, NJ, NY, OH, OK, OR, PA, RI, TN, TX, WA	Palaearctic (Asia)	1982, 1995	1931, 1932	Vector of Dutch elm disease; vigorous or stressed hosts and recently cut material	CFIA 2003, 2004; Chamberlin 1939; Chapin and Oliver 1986; Humble 2001; LaBonte et al. 2005; Marchant and Borden 1976; Mattson et al. 1994; Rabaglia 2003; Rabaglia and Valenti 2003; Rabaglia et al. 2006; Wood 1977, 1982

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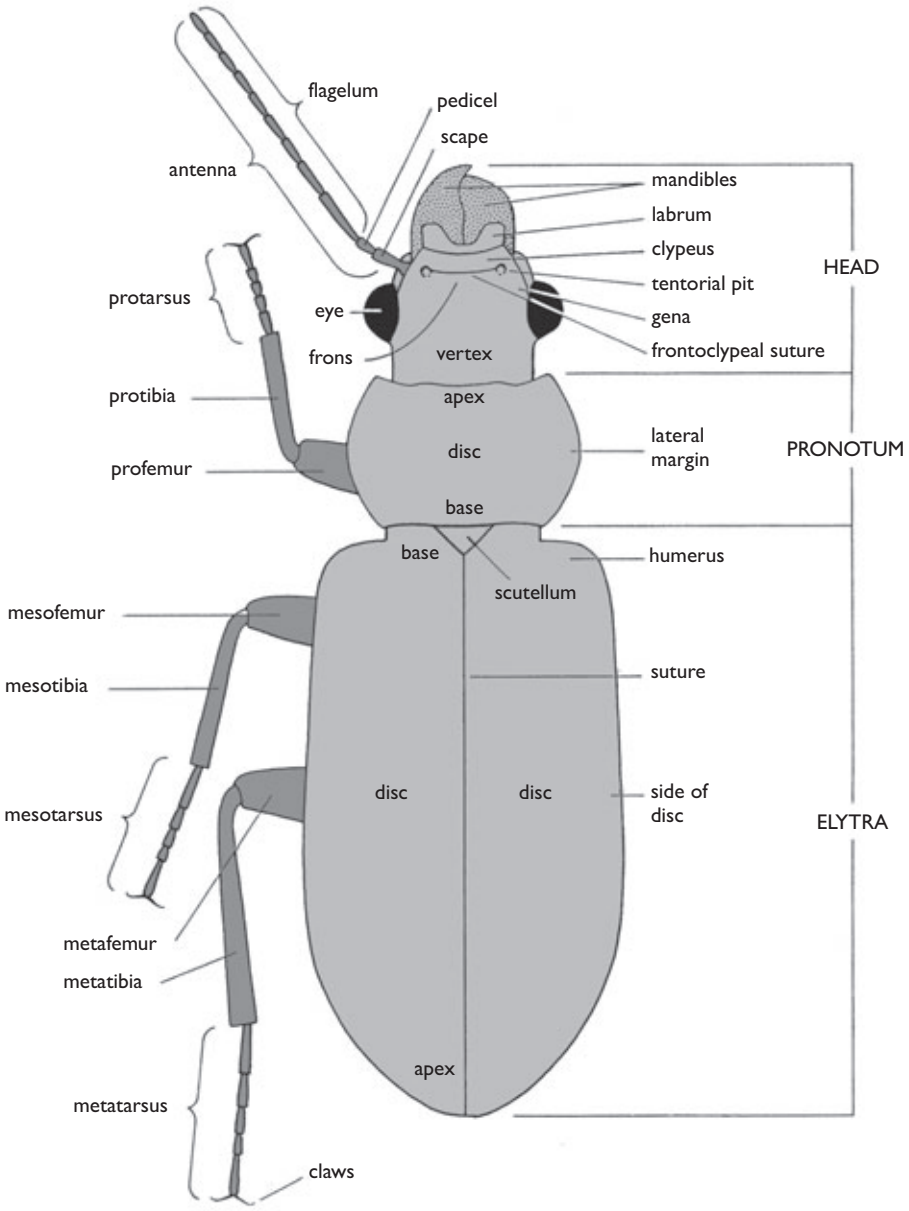


Figure 1. Body division in Coleoptera (Adephaga), dorsal view (after Klimaszewski & Watt 1997, slightly modified).

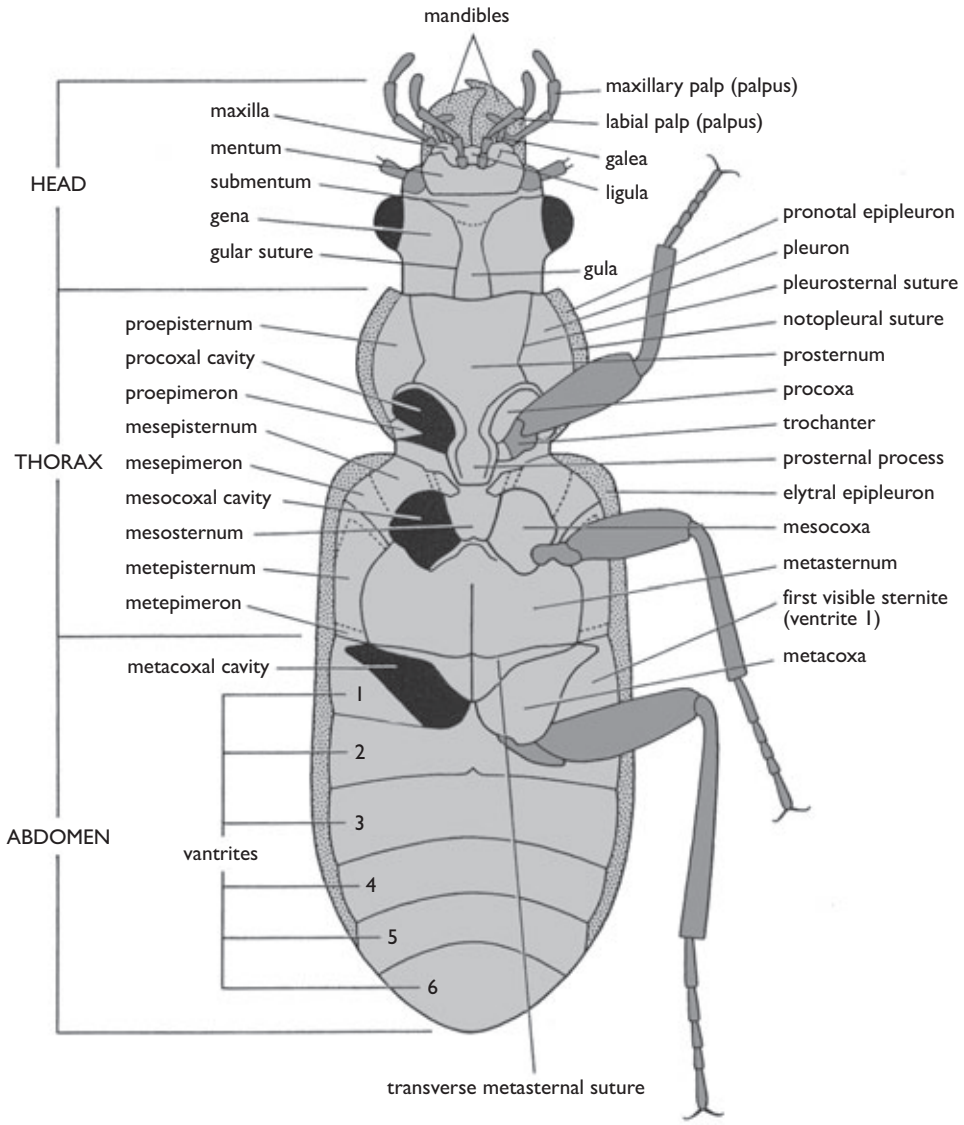


Figure 2. Body division in Coleoptera (Adephaga), ventral view (after Klimaszewski & Watt 1997, slightly modified).

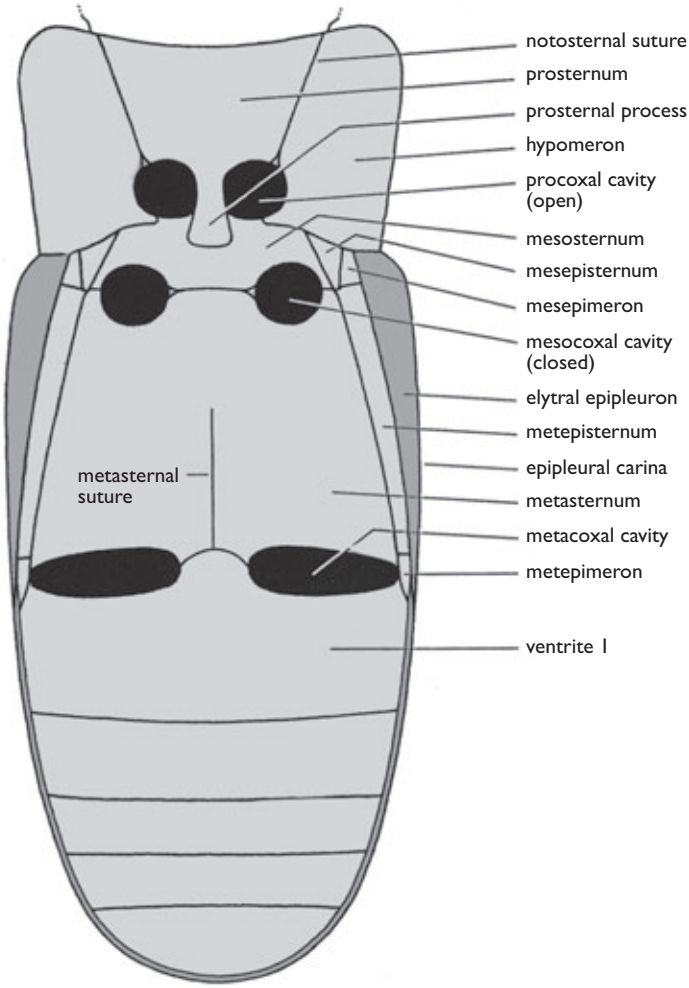
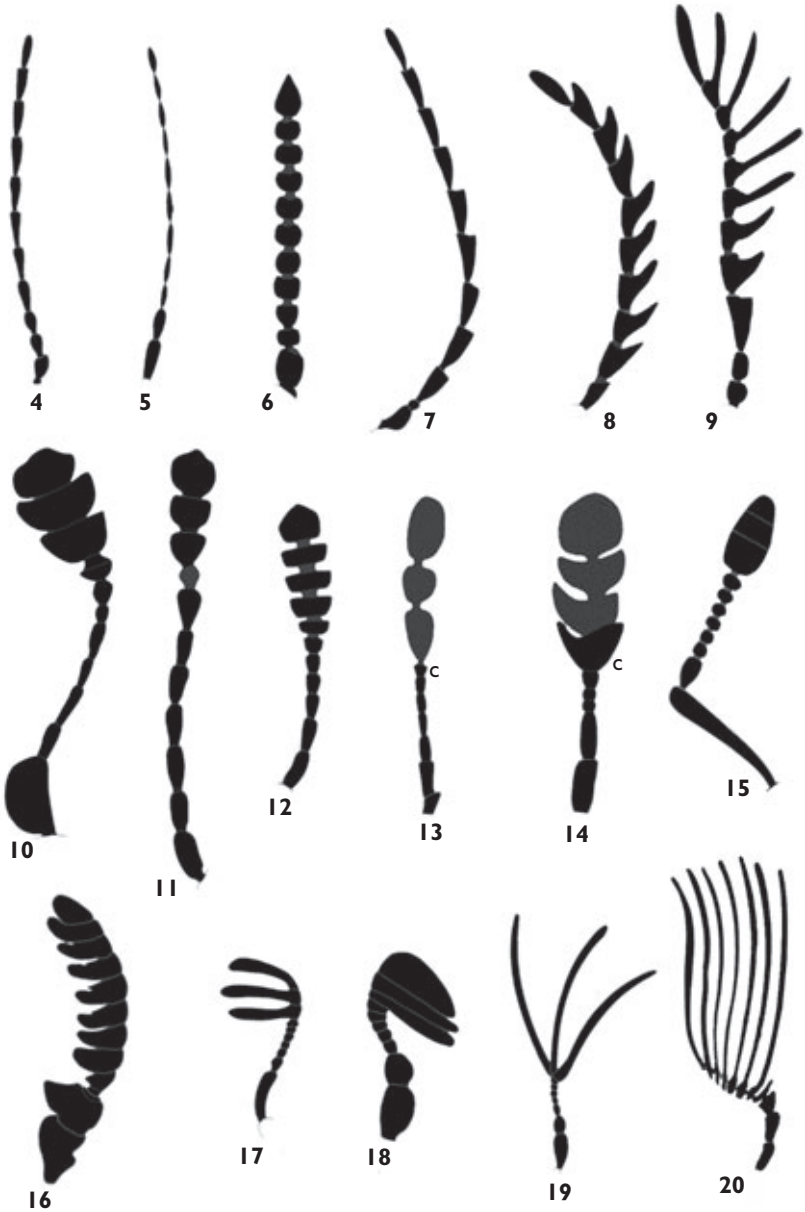
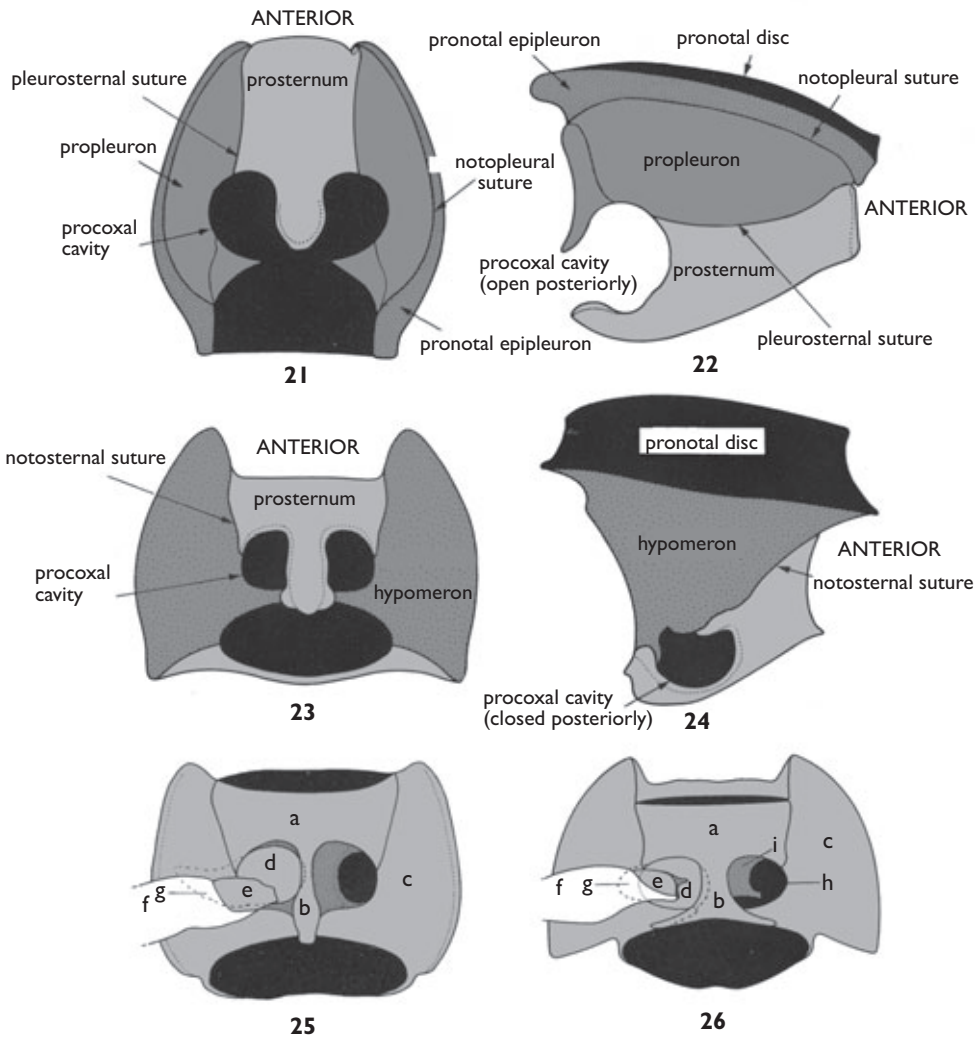


