

A remarkable new species of *Himalusa* Pace from Thailand (Coleoptera, Staphylinidae, Aleocharinae): phytophagous aleocharine beetle with potential for bio-control of skunkvine-related weeds in the United States

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Abstract

A new aleocharine species, *Himalusa thailandensis* Pace, Klimaszewski & Center **sp. n.**, found feeding on sewer vine, *Paederia pilifera* Hook. f., in Thailand, is described and illustrated. This is the first record of the genus *Himalusa* for Thailand. *Himalusa* was previously known from the Himalayan region in Nepal where it was originally described. New data on bionomics and distribution are provided, including a discussion on the potential use of this species in the biological control of weeds in the United States. A short diagnosis, description, colour habitus images of adult and larva, and black and white genital images are provided. A key to the world species of *Himalusa* is also given. A new tribe Himalusini Klimaszewski, Pace & Center, is erected to accommodate *Himalusa* species.

Keywords

Himalusa, Aleocharinae, Coleoptera, Thailand, new species, phytophagous, biological control, weeds, *Paederia pilifera*, sewer vine

Introduction

Himalusa Pace (2006) was previously known from a single species, *H. annapurnensis* Pace, described from the Annapurna region of the Himalayas, Nepal. Recently, an additional undescribed species of the same genus was discovered in Thailand. This constitutes the first generic records of *Himalusa* in Thailand. Adults of the new species were observed feeding on *Paederia pilifera* Hook. f. (Rubiales: Rubiaceae), by gnawing little holes in plant leaves and scraping the plant tissue using their mandibles. This may be the first confirmed record of Staphylinidae/Aleocharinae species feeding on live plant tissues. Most aleocharine species are predators of other small arthropods. The purpose of this paper is to describe a new species of *Himalusa* from Thailand, and to enhance further studies of this beetle, which has the potential to be a biological control agent of *Paederia foetida* L. and *P. cruddasiana* Prain, invasive environmental weeds in the southern United States.

Material examined

Sixteen adults of *Himalusa* representing a new species were found in Thailand. All specimens were dissected. The genital structures were dehydrated in absolute alcohol and mounted in Canada balsam on celluloid microslides and pinned with the specimens from which they originated. The photographs of the body images (Figs 1, 2, 17) and the genital structures were taken using an image processing system (Nikon SMZ 1500 stereoscopic microscope; Nikon digital camera DXM 1200F; Nikon View 5 COOLPIX NSA, Version 5.1.2, and Adobe Photoshop software). The colour images of entire beetles (Figs 26–29) were generated using an image processing system consisting of a Wild M420 stereomicroscope (Leica), SPOT™ RT™ Slider camera (Diagnostic Instruments) and Adobe Photoshop software.

Terminology mainly follows that used by Pace (2006) and Seevers (1978). The ventral part of the median lobe of the aedeagus is considered to be that with the foramen mediale of the bulbus with ductus ejaculatorius and the opposite side is considered as the dorsal part.

Institutional abbreviations:

- IPRL** Invasive Plant Research Laboratory, Agricultural Research Service, United States Department of Agriculture, Fort Lauderdale, Florida, U.S.A.
LFC Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, Insectarium R. Martineau, Quebec City, Quebec, Canada

Tribe Himalusini Klimaszewski, Pace & Center, trib. n.

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Type genus: *Himalusa* Pace, 2006

Diagnosis. The following unique combination of characters is characteristic of this tribe: tarsal formula 4-4-5; maxillary palpi with four articles and a pseudosegment (Fig. 7, 7b); ligula in the form of a small lobe (Fig. 8); labial palpi with two articles and a very short pseudosegment (Fig. 8); median lobe of aedeagus slightly asymmetrical (Figs. 12, 21), uniquely shaped structures of internal sac of the median lobe of aedeagus and rigid flagellum (Figs. 11, 12, 20, 21), and unique form of the apical lobe of paramere, which is attached medially to the paramerite, is very long and has serrate internal edge (Figs. 13, 22).

