



Monotomidae (Coleoptera) of the Maritime Provinces of Canada

Christopher G. Majka and Yves Bousquet

ABSTRACT

The Monotomidae of the Maritime Provinces of Canada are surveyed. Nine species are found in the region in the genera *Rhizophagus* and *Monotoma*. Four species are adventive from the Palaearctic region; the other five are native to the Nearctic region. Five species have been recorded in New Brunswick, eight in Nova Scotia, and two in Prince Edward Island. Seven new provincial records are reported. The distribution of species in North America, and of adventive species, elsewhere in the world, is briefly summarized, as well as the bionomics of each species.

RÉSUMÉ

Nous avons effectué un relevé des Monotomidés dans les provinces Maritimes canadiennes. On trouve neuf espèces des genres *Rhizophagus* et *Monotoma* dans la région. Quatre d'entre elles sont des espèces adventives provenant de la région paléarctique; les cinq autres sont indigènes à la région néarctique. Nous avons répertorié cinq espèces au Nouveau-Brunswick, huit en Nouvelle-Écosse et deux à l'Île-du-Prince-Édouard. Dans sept des cas, c'est la première fois que l'espèce est signalée dans la province. Nous résumons brièvement la répartition des espèces en Amérique du Nord et des adventices ailleurs dans le monde, ainsi que la bionomie de chacune d'entre elles.

INTRODUCTION

The Monotomidae (the “root-eating beetles”) are a small family of Coleoptera, with 55 species recorded from North America (Bousquet 2002). The Canadian fauna consists of 24 species (Bousquet 1991). In Atlantic Canada monotomids include representatives of two genera; *Rhizophagus* Herbst, including six species that are generally found under bark in association with scolytine larvae and subcortical fungi on which they feed; and *Monotoma* Herbst, including four species that feed on fungi and are variously found in decomposing micro-habitats such as compost heaps and haystacks. Some species (i.e., *Monotomoma longicollis*) are found in association with dried stored products, while others (i.e., *Monotoma producta*) are found under beach wrack (Bousquet 1990, 2002; Bousquet and Laplante 1999).

The Canadian fauna of both these genera have been reviewed by Bousquet (1990) and Bousquet and Laplante (1999). Nonetheless, recent collections, and an examination of voucher specimens in collections in the Maritime Provinces of Canada (New Brunswick, Nova Scotia, Prince Edward Island) have revealed many additional specimens, that have almost doubled the number of provincial records in the region, and added to our knowledge of their bionomics. The present contribution presents these new discoveries and surveys the status of the family in the region.

Received 23 December 2009. Accepted for publication 20 January 2010. Published on the Acadian Entomological Society website at www.acadianes.org/journal.html on 2 March 2010.

Christopher G. Majka¹: Research Associate, Nova Scotia Museum, 1747 Summer Street, Halifax, Nova Scotia, Canada B3H 3A6

Yves Bousquet: Agriculture and Agri-Food Canada, ECORC, K.W. Neatby Bldg., 960 Carling Ave., Ottawa Ontario K1A 0C6

¹Corresponding author (email c.majka@ns.sympatico.ca)

METHODS AND CONVENTIONS

Specimens of Monotomidae from the Maritime Provinces in a variety of collections were examined and identified. These collections yielded 145 specimens, 104 from Nova Scotia, 38 from New Brunswick, and two from Prince Edward Island. Abbreviations (following Evenhuis 2009) of collections consulted and referred to in this study include:

CBU	Cape Breton University, Sydney, Nova Scotia, Canada
CGMC	Christopher G. Majka Collection, Halifax, Nova Scotia, Canada
CNC	Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
DHWC	David H. Webster Collection, Kentville, Nova Scotia, Canada
JCC	Joyce Cook Collection (now at the New Brunswick Museum, Saint John, New Brunswick, Canada)
MMUE	Manchester Museum, The University, Manchester, United Kingdom
NSMC	Nova Scotia Museum, Halifax, Nova Scotia, Canada
NSNR	Nova Scotia Department of Natural Resources, Shubenacadie, Nova Scotia, Canada

In the species treatments, the number of specimens and the collection abbreviation are enclosed in parentheses. Abbreviations employed are: FIT = flight intercept trap.