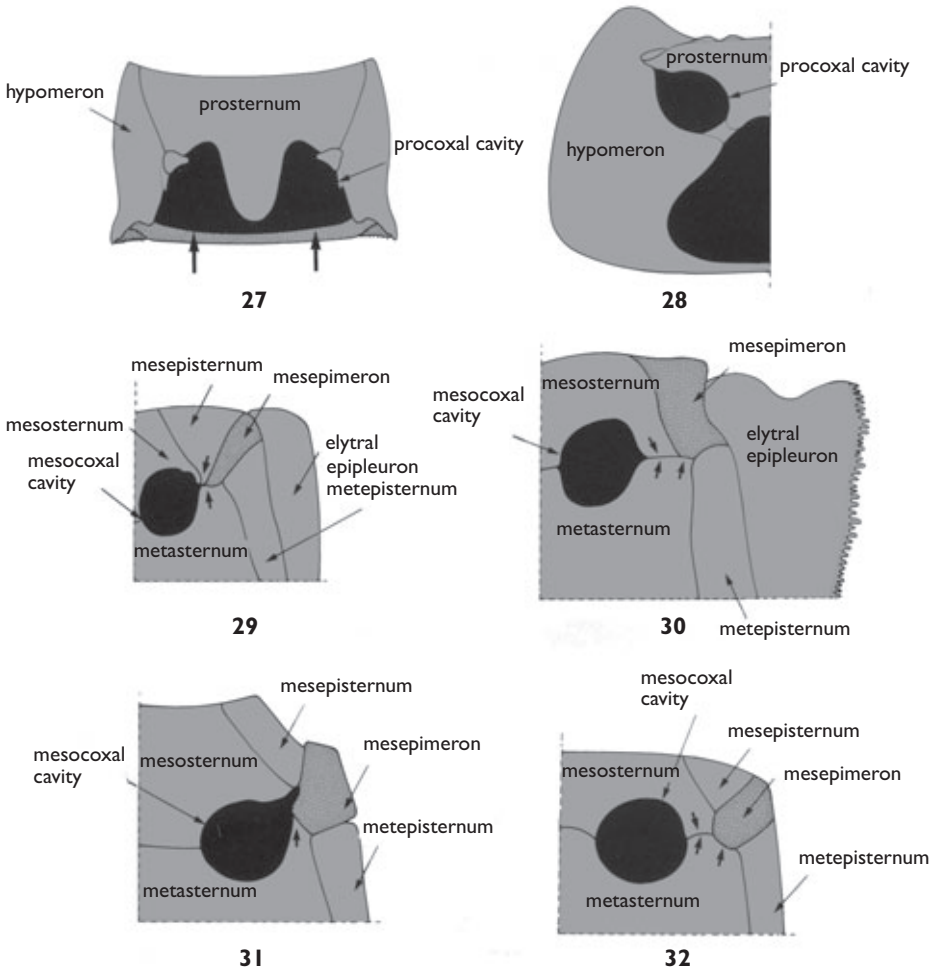
Figure 3. Body division in Coleoptera (Polyphaga), ventral view (after Klimaszewski & Watt 1997, slightly modified).



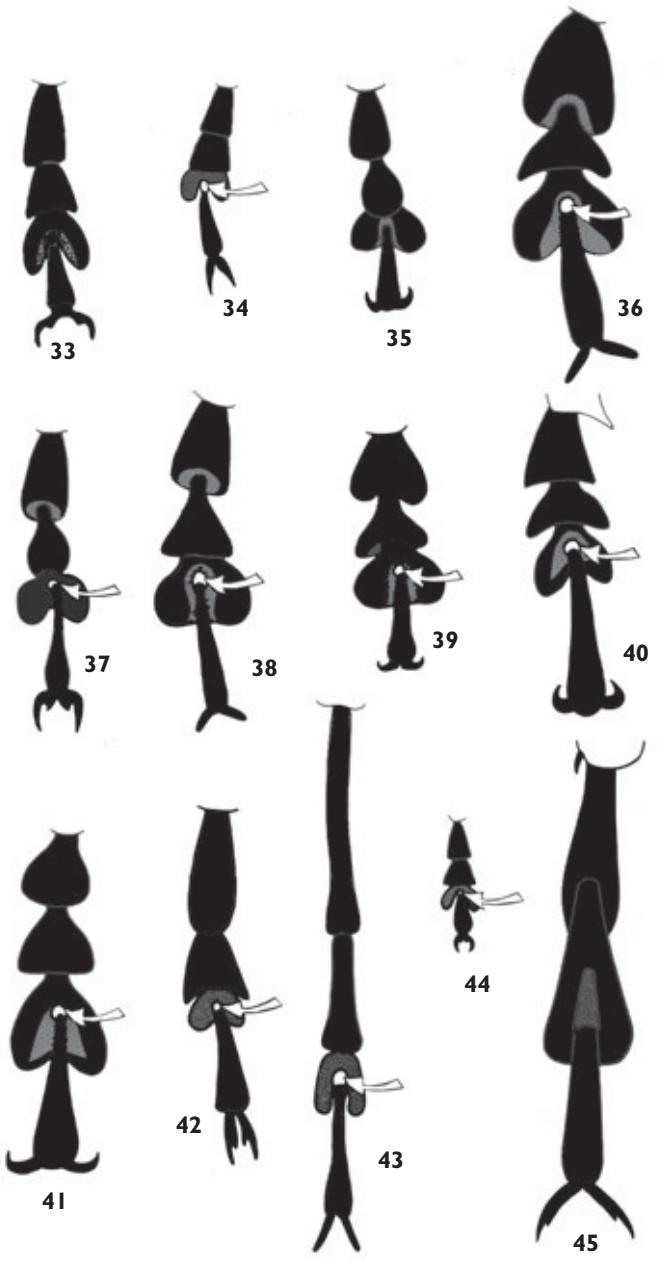
Figures 4–20. Major types of antennae in Coleoptera: **4, 5** filiform (e.g., Staphylinidae, Carabidae) **6** moniliform (e.g., Rhysodidae) **7** serrate **8, 9** pectinate **10** antenna with abrupt club (e.g., Nitidulidae) **11** with gradual club and reduced article 8 (e.g., Leiodidae) **12** with evenly developed club (e.g., Leiodidae) **13, 14** with variously modified article preceding club, a couple (c) (e.g., Hydrophilidae) **15** geniculate (e.g., Curculionidae) **16** extended (e.g., Dryopidae) **17, 18** flabellate **19, 20** flabellate (after Klimaszewski & Watt 1997, slightly modified).



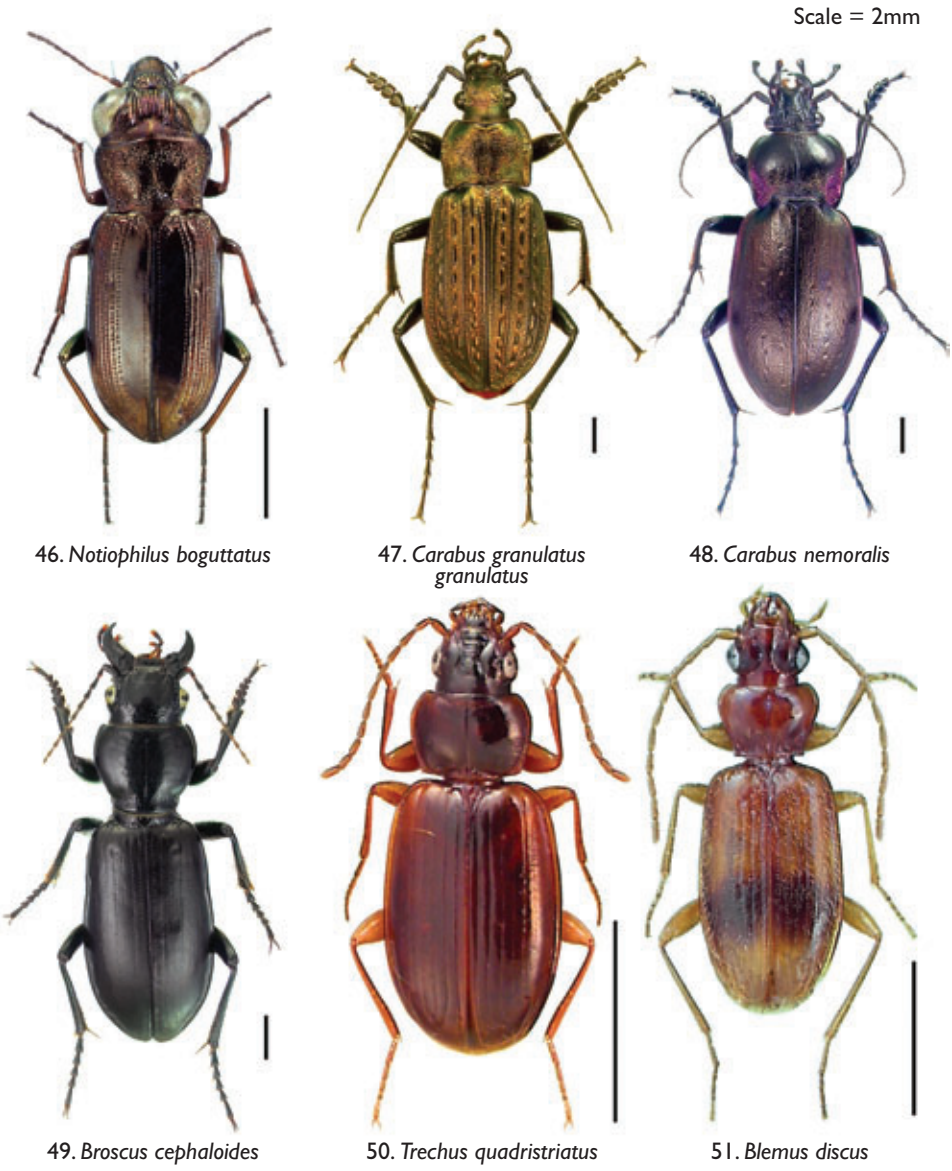
Figures 21–26. Division of prothorax in Adepahaga and Polyphaga (Coleoptera): **21, 22** ventral and lateral view, Adephaga **23, 24** ventral and lateral view, Polyphaga **25, 26** two types of procoxal closures, **a** prosternum **b** prosternal process **c** hypomeron **d** coxa **e** trochanter **f** femur **g** concealed membranous extension **h** aperture **i** membrane (after Klimaszewski & Watt 1997, slightly modified).