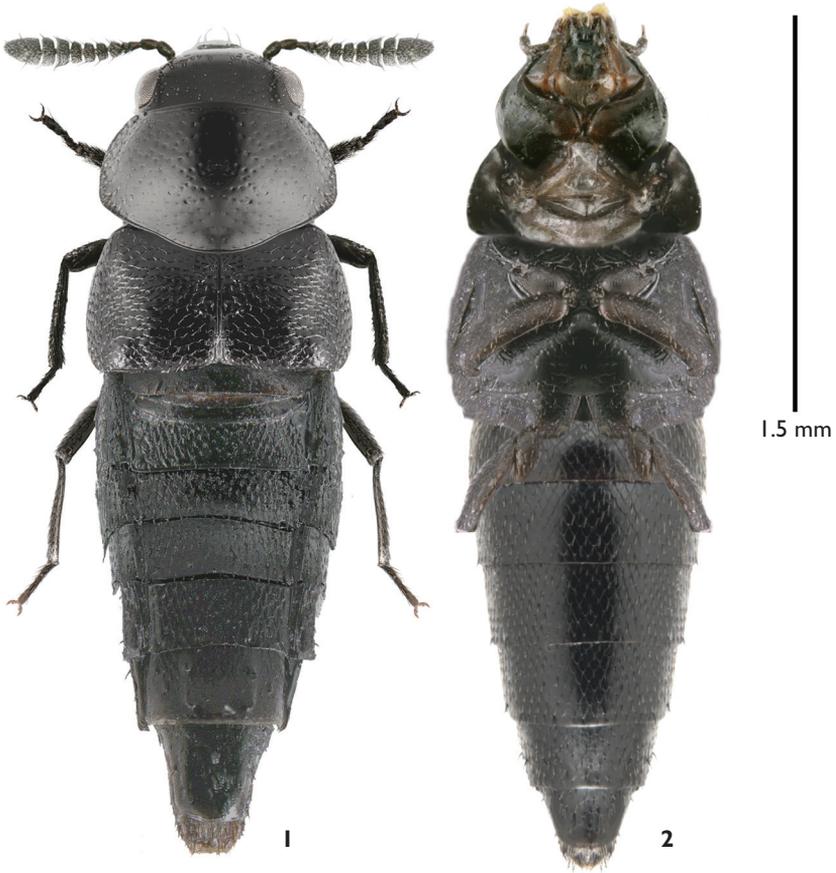
Remarks. Pace (2006) affiliated *Himalusa* with the tribe Homalotini Heer, and suspected a possible link between *Himalusa* and the genus *Placusa* Erichson [now placed in a separate tribe Placusini Mulsant and Rey], on the grounds of similar morphology of labial palpi, ligula, and some genital features. The general robust body form of *Himalusa* and the presence of pseudosegments on the last articles of maxillary and labial palpi are similar to those in the genus *Aleochara* Gravenhorst and *Tinotus* Sharp of Aleocharini Fleming, and the genera of Hoplandriini Casey. Majority of Aleocharini taxa have 5-5-5 articulated tarsi and *Tinotus* and Hoplandriini have 4-5-5 tarsal formula. A future phylogenetic study is needed to reveal the true relationship of Himalusini to the other aleocharine tribes, mainly Aleocharini, Homalotini, Hoplandriini and Placusini.

***Himalusa* Pace, 2006**

Figs. 1–29

Type species: *Himalusa annapurnensis* Pace, 2006, by original designation.

Diagnosis. *Himalusa* may be distinguished from other aleocharine genera by the following combination of characters: body broad, robust, heavily sclerotized, glossy, sparsely punctate and sparsely pubescent (Figs. 1, 17); head large with pronounced eyes (Figs. 1, 17); antennae with antennomeres 5–11 transverse and incrassate (Figs. 1, 17); labrum elongate (Fig. 4); mandibles strong, each with one large subapical tooth and well-developed hairy molar plate (Figs. 5–5a), maxillae well developed, galea with long apical hairs (Figs. 7, 7a,b), lacinia with several large triangular teeth near the apex (Figs. 7, 7a), maxillary palpi with 4 articles, last one with pseudosegment (Figs. 7, 7b); ligula short, entire and in the form of a small lobe (Fig. 8); labial palpi with 2 articles and with minute apical pseudosegment (Fig. 8); pronotum strongly transverse and strongly convex dorsoapically (Figs. 1, 17); elytra and abdomen with scale-shaped microsculpture (Figs. 1, 17); elytra at base shorter than pronotum (Figs. 1, 17); abdomen tapering apically (Fig. 1); procoxae elongate, projecting and broadly separated, their cavities round and small (Fig. 2); mesocoxae oval in shape, flattened, and narrowly separated (Figs. 2, 3), mesov-



Figures 1, 2. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n.: **1** dorsal view, and **2** ventral view.