RESULTS

Ten Monotomidae species are found in the Maritime Provinces in the genera *Rhizophagus* and *Monotoma*. Five are adventive Palaearctic species; the other five are native to the Nearctic region. Six species have been recorded in New Brunswick, eight in Nova Scotia, and two in Prince Edward Island (Table 1). Seven new provincial records are reported.

Rhizophagus Herbst, 1793

Keys to the identification of North American *Rhizophagus* species are available in Bousquet (1990).

Rhizophagus brunneus brunneus Horn, 1879 (Fig. 1)

Fig. 1. Dorsal habitus photograph of *Rhizophagus brunneus brunneus*. Photo Credit: Christopher Majka, Nova Scotia Museum, Halifax, NS.



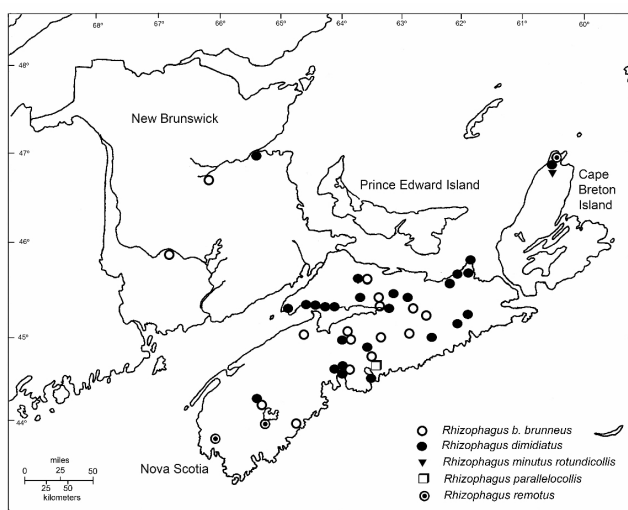
NOVA SCOTIA: Antigonish Co.: Cape George Point, June 22, 1995, M. LeBlanc, FIT (1, NSNR); **Guysborough Co.:** Trafalgar, Liscomb Sanctuary, July 19, 1992, S. & J. Peck, forest road, car net (2, JCC); **Colchester Co.:** Debert, June 18, 1993, May 23, 1995, J. Ogden (3, NSNR); Masstown, June 18, 1993, J. Macphee (1, NSNR); Shubenacadie, July 12, 2004, J. Ogden, FIT (1, NSNR); **Cumberland Co.:** Wentworth, July 1, 1965, B. Wright (1, NSMC); **Halifax Co.:** Old Annapolis Trail, July 16, 2004, D. MacDonald, FIT (1, NSNR); Soldier Lake, August 27, 2004, D. MacDonald, spruce beetle trap (1, NSNR); Upper Musquodoboit, August 31, 1999, J. Ogden, Funnel Trap (1, NSNR); **Hants Co.:** Smileys Park, July 16, 2004, D. Gordon, FIT (5, NSNR); Smileys Park, June 24, 2004, J. Ogden & N. Wood, FIT (2, NSNR); Stanley, June 8, 1992, M. LeBlanc, Funnel Trap (1, NSNR); Stanley, June 13, 2005, P. Kenrick (1, NSNR); **Kings Co.:** Cambridge, September 17, 2007, D.H. Webster, felled *Populus grandidentata* (2, DHWC); **Pictou Co.:** Shepherders Junction, July 14, 2004, J. Ogden & N. Wood, FIT (2, NSNR); **Queens Co.:** Bowater Mill, June 28, 2004, P. Colp, FIT (2, NSNR); Kejimikujik National Park, June 16, 2004, M. LeBlanc, FIT (1, NSNR).