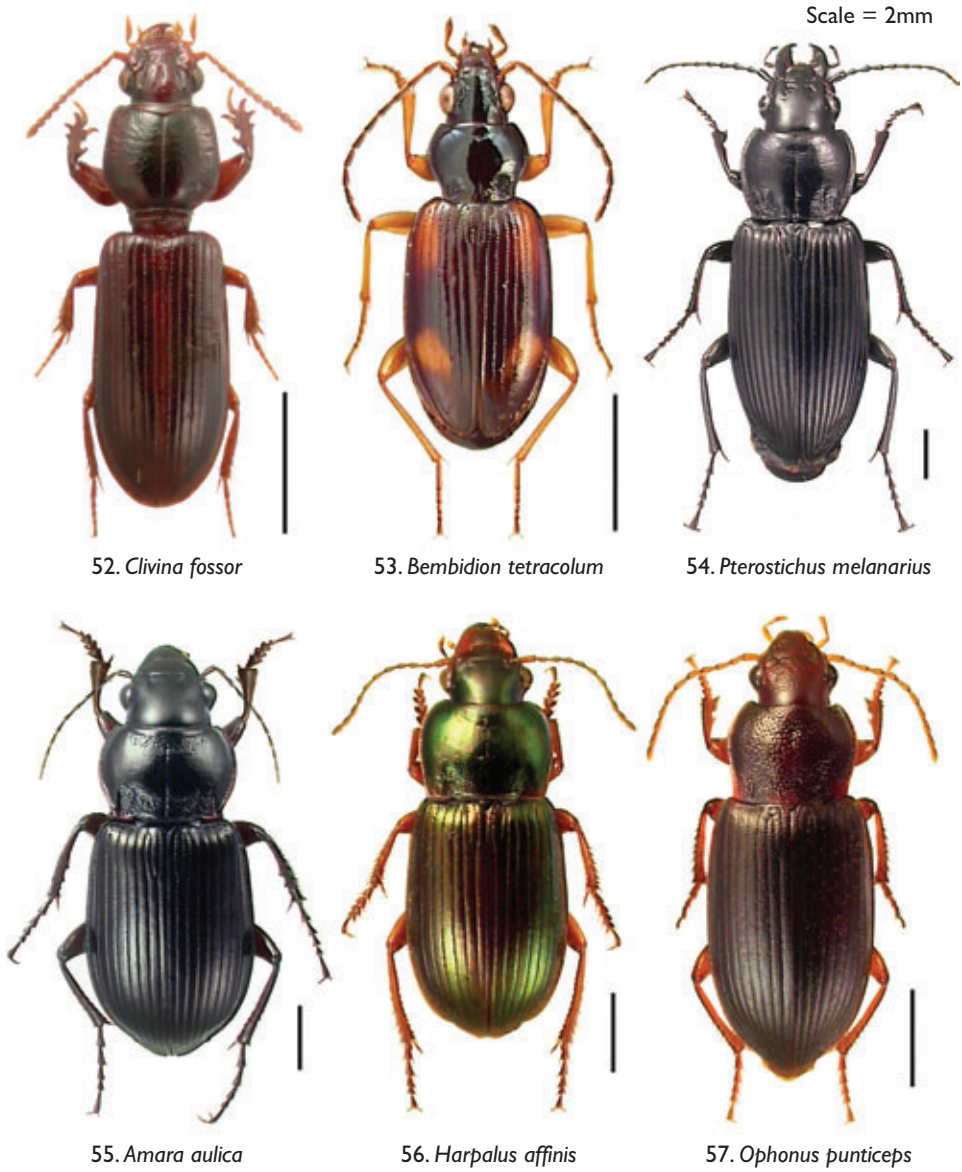
Figures 27–32. Types of coxal closure: **27** procoxae completely opened behind (Buprestidae) **28** procoxal cavity closed (Hydrophilidae) **29** mesocoxal cavity opened laterally (Mycetophagidae) **30** mesocoxal cavity closed laterally (Colydiidae) **31** mesocoxal cavity open laterally (Cucujidae) **32** mesocoxal cavity closed laterally (Erotylidae) (after Klimaszewski & Watt 1997, slightly modified).



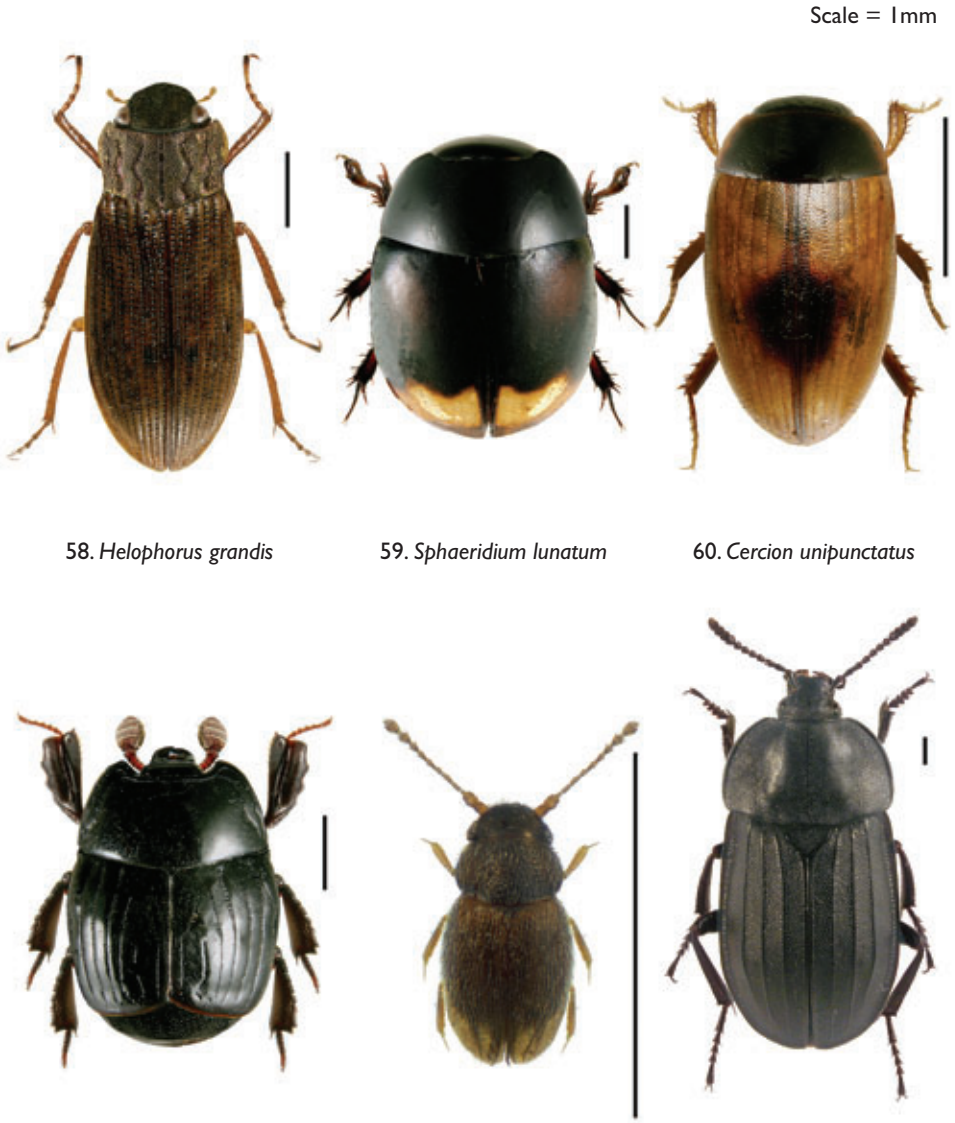
Figures 33–45. Protarsal configuration in Chrysomeloidea, Curculionoidea, tarsi 5-5-5 with reduced 4th article (Figs. **33–43**), and tarsi 4-4-4 with reduced 3rd article (Figs. **44, 45**): **37–39** Chrysomelidae **40** Cerambycidae **41** Curculionidae **42, 43** Anthribidae **44** Brentidae **45** Coccinellidae (after Klimaszewski & Watt 1997, slightly modified).



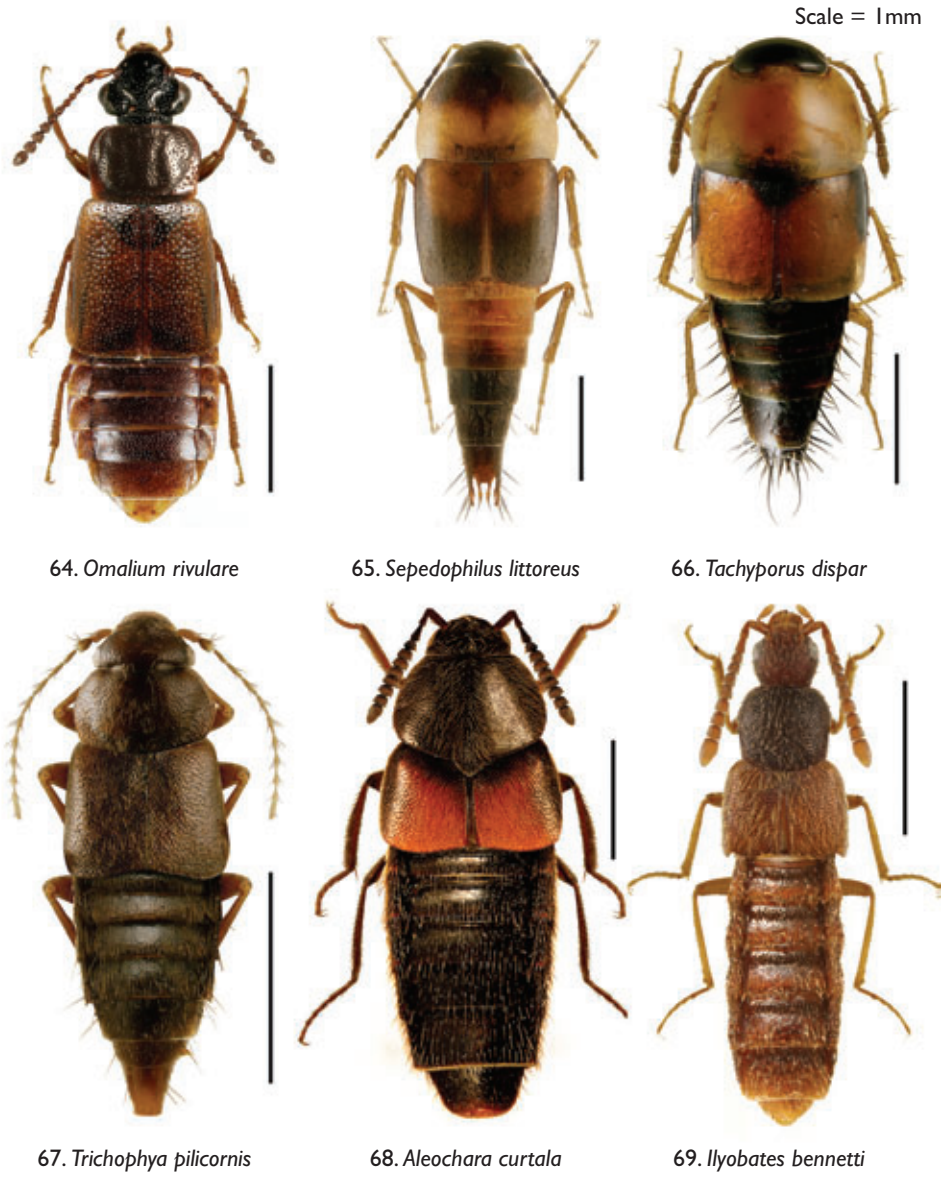
Figures 46–51. Examples of adventive species of Carabidae (eastern Canada).



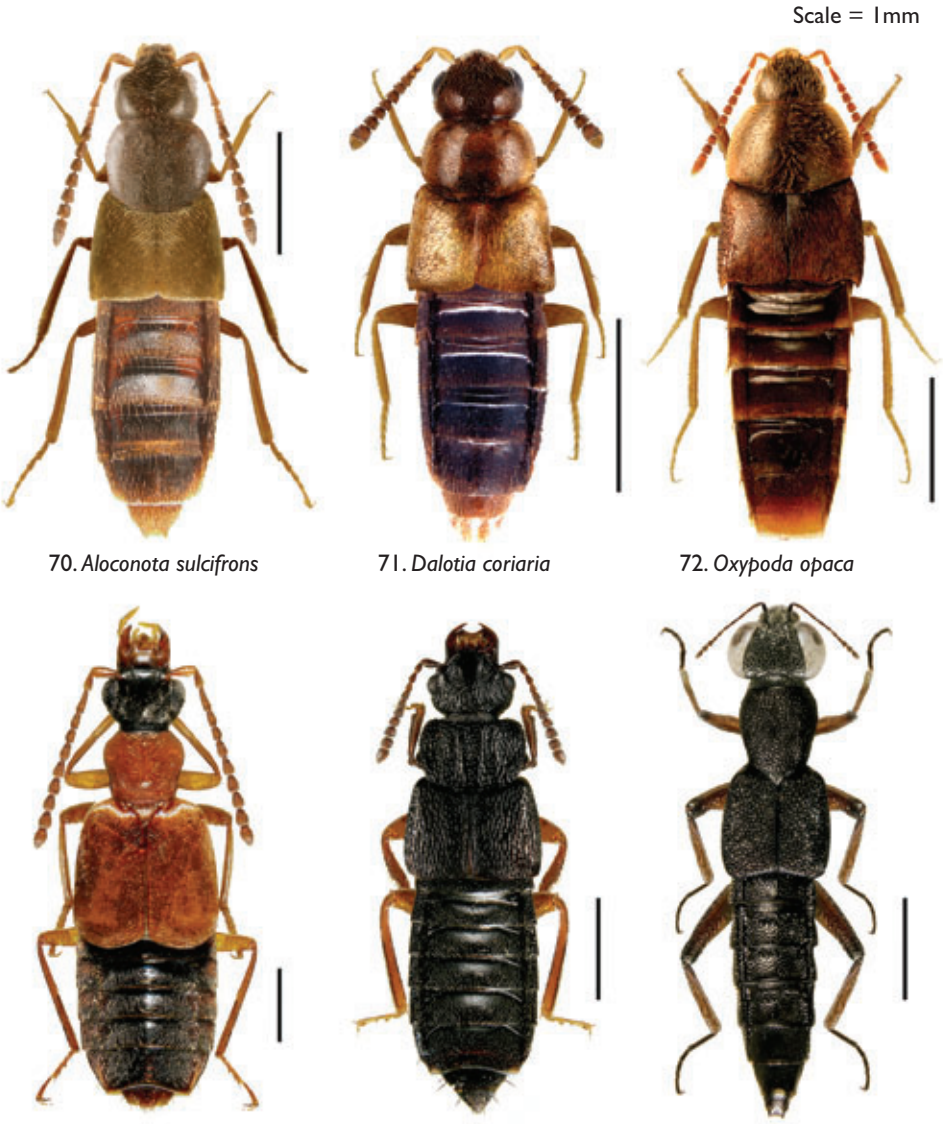
Figures 52–57. Examples of adventive species of Carabidae (eastern Canada).