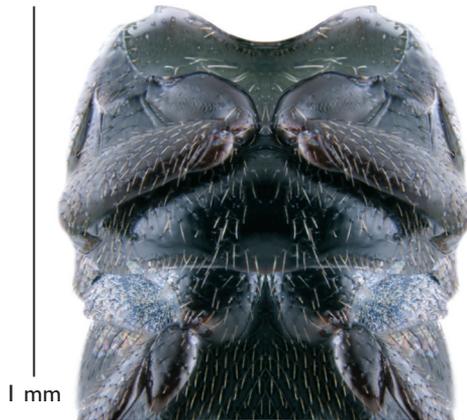
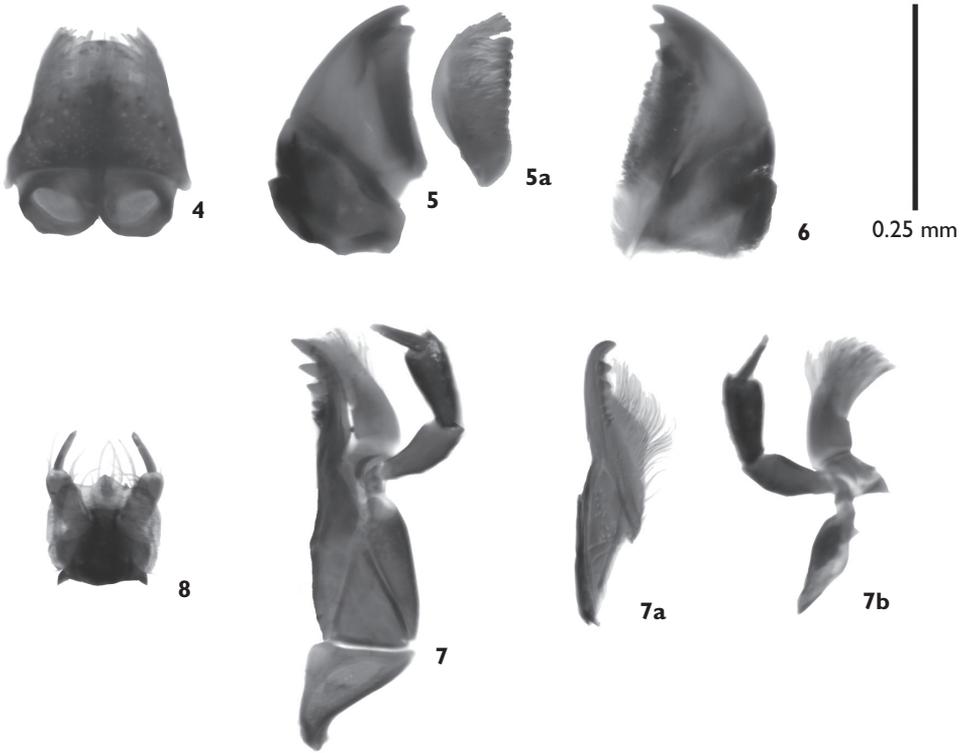


Figure 3. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n.: ventral view of meso-metathorax and first ventrite.