Rhizophagus brunneus brunneus is newly recorded from Nova Scotia. Previously the species was recorded from New Brunswick by Bousquet (1990). *Rhizophagus brunneus brunneus* is widely distributed throughout most of mainland Nova Scotia (Fig. 2). This Nearctic species has been recorded from the Maritime Provinces west to Alberta and south to Alabama in the eastern United States (Bousquet 1990). Specimens have been collected from under the bark of *Pinus strobus* L. *Pinus palustris* Mill., and *Picea glauca* (Moench) (Pinaceae).

Table 1. Monotomid fauna of Atlantic Canada.

					Regional distribution
	NB	NS	PE	NL	in northeastern North America
Rhizophaginae					
<i>Rhizophagus brunneus brunneus</i> Horn	1	1			MA, ME, NB, NH, NS, NY, ON, QC, VT
<i>Rhizophagus dimidiatus</i> Mannerheim		1		1	ME, NB, NF, NH, NS, NY, ON, QC, VT
<i>Rhizophagus minutus rotundicollis</i> Bousquet		1		1	ME, NF, NH, NS, ON, QC
<i>Rhizophagus parallelocollis</i> Gyllenhal †		1		1	MA, ME, NF, NS, NY, ON, QC, RI
<i>Rhizophagus remotus</i> LeConte		1			CT, MA, ME, NH, NS, NY, ON, QC, VT
Monotominae					
Monotomini					
<i>Monotoma bicolor</i> Villa & Villa †	1				MA, ME, NB, NH, NY, ON, QC, VT
<i>Monotoma longicollis</i> (Gyllenhal) †	1	1		1	CT, MA, ME, NB, NF, NH, NS, NY, ON, QC
<i>Monotoma picipes</i> Herbst †	1	1	1	1	CT, MA, ME, NB, NF, NH, NS, NY, ON, PE, QC
<i>Monotoma producta</i> LeConte	1	1	1		CT, MA, ME, NB, NH, NS, NY, PE, RI

Note: † = adventive Palearctic species; NB = New Brunswick; NS = Nova Scotia; PE = Prince Edward Island; NL = Newfoundland and Labrador. Information from Newfoundland and Labrador is included as a basis of comparison for the Maritime Provinces fauna. For purpose of this treatment, northeastern North America is taken to consist of the following jurisdictions: CT = Connecticut; LB = Labrador; MA = Massachusetts; ME = Maine; NF = insular Newfoundland; NH = New Hampshire; NY = New York; ON = Ontario; QC = Quebec; RI = Rhode Island; PM = St. Pierre et Miquelon; and, VT = Vermont.

Fig. 2. Distribution of *Rhizophagus* species in the Maritime Provinces of Canada.**Fig. 3.** Dorsal habitus of *Rhizophagus dimidiatus* Mannerheim, 1843 (Fig. 3)**Fig. 3.** Dorsal habitus of *Rhizophagus dimidiatus*. Photo Credit: Christopher Majka, Nova Scotia Museum, Halifax, NS.

NEW BRUNSWICK: Northumberland Co.: Chatham, June 7, 1991, P. Kaanar (1, CNC).

Rhizophagus dimidiatus is newly recorded from New Brunswick. Previously the species was recorded from both Nova Scotia and insular Newfoundland by Bousquet (1990). In Nova Scotia, it is the most abundant and widely distributed monotomid, found both on the mainland and on Cape Breton Island (Fig. 2). The absence of records

from New Brunswick likely reflects a lack of collecting effort for monotomids in that province. In North America *Rhizophagus dimidiatus* exhibits a disjunct distribution; in the east, it is found from insular Newfoundland and Ontario south to North Carolina and Tennessee; in the west, it occurs from Alaska south to southern Arizona and New Mexico (Bousquet 1990). Bousquet (1990) suggested that this species might represent a complex of related species. In the east, Bousquet (1990) reported it from under the bark of a variety of deciduous and coniferous trees; records from Nova Scotia include specimens collected on *Picea rubens* Sarg., *Picea mariana* (Mill.) BSP., *Pinus strobus*, (Pinaceae), and *Betula papyrifera* Marshall (Betulaceae) in both coniferous and deciduous forests aged from 45 to > 120 years. Chandler (1991) collected them in mixed coniferous-deciduous forest stands in New Hampshire.