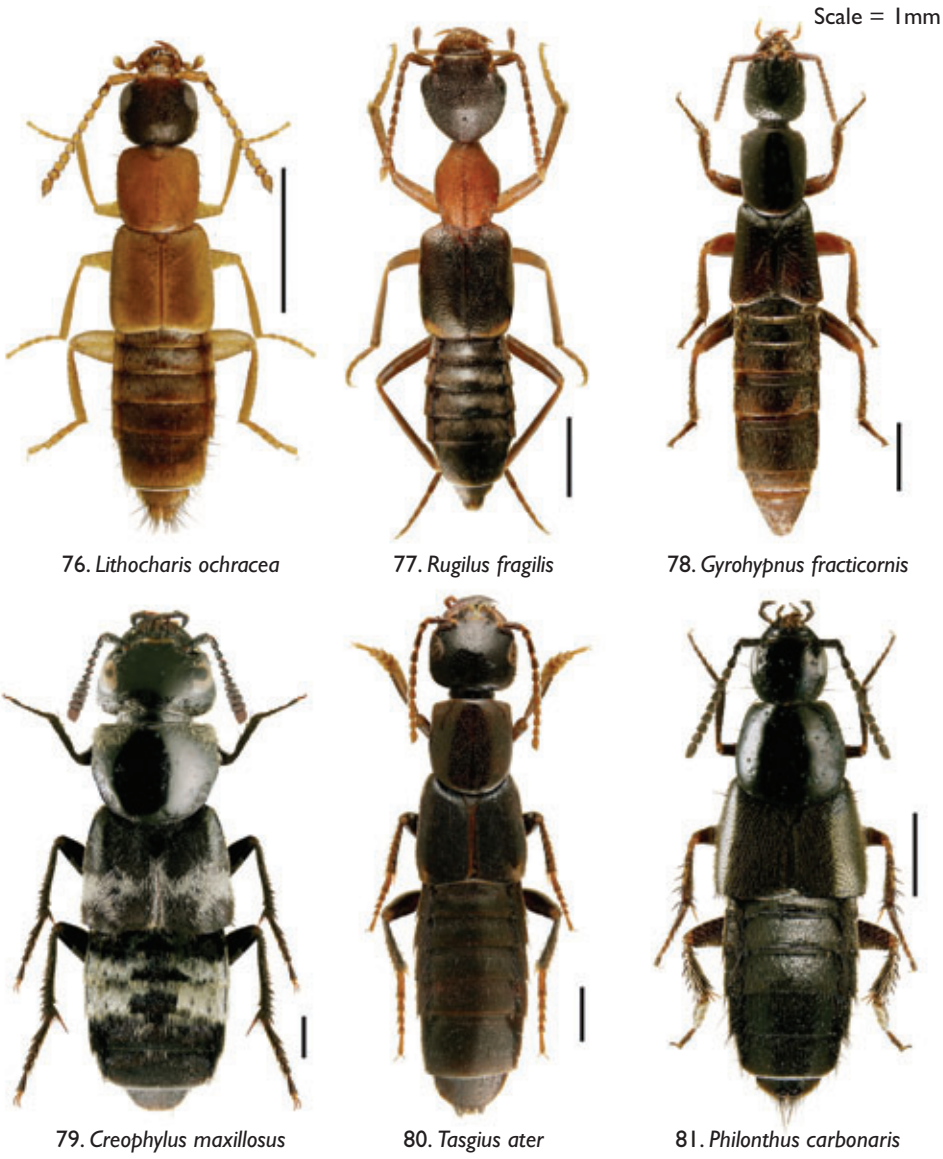
Figures 58–63. Examples of adventive species of Hydrophilidae (Figs. **58–60**); Histeridae (Fig. **61**); Ptiliidae (Fig. **62**), and Silphidae (Fig. **63**) (eastern Canada).



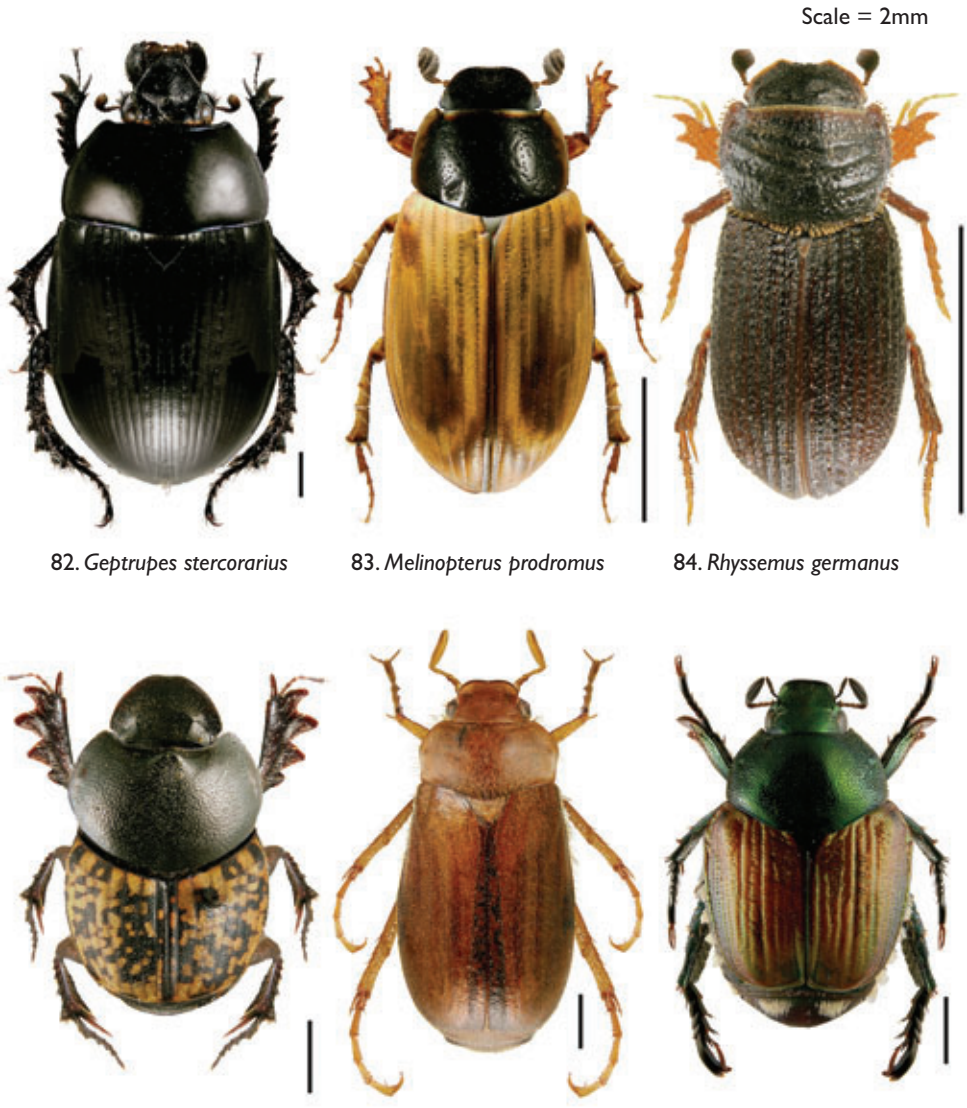
Figures 64–69. Examples of adventive species of Staphylinidae (eastern Canada).



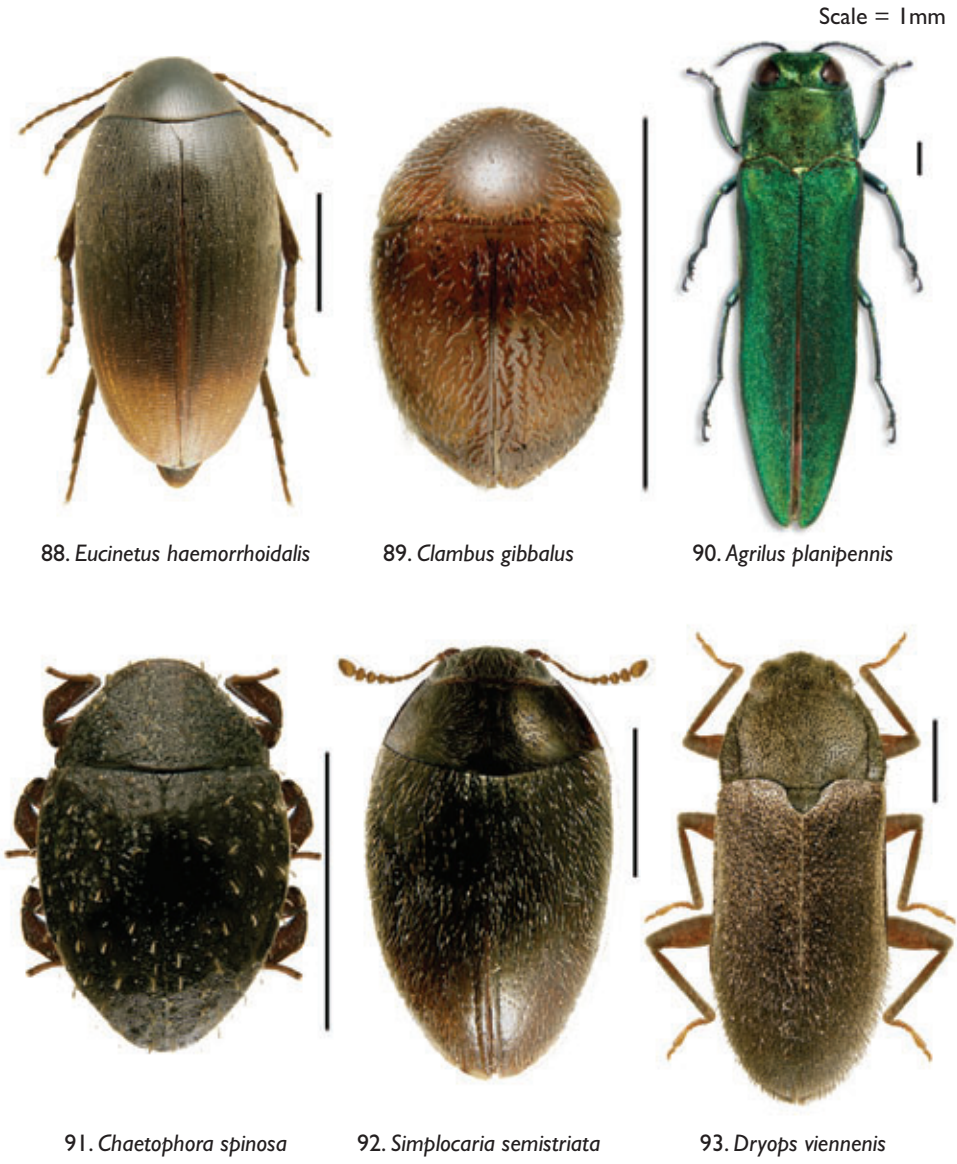
Figures 70–75. Examples of adventive species of Staphylinidae (eastern Canada).



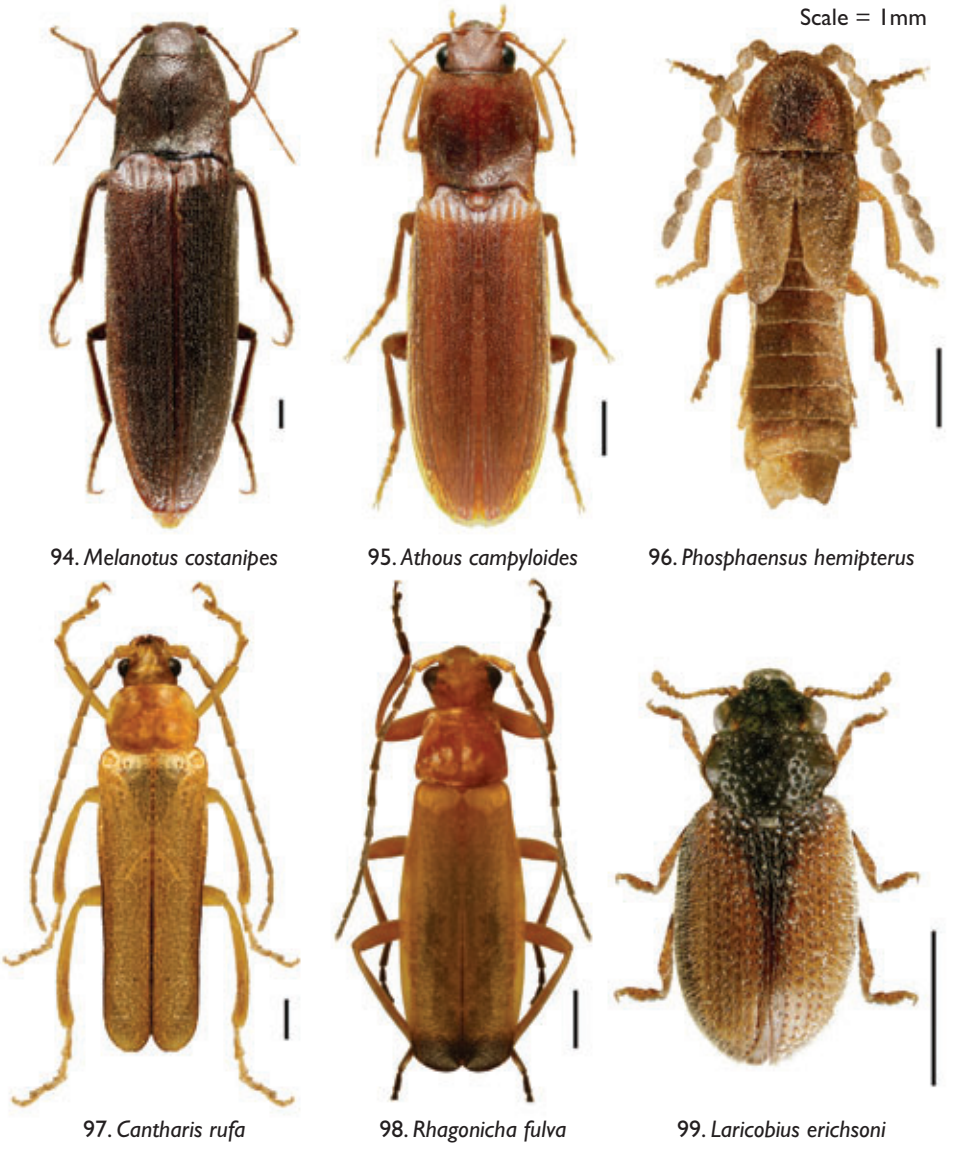
Figures 76–81. Examples of adventive species of Staphylinidae (eastern Canada).