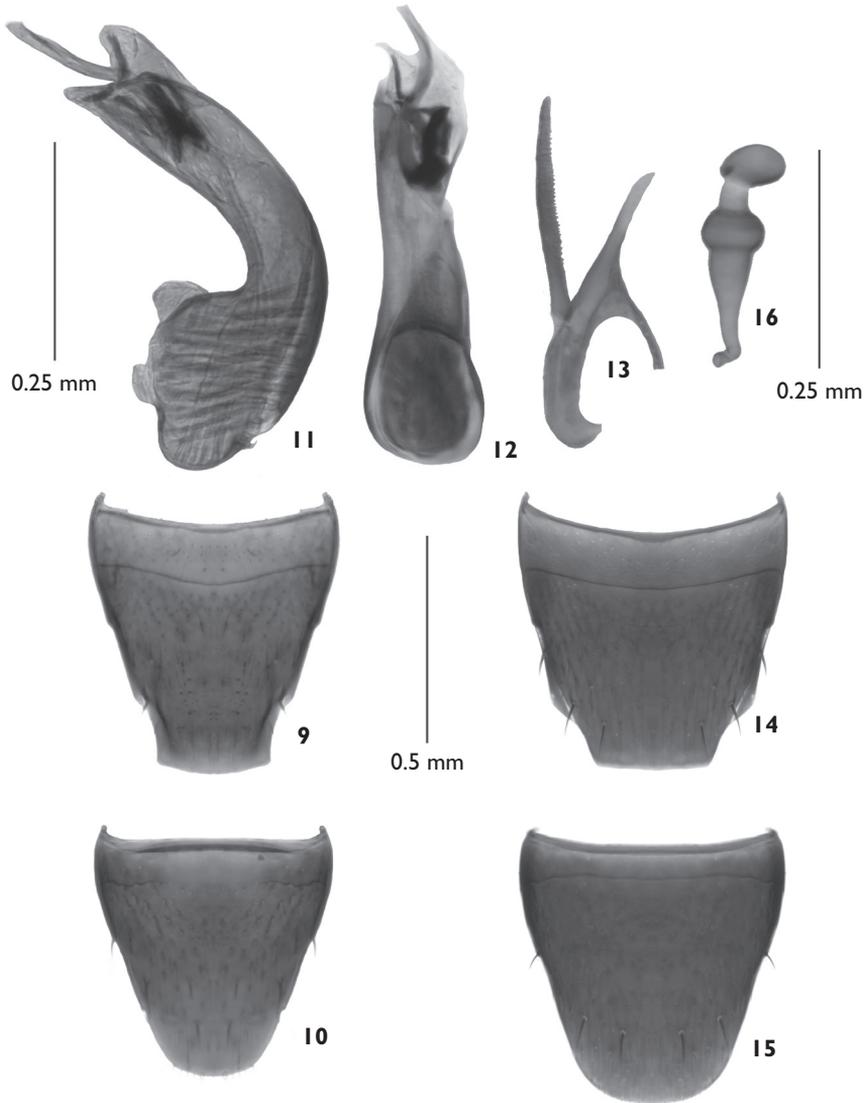


Figures 4–8. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., mouthparts: **4** labrum **5** left mandible **5a** molar structure **6** right mandible **7** maxilla **7a** lacinia and part of the galea **7b** maxillary palpus with galea **8** labial palpi and ligula.

entrite narrowly V-shaped and reaching one fifth of the mesocoxal length, isthmus short (Fig. 3); metacoxae transverse and nearly in contact medially (Fig. 3).

Key to *Himalusa* species of the world

- 1. Body broadly oval (Fig. 1); basal antennomeres black; base of pronotum approximately as broad as apex of elytra (Fig. 1); elytra at suture shorter than pronotum (Fig. 1); median lobe of aedeagus moderately narrow and moderately strongly curved, broader at base and gradually narrowing apically (Figs. 11, 12, 20, 21); known from Thailand.....
 ***H. thailandensis* Pace, Klimaszewski & Center, sp. n.**
- Body narrowly elongate (Fig. 74 in Pace 2006); basal antennomeres reddish; base of pronotum narrower than apex of elytra (Fig. 74 in Pace 2006); elytra at suture about as long as pronotum (Fig. 74 in Pace 2006); median lobe of aedeagus narrow and very strongly curved, narrow at base and broadest in apical third (Figs. 75, 76, in Pace 2006); known from Himalayan region in Nepal..... ***H. annapurnensis* Pace**



Figures 9–16. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., genital structures: **9** male tergite 8 **10** male sternite 8 **11** median lobe of aedeagus in lateral view **12** median lobe of aedeagus in dorsal view **13** paramere **14** female tergite 8 **15** female sternite 8 **16** spermatheca.

***Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n.**

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Figs. 1–29

HOLOTYPE (male): THAILAND, Lampang Province, Sop Prap District, N17°84'20.8" E99°20'33.3", 22.VII.2009, coll. R.W. Pemberton; feeding on *Paederia*