Rhizophagus minutus rotundicollis Bousquet, 1990

NOVA SCOTIA: Inverness Co.: Lone Shieling, July 1, 1983, R. Vockeroth, malaise trap (1, CNC).

Rhizophagus minutus rotundicollis is newly recorded in Nova Scotia (Fig. 2). Previously the species was reported from insular Newfoundland (Bousquet 1990). In eastern North America it is distributed from Newfoundland and Ontario south to Maine and New Hampshire recorded from *Abies balsamea* L. Mill. (Pinaceae) and *Picea glauca*. (Bousquet 1990).

Rhizophagus parallellocollis Gyllenhal, 1827

Fig. 4. Dorsal habitus of *Rhizophagus parallellocollis* (Length = 3.0 mm). Photo Credit: Christopher Majka, Nova Scotia Museum, Halifax, NS.



Rhizophagus parallellocollis has previously been recorded from both Nova Scotia and insular Newfoundland (Bousquet 1990). The only record of this adventive Palaearctic species in the Maritime Provinces is from 1957 in Waverley, Nova Scotia. The bionomics of this species are unusual; in Europe it is known as the “graveyard beetle” since it is frequently found in graves, swarming on corpses in coffins where it is associated with dipterous larvae on which they may feed. The species is also found in fungi, soil, mammal nests, on mould, plant refuse, old bones, and at sap (Bousquet 1990). *Rhizophagus parallellocollis* is widely distributed throughout Europe, from northern Russia and Scandinavia south to the Mediterranean including Great Britain and Ireland and the Black Sea coast (Jelínek 2007).

Rhizophagus remotus LeConte, 1866 (Fig. 5)

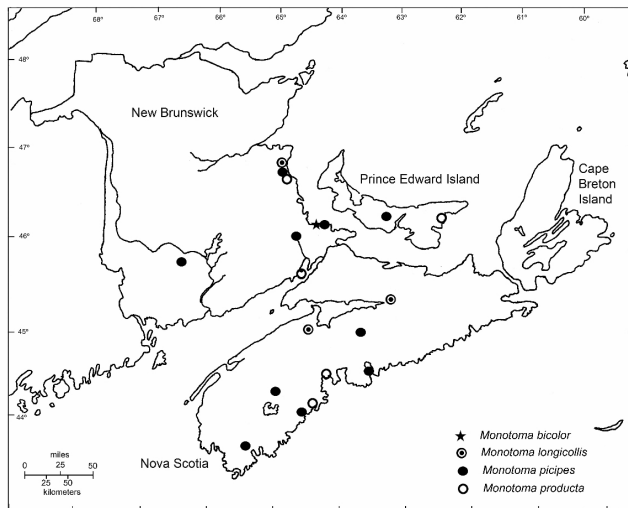
Fig. 5. Dorsal habitus of *Rhizophagus remotus*. Photo Credit: Christopher Majka, Nova Scotia Museum, Halifax, NS.



NOVA SCOTIA: Colchester Co.: Debert, June 18, 1993, J. Ogden, sweep (1, NSNR); **Queens Co.:** Fifth Lake Bay, June 3, 2003, P. Dollin, old growth (> 120 years) hemlock forest, on bracket fungi growing on white birch (1, NSMC); **Yarmouth Co.:** Carleton, Perry Road, August 22, 1992, J. & T. Cook, mixed forest, car net (1, JCC).