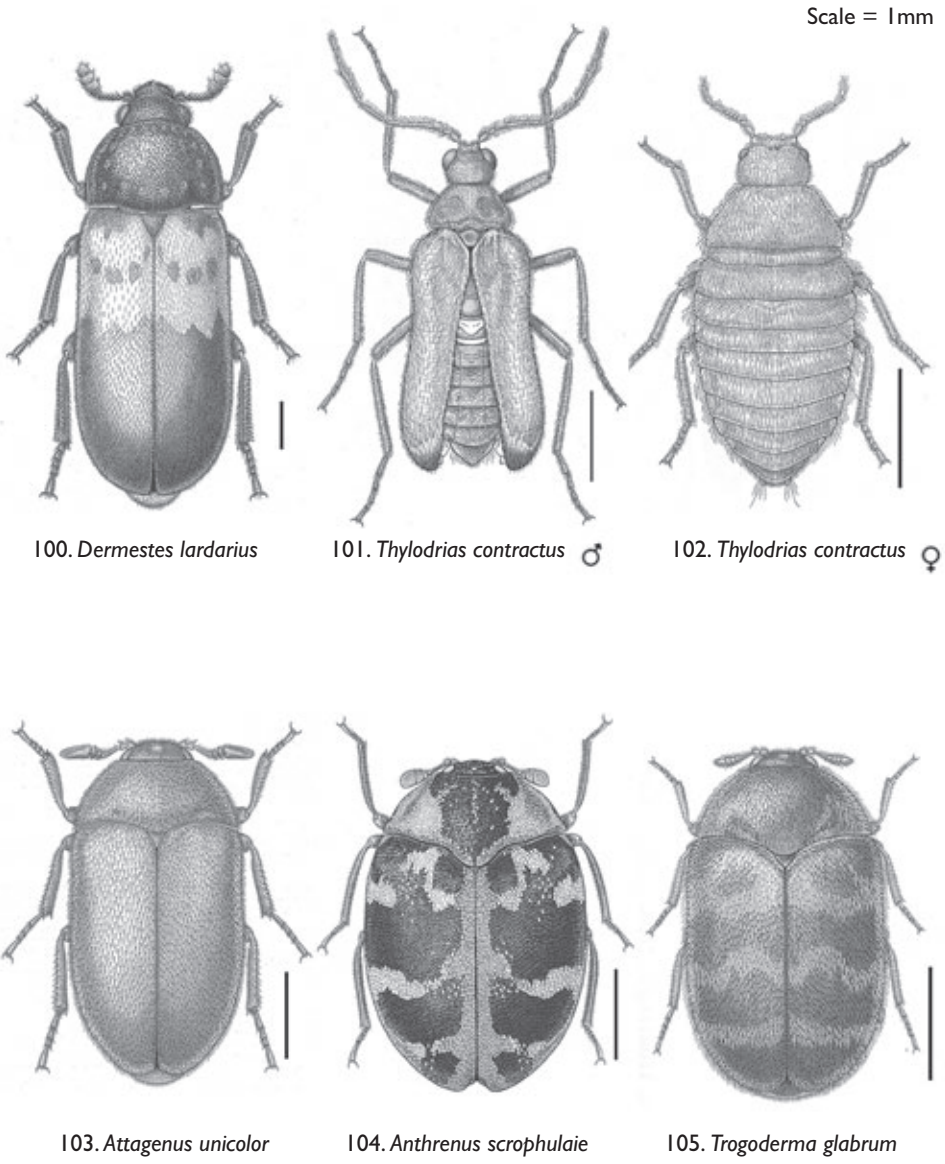
Figures 82–87. Examples of adventive species of Geotrupidae (Fig. **82**), and Scarabaeidae (Figs. **83–87**) (eastern Canada).



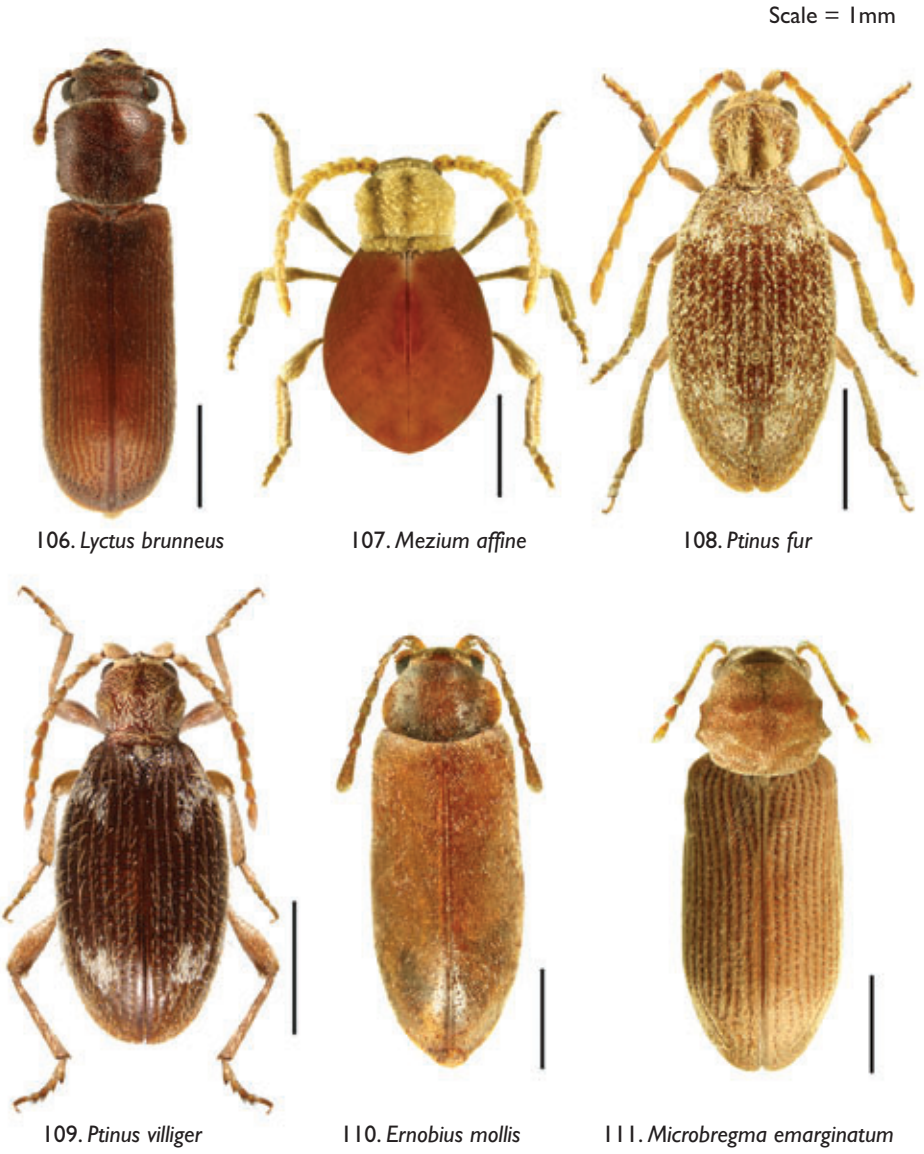
Figures 88–93. Examples of adventive species of Eucinetidae (Fig. **88**), Clambidae (Fig. **89**), Buprestidae (Fig. **90**), Byrrhidae (Figs. **91, 92**), and Dryopidae (Fig. **93**) (eastern Canada).



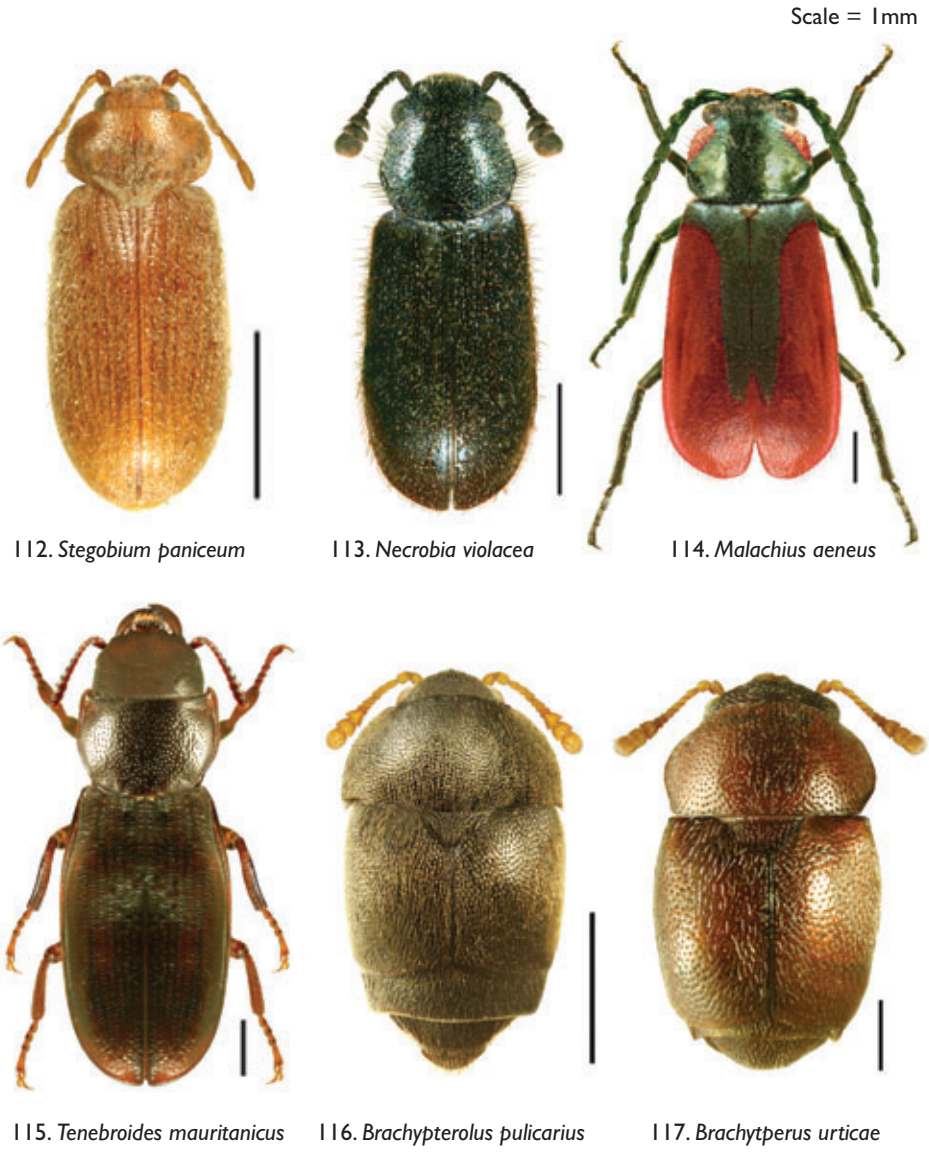
Figures 94–99. Examples of adventive species of Elateridae (Figs. **94, 95**), Lampyridae (**96**), Cantharidae (Figs. **97, 98**), and Derodontidae (Fig. **99**) (eastern Canada).



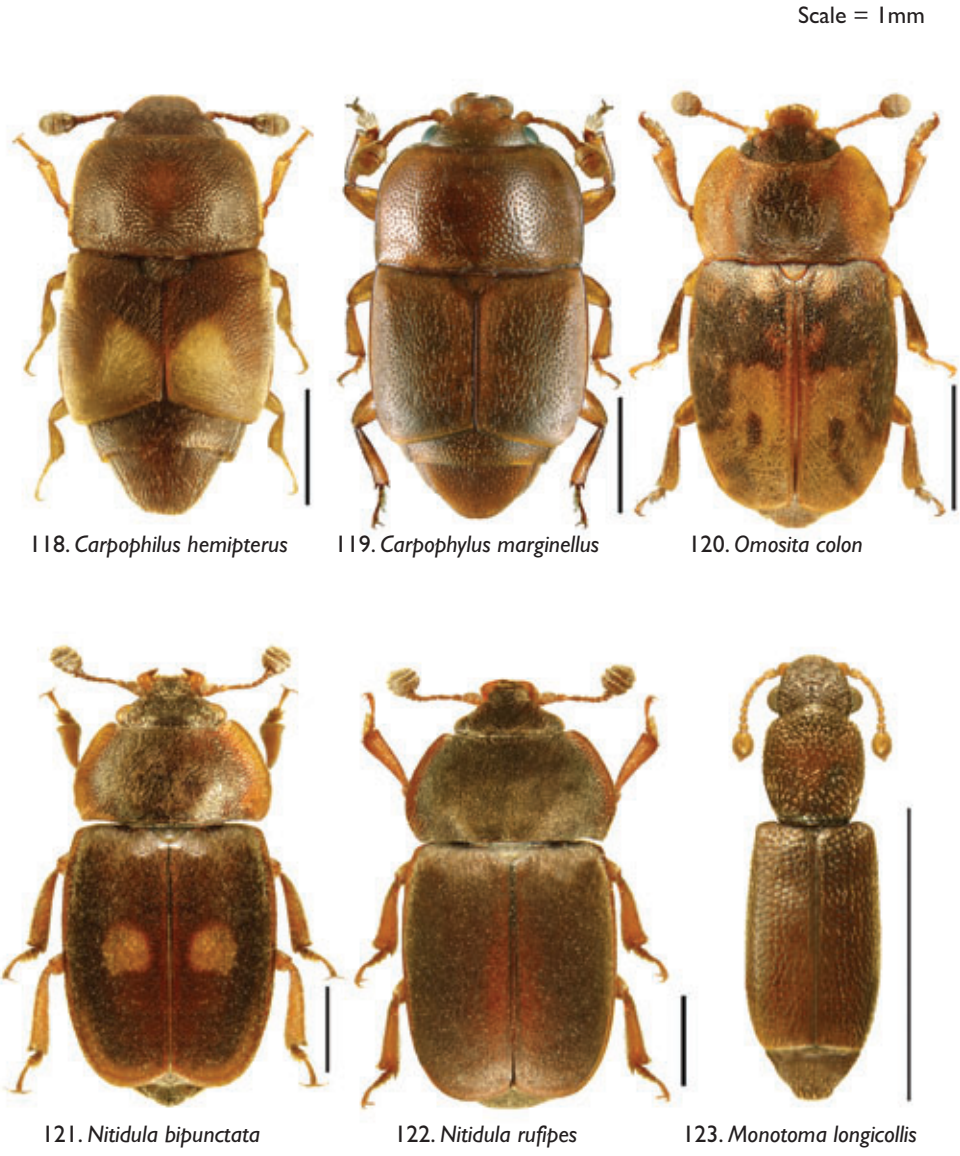
Figures 100–105. Examples of adventive species of Dermestidae (eastern Canada).