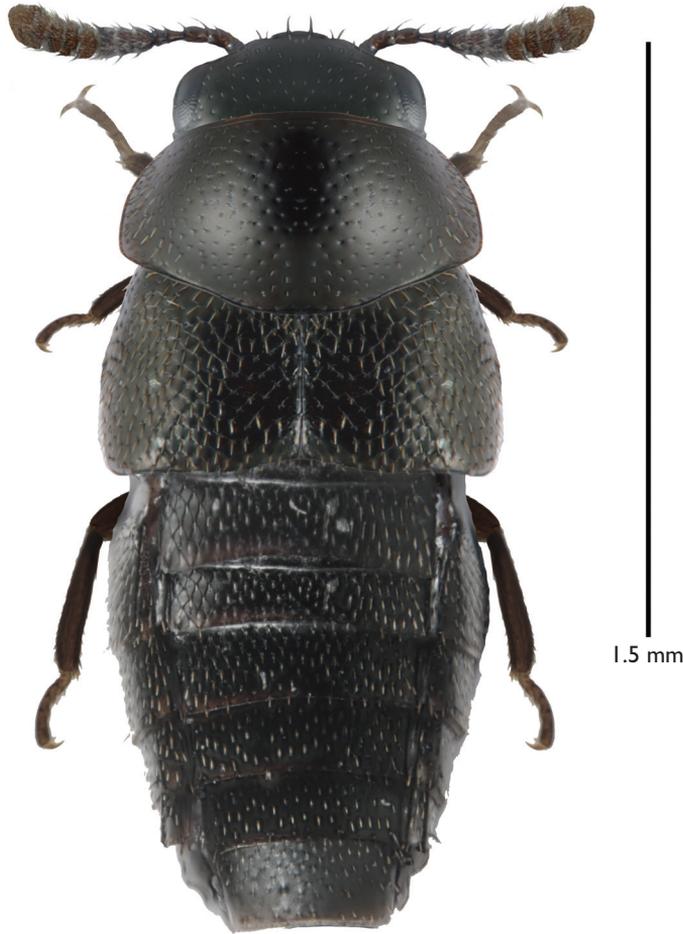


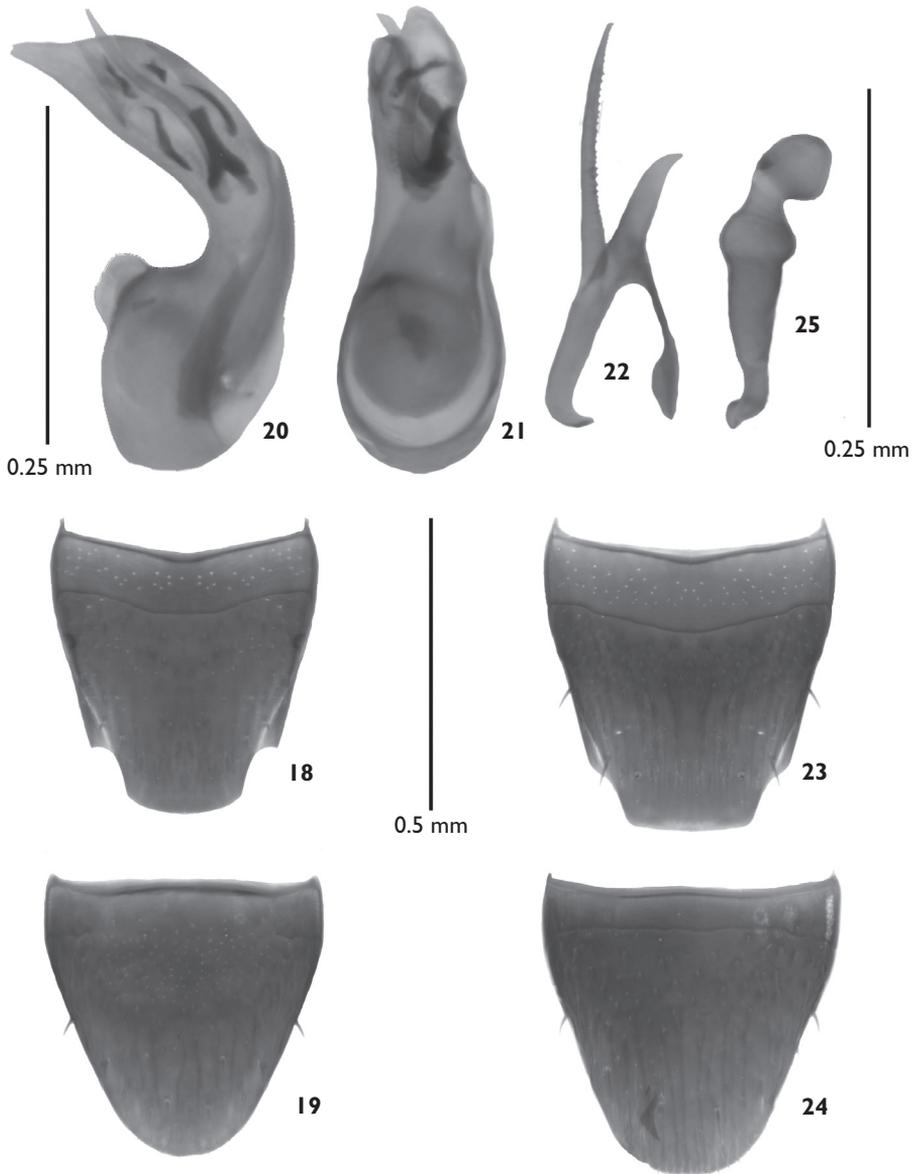
Figure 17. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., small body form, in dorsal view (apex of abdomen removed).

pilifera (LFC). **PARATYPES:** all labelled as the holotype (LFC) 2 males, 2 females, (IPRL) 2 males, 4 females.

NON-TYPES: these specimens are excluded from the type series on the grounds of smaller size but are considered as infraspecific variation of *H. thailandensis*: THAILAND, Prachuap Kin Kan Province, main highway, roadside heading north, Lat. 11°43.387'N, Long. 99°43.532'W, 21.IV.2009, A.D. Wright, staphylinid adults on *Paederia* sp. (LFC) 2 males, 1 female, (IPRL) 2 females.

Etymology. The specific name is a feminine adjective derived from the country name Thailand, where the type series was found.

Diagnosis. It differs externally from *H. annapurnensis* Pace by more robust body, more transverse pronotum, and tapering abdomen (Figs. 1, present paper, and 74 in



Figures 18–25. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., small body form, genital structures: **18** male tergite 8 **19** male sternite 8 **20** median lobe of aedeagus in lateral view **21** median lobe of aedeagus in dorsal view **22** paramere **23** female tergite 8 **24** female sternite 8 **25** spermatheca.

Pace 2006), and genitally with the tubus of the median lobe of the aedeagus being less convex in lateral view (Figs. 10, present paper, and 74 in Pace 2006).