Rhizophagus remotus has previously been recorded from Cape Breton Island in Nova Scotia (Bousquet 1990). Additional records from the mainland of Nova Scotia are given above (Fig. 2). This species also has a disjunct distribution in North America, occurring from Nova Scotia south to New Jersey and west to eastern Manitoba and Minnesota; in the west it is found from Alaska south to Arizona and New Mexico, reported commonly on *Pinus* spp., *Populus tremuloides* Michx., *Populus grandidentata* Michx., and *Populus trichocarpa* Torr. and Gray (Salicaceae) (Bousquet 1990). Chandler (1991) collected them in mixed coniferous-deciduous forest stands in New Hampshire.

Fig. 6. Distribution of *Monotoma* species in the Maritime Provinces of Canada.



Monotoma Herbst, 1793

Keys to the identification of North American *Monotoma* specimens are available in Bousquet and Laplante (1999).

Monotoma bicolor Villa & Villa, 1835 (Fig. 7)

Fig. 7. Dorsal habitus of *Monotoma bicolor* (Length: 1.9-2.5 mm). Photo credit: Christopher Majka, Nova Scotia Museum, Halifax, NS.



Monotoma bicolor has previously recorded from New Brunswick by Bousquet and Laplante (1999). There is only one record of this adventive Palearctic species from the region (Fig. 6). The species is widely distributed in Europe from Northern Russia and Scandinavia south to the Mediterranean including Great Britain, Ireland, and the Mediterranean islands. It is also found across North Africa, in Turkey and the Middle East, across Siberia

to the Russian Far East, south to China and Tajikistan and in Australia (Jelínek 2007). *Monotoma bicolor* is primarily found in decaying vegetable matter such as grass piles and barnyard litter (Bousquet and Laplante 1999).

Monotoma longicollis (Gyllenhal, 1827) (Fig. 8)

NOVA SCOTIA: Colchester Co.: Bible Hill, July 4, 2007, C.W. D'Orsay, pasture, sweeping (1,

Fig. 8. Dorsal habitus of *Monotoma longicollis*. Photo credit: Tim Moyer, Medford, New Jersey.



CBU); **Kings Co.:** Kentville, August 10, 2005, D.H. Webster, compost heap, moldy corncobs (1, DHWC).

Monotoma longicollis is newly recorded from Nova Scotia (Fig. 5). This adventive Palearctic species has previously recorded from New Brunswick and insular Newfoundland (Bousquet and Laplante 1999). The species is widely distributed throughout North America where it has been found in grass piles and stored wheat (Bousquet and Laplante 1999). *Monotoma longicollis* is widely distributed in Europe from Northern Russia and Scandinavia south to the Mediterranean including Great Britain, Ireland, Sardinia, Madeira, and the Canary Islands. It is also found in the Russian Far East south to Turkmenistan, China, and Japan, and in sub-Saharan Africa and Australia (Jelínek 2007).

Monotoma picipes Herbst, 1793 (Fig. 9)

PRINCE EDWARD ISLAND: Queens Co.: Harrington, September 2, 2005, M.E.M. Smith, weeds & barley, sweep (1, CGMC).

Monotoma picipes is newly recorded from Prince Edward Island. This adventive Palearctic species has previously been recorded from New Brunswick, Nova Scotia, and insular Newfoundland (Bousquet and Laplante 1999). It is

widely distributed in the region with the exception of Cape

Fig. 9. Dorsal habitus of *Monotoma picipes*. Photo credit: WonGun Kim, Vienna, Virginia.



Breton Island (Fig. 6) and it has been recorded throughout most of North America where it is typically found in decaying vegetable matter, under the bark of pine logs, in moss, seaweed, and occasionally in association with ants (Bousquet and Laplante 1999). *Monotoma picipes* has been found throughout Europe except for Albania, Belgium, Bosnia-Herzegovina, Bulgaria, and Macedonia where it has not been recorded. It is also found across North Africa and across Siberia to the Russian Far East, and south to China, Korea, Japan, and throughout central Asia (Jelínek 2007).