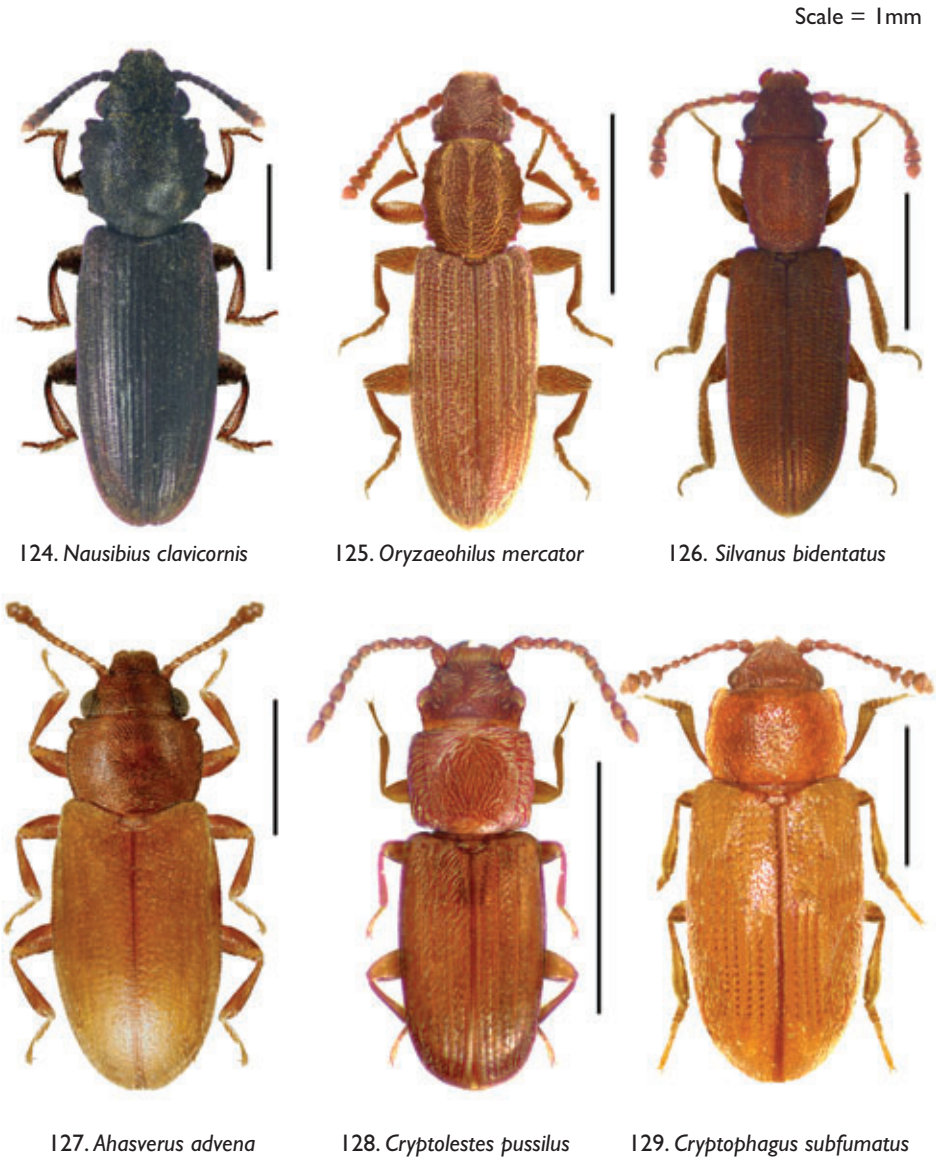
Figures 106–111. Examples of adventive species of Bostrychidae (Fig. **106**), and Ptinidae (Figs. **107–111**) (eastern Canada).



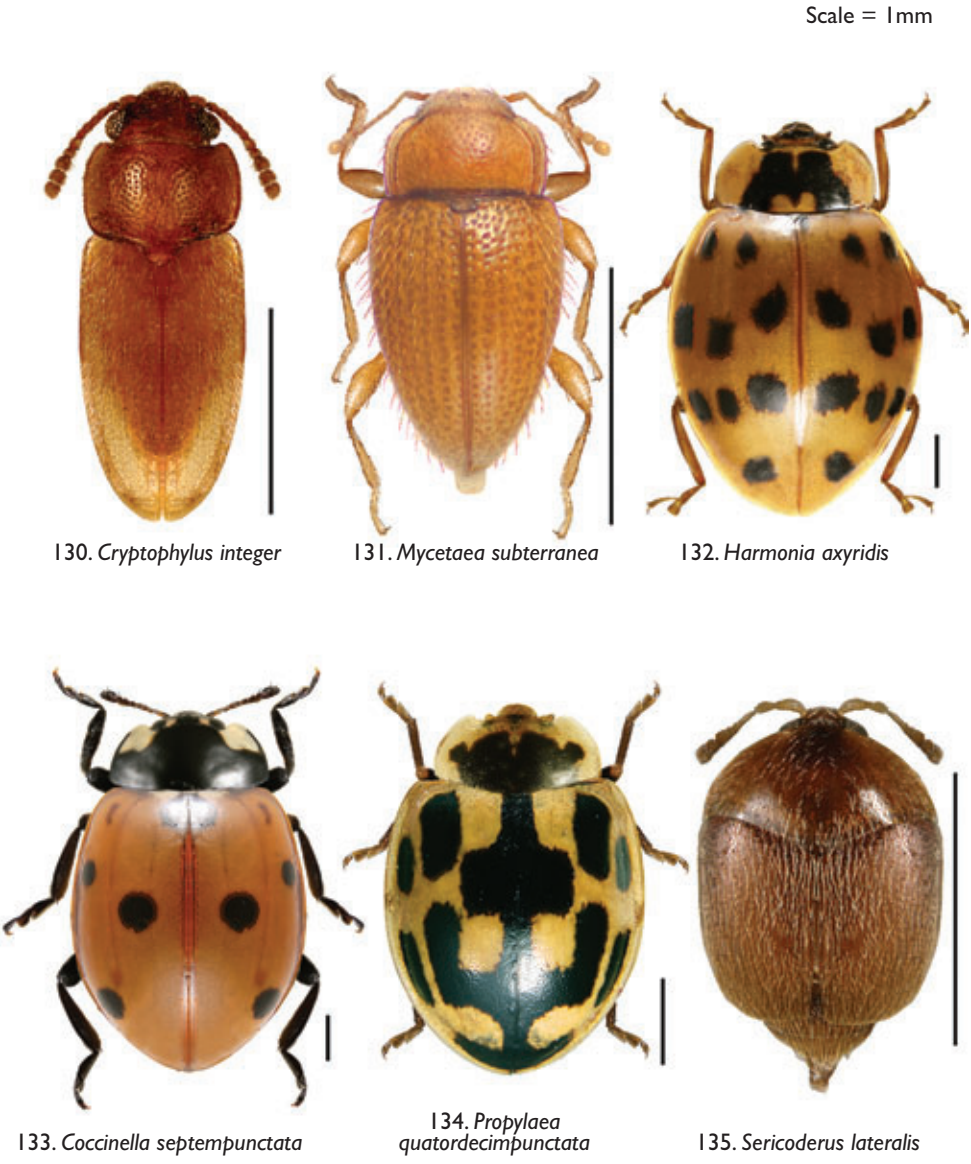
Figures 112–117. Examples of adventive species of Ptinidae (Fig. **112**), Cleridae (Fig. **113**), Melyridae (Fig. **114**), Trogossitidae (Fig. **115**), and Kateretidae (Figs. **116, 117**) (eastern Canada).



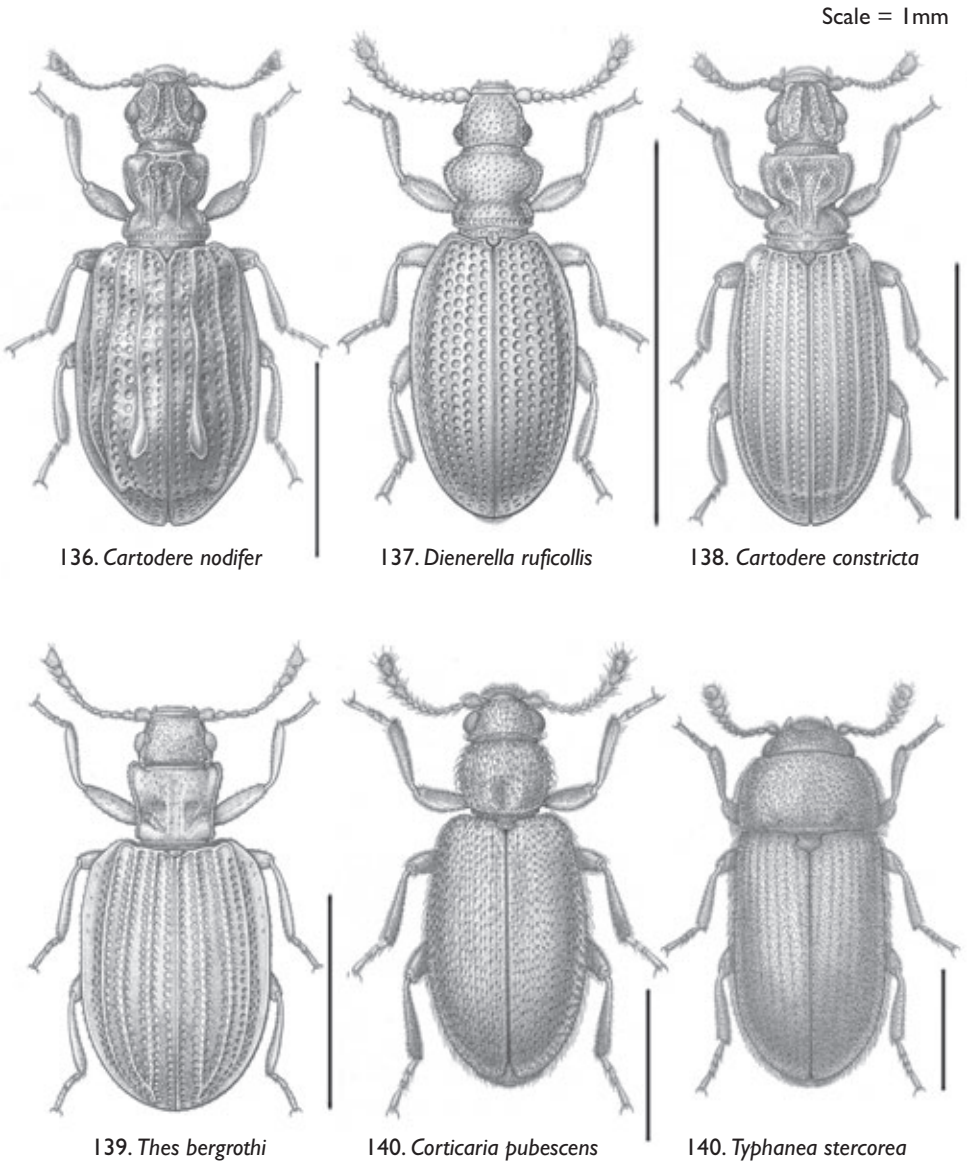
Figures 118–123. Examples of adventive species of Nitidulidae (Figs. **118–122**), and Monotomidae (Fig. **123**) (eastern Canada).