Description. Body length 2.5–3.0 mm, robust and compact, strongly sclerotized, strongly glossy, sparsely punctate, elytra and abdomen with pronounced scale-shaped



Figures 26, 27. *Himalusa thailandensis* feeding on *Paederia* sp. leaf

microsculpture; body proportions: maximum width of pronotum to maximum width of head (1.3); maximum width of pronotum to its length (2.0); maximum width of elytra to length at suture (2.4); abdomen tapering apically (Fig. 1); legs moderately elongate. *Male*. Tergite 8 truncate apically (Figs. 9, 18); sternite 8 rounded apically



Figure 28. *Himalusa thailandensis*: a swollen petiole of *Paederia* sp. leaf that contains a larva.



Figure 29. *Himalusa thailandensis*: a larva that emerged from a swollen petiole of *Paederia* sp. leaf.

(Figs. 10, 19); median lobe of aedeagus with broadly arcuate venter of tubus in lateral view (Figs. 11, 20), and asymmetrical tubus in dorsal view (Figs. 12, 21), internal sac structures as illustrated (Figs. 11, 12, 20, 21); paramere with long styliform apical lobe bearing serrate internal edge (Figs. 13, 22). *Female*. Tergite and sternite 8 similar to those of male (Figs. 14, 15, 23, 24); spermatheca with approximately spherical capsule connected to narrow neck, swelled chamber and posterior stem (Figs. 16, 25).

Distribution. Adult specimens were collected from Lampang and Prachuap Kin Kan provinces, both in Thailand.

Comments. The specimens from Prachuap Kin Kan Province were excluded from the paratype series of *Himalusa thailandensis* on the grounds of smaller body (length 1.9–2.0 mm) and slight differences in the median lobe of aedeagus and spermatheca (Figs. 20, 21, 25). We consider these differences as infraspecific variations. Should further molecular studies prove the opposite, the status of this form should be reconsidered.

Collection and habitat data

Adults were captured in July (by type material) and April (by non-type material) feeding on skunkvine - *Paederia pilifera* Hook. f. (Rubiales: Rubiaceae). Closely related species are invasive weeds in the southern United States.

The adult beetles feed on the upper leaf surfaces of *P. pilifera*, parallel to a leaf vein, most often the mid-vein, where they excavate oblong holes completely through the leaf (Figs. 26, 27). These holes conform to the size of their bodies. The adults often nestle within them and, when disturbed, exit through to the underside of the leaf. They also scrape the lateral laminar surfaces causing an irregular skeletonized pattern. The leaf tissues adjacent to the feeding sites blacken and necrosis follows. This produces significant levels of foliar damage. The larvae burrow and feed within the leaf petioles. As they grow, the petioles swell and become almost gall-like. At some point, the petiole splits and the larva drops out. The images show a swollen petiole that contains a larva (Fig. 28), and the larva that emerged from it (Fig. 29). Pupation probably occurs in the soil or under leaf litter. Other aspects of their biology are unknown and merit further investigation.

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Contributions towards an understanding of the Cryptophaginae (Coleoptera, Cryptophagidae) of Atlantic Canada

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Abstract

Eighteen species of Cryptophaginae are now known to occur in Atlantic Canada. Eight of these including *Cryptophagus difficilis* Casey, *Cryptophagus jakowlewi* Reitter, *Cryptophagus laticollis* Lucas, *Cryptophagus mainensis* Casey, *Cryptophagus tuberculatus* Mäklin, *Pteryngium crenatum* (Gyllenhal), *Telmatophilus americanus* LeConte and *Caenoscelis basalis* Casey, are newly recorded in Atlantic Canada; one of which, *C. mainensis*, is newly recorded in Canada, and another, *C. laticollis*, is newly recorded in eastern North America. Nineteen new provincial records are reported with the result that five species of Cryptophaginae are now known from New Brunswick, 14 from Nova Scotia, four from Prince Edward Island, 10 from insular Newfoundland, and four from Labrador. A new early date of detection (1986) is reported for the adventive Palaearctic *Telmatophilus typhae* (Fallén) in North America. Keys to identification are provided for the genera *Antherophagus*, *Cryptophagus*, and *Telmatophilus* and the composition, zoogeography, and bionomics of the group in Atlantic Canada are discussed.

Keywords

Cryptophagidae, Cryptophaginae, *Antherophagus*, *Cryptophagus*, *Henoticus*, *Henotiderus*, *Pteryngium*, *Telmatophilus*, *Caenoscelis*, Atlantic Canada, New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, biodiversity, zoogeography, bionomics, keys to identification, adventive species

Introduction

The Cryptophaginae is the nominate subfamily of the Cryptophagidae (the silken fungus beetles). Most species feed on fungal hyphae, spores, and conidia while others are saprophagous. They are typically found in decaying organic materials that are colonized by fungi. Some species of *Cryptophagus* are found on a variety of stored products. Members of the genus *Antherophagus* are phoretic on bumble bees (*Bombus* spp.) whereas species in the genus *Telmatophilus* are associated with the flowers of various aquatic plants (Leschen and Skelley 2002).