Monotoma producta LeConte, 1855 (Fig. 10)

Fig. 10. Dorsal habitus of *Monotoma producta*. Photo credit: Tom Murray, Groton, Massachusetts.



NEW BRUNSWICK: Albert Co.: Mary's Pt., August 23, 2003, C.G. Majka, coastal dunes, under flotsam (1,

CGMC); **NOVA SCOTIA: Lunenburg Co.:** Chester, June 22, 1968, B. Wright (3, NSMC); Petite Riviere, June 25, 1988, J. Keddy (1, NSMC). **PRINCE EDWARD ISLAND: Kings Co.:** Launching, August 26, 2003, C.G. Majka, sand beach, under flotsam (1, CGMC).

Monotoma producta is newly recorded from Nova Scotia and Prince Edward Island. This Nearctic species has previously been recorded from New Brunswick by Bousquet and Laplante (1999). Additional New Brunswick records are given above. There are scattered records from coastal locations throughout the Maritime Provinces except for Cape Breton Island (Fig. 6). *Monotoma producta* is found along the Atlantic coast from Nova Scotia south to Florida (Bousquet and Laplante 1999). In the Maritime Provinces, the species has been found under flotsam and wrack on ocean beaches, similar to habitats where it has been found in the United States (Bousquet and Laplante 1999). Chandler (1983) found larvae feeding on the spores of "fungi imperfecti."

DISCUSSION

Although the data presented herein are preliminary, an examination of the species distributions in the Maritime Provinces reveals several patterns. Of the adventive species, *Monotoma picipes*, and to lesser degree *Monotoma longicollis*, are generally distributed in the region, whereas only single records of *Monotoma bicolor* and *Rhizophagus parallelocollis* are known (Figs. 2, 6). Early dates of detection of these species are provided in Table 2 for all the jurisdictions in Atlantic Canada and North America as a whole.

Among the native species, *Rhizophagus dimidiatus* and *Rhizophagus brunneus brunneus* are abundant and generally distributed, at least within Nova Scotia (Fig 2). The lack of records of the latter species from Cape Breton Island, and both from Prince Edward Island, warrants further investigation. *Monotoma producta* also appears to be generally distributed in the region, within its preferred coastal habitats (Fig. 1). There are scattered records of *Rhizophagus remotus* from northern Cape Breton and on the mainland of Nova Scotia, and there is but a single record of *R. minutus rotundicollis* from northern Cape Breton (Fig. 2). Both these species also warrant further investigation to determine the extent of their distribution in the region.

Most *Rhizophagus* species inhabit subcortical environments and prey on bark beetles and/or feed on fungal mycelia or spores that grow in such environments and may therefore be considered saproxylic. The exception is *Rhizophagus parallelocollis*, which in Europe is primarily

Table 2. Atlantic Canada Monotomidae; earliest dates of detection.

	NB	NS	PE	NL	NA	Source
<i>Rhizophagus parallelocollis</i> Gyllenhal		1957		1965	1895	Bousquet (1990)
<i>Monotoma bicolor</i> Villa & Villa	?				1855	LeConte (1855)
<i>Monotoma longicollis</i> (Gyllenhal)	1977	2005		1981	1879	Horn (1879)
<i>Monotoma picipes</i> Herbst	1928	1982	2005	1981	1879	Horn (1879)

Note: NB = New Brunswick; NS = Nova Scotia; PE = Prince Edward Island; NL = Newfoundland and Labrador; NA = North America. Information from Newfoundland and Labrador is included as a basis of comparison for the Maritime Provinces fauna.

associated with carrion, apparently feeding on larval Diptera.

Monotoma species, in contrast, are primarily found in decomposing situations, particularly decaying vegetation. *Monotoma longicollis* is occasionally found in association with stored products, and the native *M. producta* appears to be a specialist inhabitant of beach drift environments. Bousquet and Laplante (1999) noted that adults are mold feeders in such habitats.