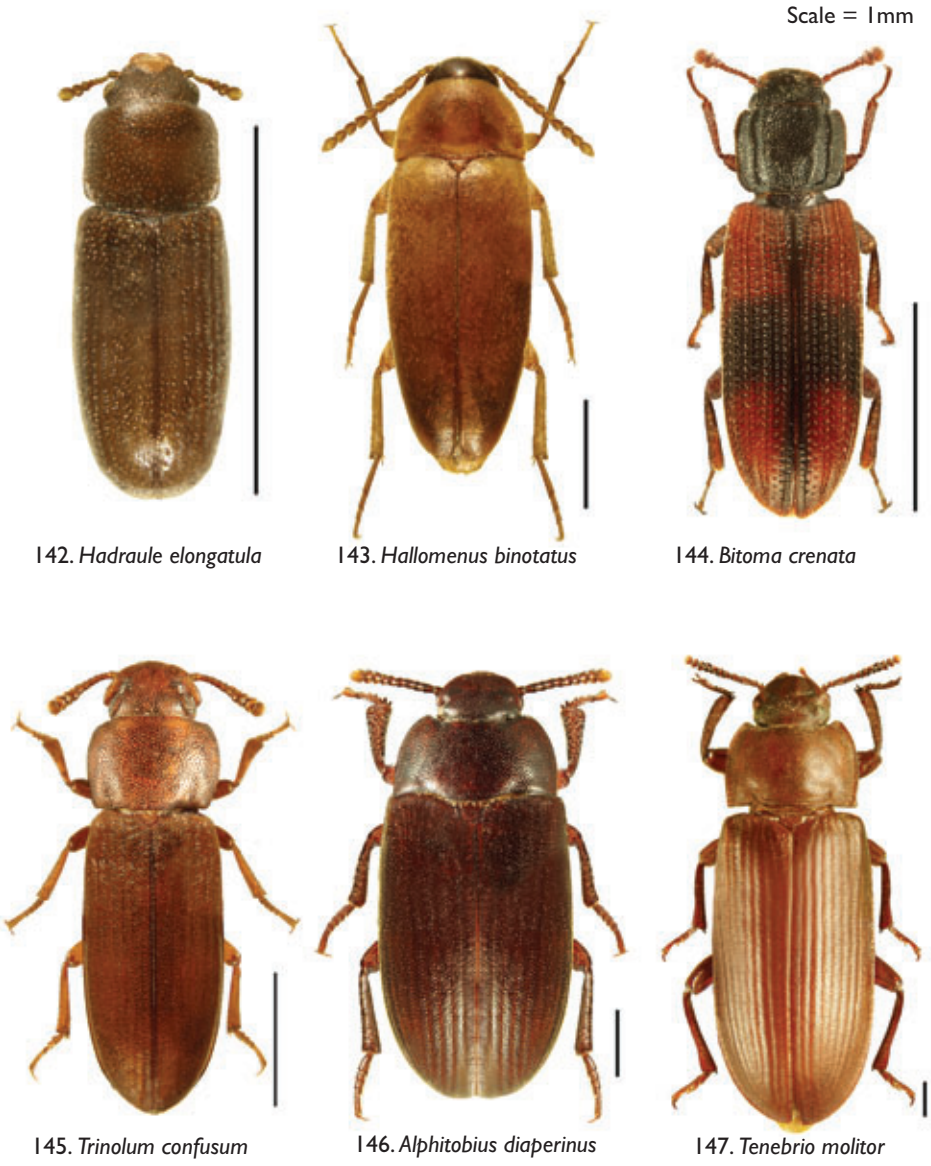
Figures 124–129. Examples of adventive species of Silvanidae (Figs. **124–127**), Laemophloeidae (Fig. **128**), and Cryptophagidae (Fig. **129**) (eastern Canada).



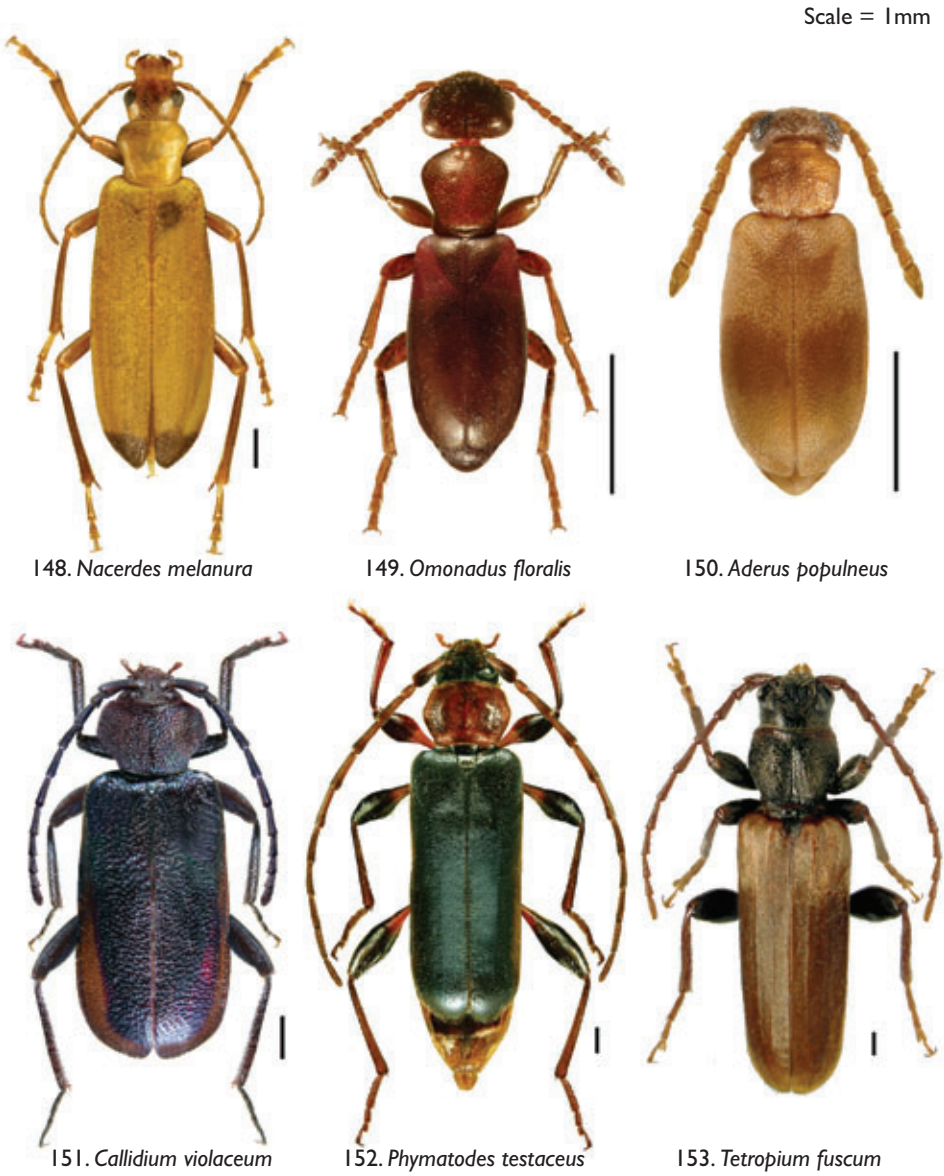
Figures 130–135. Examples of adventive species of Eroylidae (Langurinae) (Fig. **130**), Endomychidae (Fig. **131**), Coccinellidae (Figs. **132–134**), and Corylophidae (Fig. **135**) (eastern Canada).



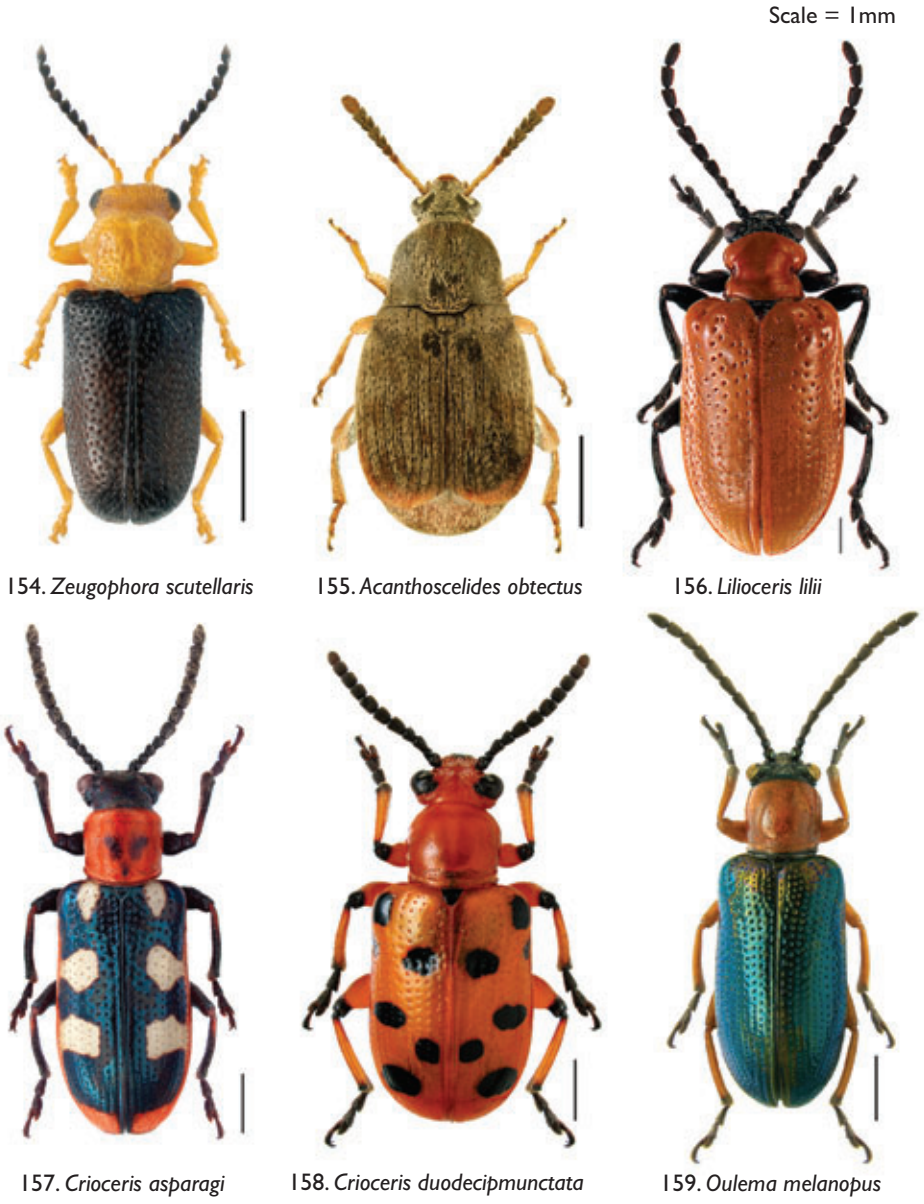
Figures 136–141. Examples of adventive species of Latridiidae (Figs. **136–140**), and Mycetophagidae (Fig. **141**) (eastern Canada).



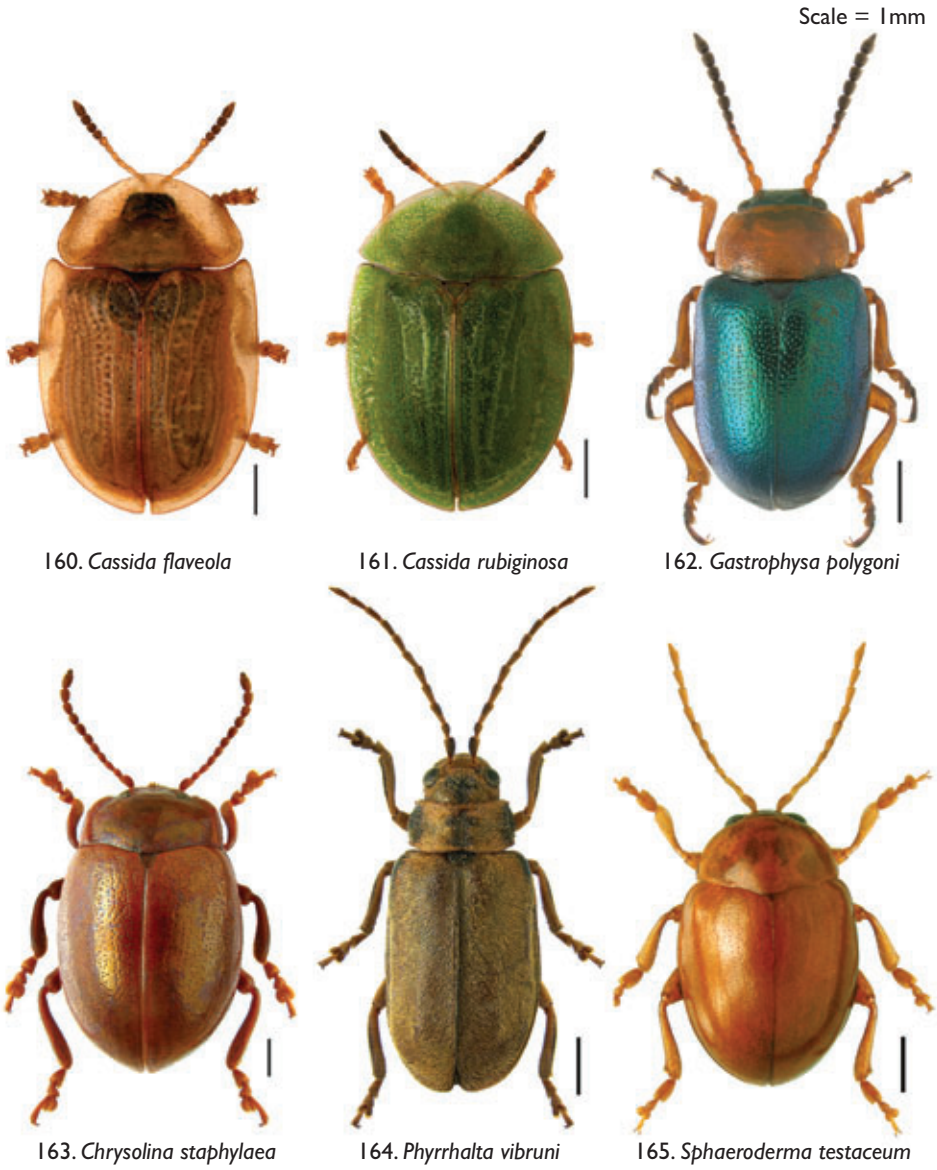
Figures 142–147. Examples of adventive species of Ciidae (Fig. **142**), Tetratomidae (Fig. **143**), Zopheridae (Colydinae) (Fig. **144**), and Tenebrionidae (Figs. **145–147**) (eastern Canada).



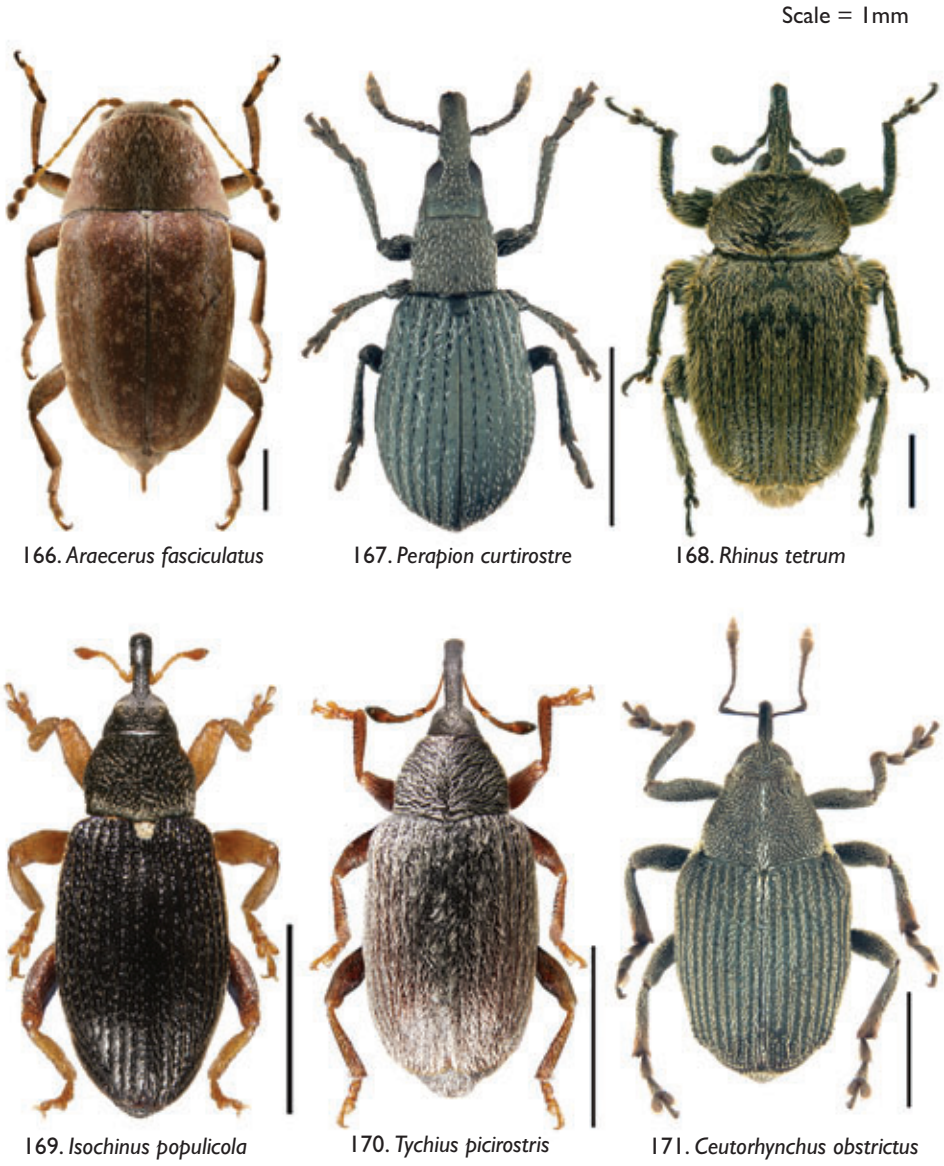
Figures 148–153. Examples of adventive species of Oedemeridae (Fig. **148**), Anthicidae (Fig. **149**), Aderidae (Fig. **150**), and Cerambycidae (Figs. **151–153**) (eastern Canada).



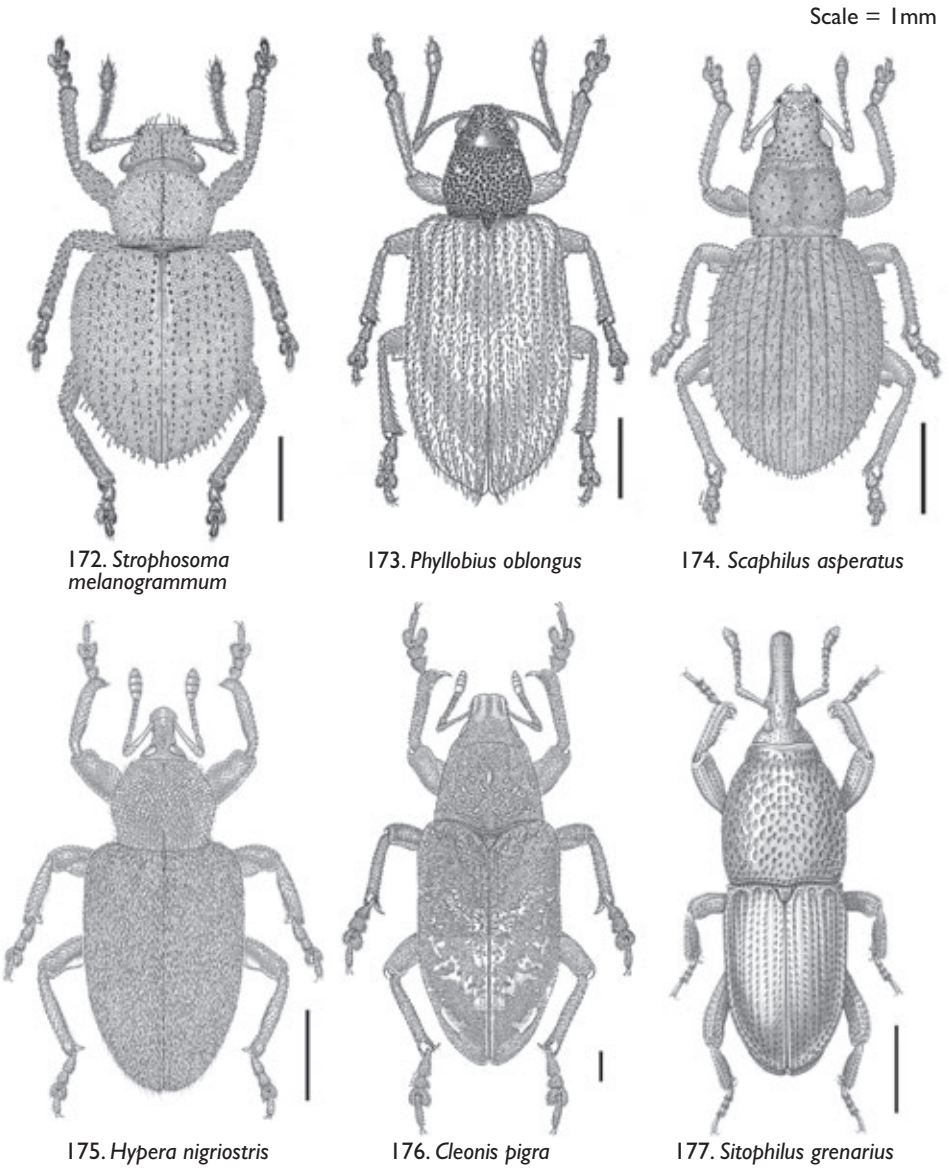
Figures 154–159. Examples of adventive species of Aderidae (Fig. **154**), and Chrysomelidae (Figs. **155–159**) (eastern Canada).



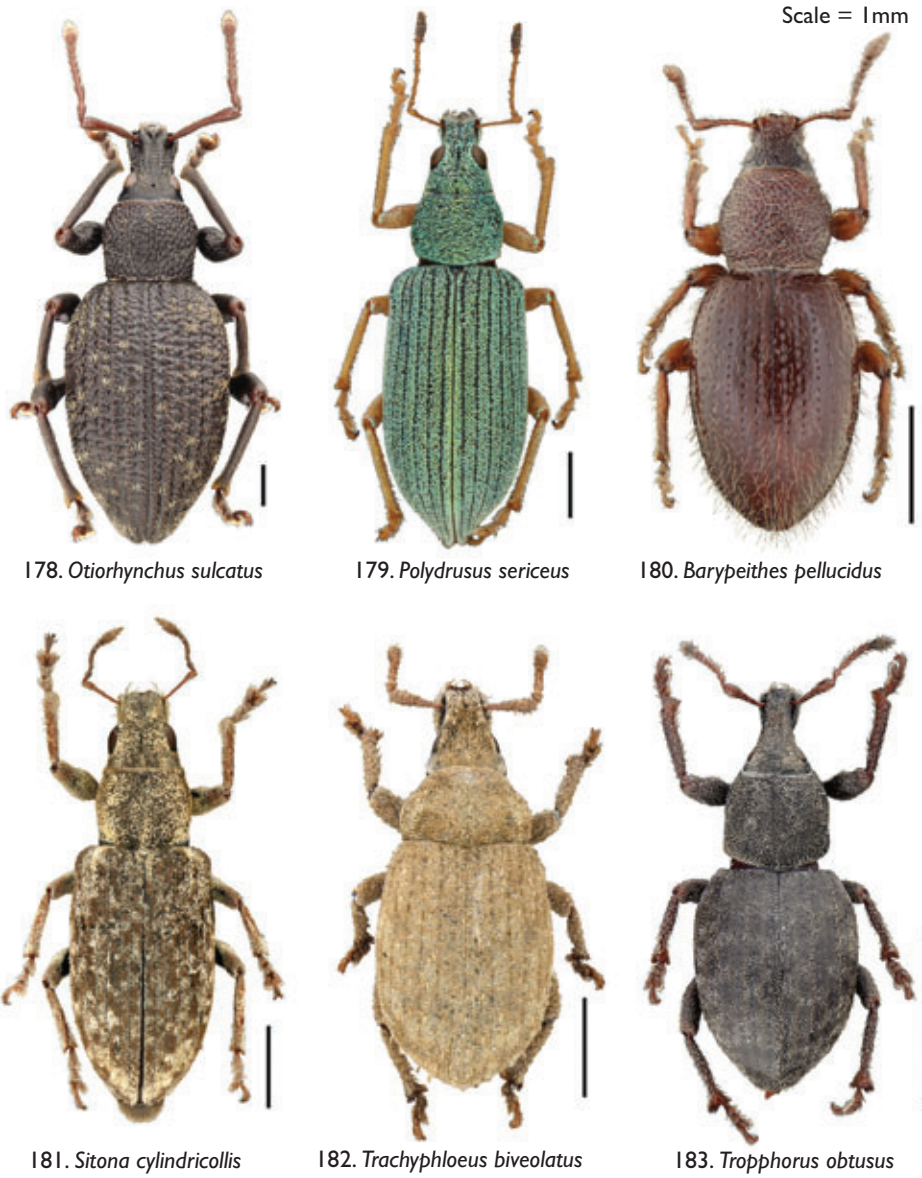
Figures 160–165. Examples of adventive species of Chrysomelidae (eastern Canada).



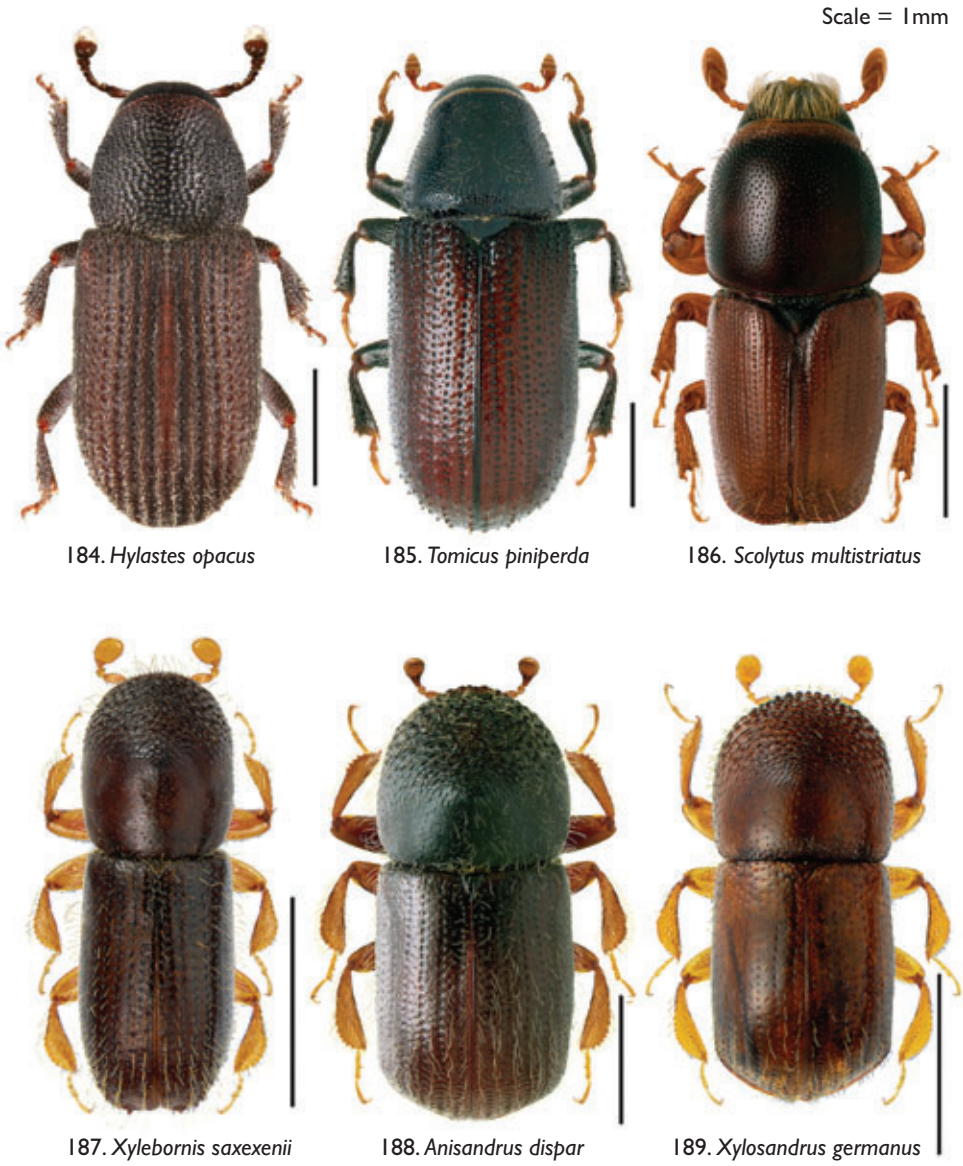
Figures 166–171. Examples of adventive species of Anthribidae (Fig. **166**), Brentidae (Fig. **167**), and Curculionidae (Figs. **168–171**) (eastern Canada).



Figures 172–177. Examples of adventive species of Curculionidae (eastern Canada).



Figures 178–183. Examples of adventive species of Curculionidae (eastern Canada).



Figures 184–189. Examples of adventive species of Curculionidae, Scolytinae (eastern Canada).