Other species of monotomids may also potentially occur in the Maritime Provinces. *Pycnotomia cavicollis* (Horn), *Bactridium striolatum* (Reitter), *Monotoma americana* Aubé, and *Monotoma testacea* Motschulsky have all been recorded in the neighbouring province of Québec (Bousquet 1991; Bousquet and Laplante 1999). These species exhibit similar modes of life as those known in the region and should therefore be sought, particularly in western portions of New Brunswick.

ACKNOWLEDGEMENTS

Sincere thanks to Mary Smith (Agriculture and Agri-Food Canada, Charlottetown), Clayton D'Orsay and David McCorquodale (Cape Breton University), Joyce Cook (Carleton University), Philana Dollin (Dalhousie University), Colin Johnson (Manchester Museum), Jeff Ogden (Nova Scotia Department of Natural Resources), DeLancey Bishop and David H. Webster for making specimens, records, and information available. Sincere thanks also to WonGun Kim, Tim R. Moyer, and Tom Murray for their contribution of photographs of *Monotoma* species. Donald S. Chandler and another anonymous reviewer read a previous version of the manuscript and contributed many constructive suggestions. The first author thanks David Christianson, Calum Ewing, and Andrew Hebda at the Nova Scotia Museum for continuing

support and encouragement. This work has been assisted by the Board of Governors of the Nova Scotia Museum.

REFERENCES

- Bousquet, Y. 1990. A review of the North American species of *Rhizophagus* Herbst and a revision of the Nearctic members of the subgenus *Anomophagus* Reitter (Coleoptera: Rhizophagidae). *The Canadian Entomologist* 122: 131–171.
- Bousquet, Y. 1991. Family Rhizophagidae: rhizophagid beetles. In *Checklist of Beetles of Canada and Alaska*. Edited by Y. Bousquet, Research Branch Publication 1861/E, Agriculture Canada, Ottawa, Ontario. pp. 218–219. Available from <http://www.canacoll.org/Coleo/Checklist/PDF%20files/RHIZOPHAGIDAE.pdf> [accessed 20 November 2009]
- Bousquet, Y. 2002. Monotomidae Laporte 1840. In *American Beetles, Volume 2: Polyphaga: Scarabaeoidea through Curculionoidea*. Edited by R.H. Arnett, Jr., M.C. Thomas, P.E. Skelley, J.H. Frank. CRC Press, Boca Raton, USA, pp. 319–321.
- Bousquet, Y., and Laplante, S. 1999. Taxonomic review of the Canadian species of the genus *Monotoma* Herbst (Coleoptera: Monotomidae). *Proceedings of the Entomological Society of Ontario* 130: 67–96.
- Chandler, D.S. 1983. Larvae of wrack Coleoptera in the families Corylophidae, Rhizophagidae, and Lathridiidae. *Psyche*, 90: 287–296.
- Chandler, D.S. 1991. Comparison of some slime-mold and fungus feeding beetles (Coleoptera: Eucinetoidae, Cucujoidea) in an old-growth and 40-year-old forest in New Hampshire. *The Coleopterist's Bulletin* 45(3): 239–256.

- Evenhuis, N.L. 2009. Abbreviations for insect and spider collections of the world. Available from: <http://hbs.bishopmuseum.org/codens/codens-inst.html> [accessed 18.XII.2009]
- Horn, G.H. 1879. Synopsis of the Monotomidae of the United States. *Transactions of the American Entomological Society* 7: 257–267.
- Jelínek, J. 2007. Family Monotomidae Laporte, 1840. *In* Catalogue of Palaearctic Coleoptera, Volume 4: Elateroidea, Derontoidea, Bostrichoidea, Lymexyloidea, Cleroidea, Cucujoidea. *Edited by* I. Löbl, and A. Smetana. Apollo Books, Stenstrup, Denmark. pp. 491–495.
- LeConte, J.L. 1855. Synopsis of the Lathridiides of the United States, and northern contiguous Territories. *Proceedings of the Academy of Natural Sciences of Philadelphia* 7: 299–305.