Leschen and Skelley (2002) included 53 species in nine genera in the North American fauna. In Canada, Bousquet (1991) listed 42 species, although only 7 of these were recorded from Atlantic Canada (the provinces of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador). The present study contributes further records of species of this family from the region, provides keys to identification of species in the genera *Antherophagus*, *Cryptophagus*, *Henotiderus*, and *Telmatophilus* in the region, and discusses the composition, zoogeography, and bionomics of the group in Atlantic Canada.

Methods and conventions

Specimens of Cryptophaginae originating from Atlantic Canada in a variety of collections were examined and identified. These collections yielded 766 specimens; 195 from Nova Scotia, 21 from New Brunswick, 49 from Prince Edward Island, and 501 from Newfoundland and Labrador. Abbreviations (largely following Evenhuis 2009) of collections that contributed specimens or data to this study are:

AAFC	Agriculture and Agri-Food Canada, St. John's, Newfoundland and Labrador, Canada
ACNS	Agriculture and Agri-Food Canada, Kentville, Nova Scotia, Canada
ACPE	Agriculture and Agri-Food Canada, Charlottetown, Prince Edward Island, Canada
CBU	Cape Breton University, Sydney, Nova Scotia, Canada
CFS	Canadian Forest Service, Corner Brook, Newfoundland and Labrador, Canada
CGMC	Christopher G. Majka collection, Halifax, Nova Scotia, Canada
CNC	Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
CUIC	Cornell University Insect Collection, Cornell University, Ithaca, New York, United States
DHWC	David H. Webster collection, Kentville, Nova Scotia, Canada
JCC	Joyce Cook collection (now at the New Brunswick Museum)
JOC	Jeffrey Ogden collection, Truro, Nova Scotia, Canada

MUN	Memorial University of Newfoundland collection, St. John's, Newfoundland and Labrador, Canada (currently on long term loan to the Canadian Forest Service, Edmonton, Alberta)
MZHF	Zoological Museum, University of Helsinki, Helsinki, Finland
NBM	New Brunswick Museum, Saint John, New Brunswick, Canada
NSMC	Nova Scotia Museum, Halifax, Nova Scotia, Canada
NSNR	Nova Scotia Department of Natural Resources, Shubenacadie, Nova Scotia, Canada
RWC	Reginald Webster collection, Charters Settlement, New Brunswick, Canada
UMNB	Université de Moncton, Moncton, New Brunswick, Canada

In the species treatments, the number of specimens and the collection abbreviation are indicated in parentheses. Abbreviations used in the keys and listing of species are: L, body length; FIT, flight intercept trap; uv, ultra violet light.

Identification and taxonomy

The keys provided by Bousquet (1989) and Leschen and Skelley (2002) readily allow the identification of specimens to generic level.

Antherophagus. Northeastern North American species of *Antherophagus* Latreille can be identified with the following key (adapted from Downie and Arnett 1996: 1005):

Key A. Species of *Antherophagus*

1. Length over 4.0 mm; habitus broadly oblong. L. 4.0–5.0 mm
.....*Antherophagus ochraceus*
- Length less than 3.5 mm; habitus narrowly oblong. L. 3.3 mm.....
.....*Antherophagus convexulus*

Cryptophagus. Identifying *Cryptophagus* specimens to species level is fraught with difficulty. Many species are highly variable, and according to Woodroffe and Coombs (1961), variation in the North American fauna far exceeds that of European species. Certain species exhibit a high degree of local differentiation, there are polytypic species, and some species-complexes show intermediate forms between what are otherwise distinct species. There are variations in character states (such as the position of the lateral tooth on the pronotum), and in some species the aedeagi exhibit few distinctive features. Some character states, such as the shape of the lateral margins, are based on very subtle differences. Where quantitative measurements are used to help distinguish species, it is likely that some specimens will fall outside the normal range. As a result there are some species that "... are found to be so nearly indistinguishable that their correct identification on external characters becomes more of an art than a science." (Woodroffe and Coombs 1961: 183).

The keys, detailed descriptions, and illustrations of external anatomy and genitalia provided by Woodroffe and Coombs (1961) are indispensable for the identification of species of *Cryptophagus*. A simplified key to the species of *Cryptophagus* found thus far in Atlantic Canada (modified from Woodroffe and Coombs 1961: 186–189) is presented below:

Key B. Species of *Cryptophagus*

1. Elytral pubescence single, entirely decumbent with hairs of approximately equal length **2**
- Elytral pubescence double, with longer sub-erect or obliquely raised hairs, sometimes arranged in rows, in addition to decumbent pubescence; or all hairs obliquely raised and uneven in length **6**
- 2(1). Pronotal callosities strongly produced laterally so that pronotum is much wider across callosities than across lateral teeth; lateral tooth often very large (ratio of tooth projection from lateral margin/length of callosity: ~ 40%). L. 1.9–2.8 mm ***Cryptophagus acutangulus***
- Pronotal callosities much less strongly produced, pronotum not or slightly wider across callosities than across lateral teeth; lateral tooth small to medium-sized (ratio of tooth projection from lateral margin/length of callosity: 13–24%) **3**
- 3(2). Face of apical pronotal callosity projecting out from lateral margin of pronotum, delimited posteriorly by a distinct angle **4**
- Face of apical pronotal callosity not projecting out from lateral margin of pronotum, posteriorly contiguous with lateral pronotal margin **5**
- 4(3). Pronotum noticeably narrower than elytra (ratio of elytra at humeri to pronotum at middle ~ 1.0:1.2), almost parallel-sided, appearing quadrate (width to height ratio ~ 1.0:1.2). L. 2.2–3.3 mm ***Cryptophagus fallax***
- Pronotum not or only slightly narrower than elytra (ratio ~ 1.0:1.0), with arcuate lateral margins, distinctly transverse (ratio ~ 1.0:1.5). L. 2.0–2.7 mm ***Cryptophagus jakowlewi***
- 5(3). Usually bi-coloured, pronotum and elytral humeri reddish, remainder of elytra darker; pronotal callosities large (~ 1/4 of lateral margin), upturned, and not projecting anteriorly; lateral margin of pronotum strongly concave between callosity and lateral tooth. L. 2.0–2.8 mm ***Cryptophagus scanicus***
- Unicoloured red-brown; pronotal callosities smaller (~ 1/5 of lateral margin), not upturned and projecting strongly anteriorly; lateral margin of pronotum slightly concave between callosity and lateral tooth. L. 2.0–2.8 mm ***Cryptophagus tuberculosus***
- 6(1). Posterior edge of rim of pronotal callosity with a small posteriorly projecting rim tooth; flightless, most specimens with vestigial wings. L. 2.1–2.8 mm ***Cryptophagus difficilis***
- Posterior edge of rim of pronotal callosity without rim tooth; with full-sized wings **7**

- 7(6). Pronotal callosity very large (~ 1/3 of lateral margin); length ≤ 1.7 mm; antennal club with basal segment (article 9) distinctly narrower than middle segment (article 10). L. 1.5–1.7 mm..... ***Cryptophagus mainensis***
– Pronotal callosity smaller (~ 1/4 or less of lateral margin); length ≥ 1.7 mm; antennal club with articles 9 and 10 of approximately the same width **8**
- 8(7). Eyes small, conical, and somewhat flattened anteriorly; anterior elytral punctation significantly finer and more widely spaced than pronotal punctation; generally smaller, most individuals ≤ 2.0 mm. L. 1.7–2.4 mm
..... ***Cryptophagus laticollis***
– Eyes normal to large; anterior elytral punctation almost as large and dense as pronotal punctation; generally larger, individuals ≥ 2.0 mm..... **9**
- 9(8). Pronotal callosity generally smaller (1/5–1/6 of lateral margin) with weak dorsal rim, usually not prominent anteriorly. L. 2.5–3.0 mm.....
..... ***Cryptophagus histricus***
– Pronotal callosity generally larger (1/4–1/6 of lateral margin), usually thickened with strong dorsal rim, frequently prominent anteriorly. L. 2.0–3.0 mm..... ***Cryptophagus setulosus***

Henoticus. There is only a single species of *Henoticus* Thomson in northeastern North America, *H. serratus* (Gyllenhal).

Henotiderus. The Nearctic *Henotiderus hirtus* Casey, 1900 and *Henotiderus obesulus* Casey, 1900 were synonymized by Johnson et al. (2007) with the eastern Palearctic *Henotiderus centromaculatus* Reitter, 1877 to form one Holarctic species.

Pteryngium. There is only a single species of *Pteryngium* Reitter found in North America, *P. crenatum* (Gyllenhal).

Telmatophilus. North American species of *Telmatophilus* Heer can be identified with the following key (adapted from Hoebeke and Wheeler 2000: 399):

Key D. Species of *Telmatophilus*

1. Body length 2.5–3.0 mm; meta-tibia of male with an external flange-like expansion at the base; male with a deep oval pit at the apex of the fifth (last) visible abdominal ventrite ***Telmatophilus americanus***
– Body length 1.9–2.6 mm; meta-tibia of male without any flange-like expansion; male with a feeble depression at the apex of the fifth (last) visible abdominal ventrite..... ***Telmatophilus typhae***

Caenoscelis. The six species of *Caenoscelis* Thomson found in northeastern North America can be identified with the key provided in Downie and Arnett (1996: 1010–1011).

Results

Eighteen species of Cryptophaginae are now known to occur in Atlantic Canada. Nine of these including *Cryptophagus difficilis* Casey, *Cryptophagus jakowlewi* Reitter, *Cryptophagus laticollis* Lucas, *Cryptophagus mainensis* Casey, *Cryptophagus tuberculosus* Mäklin, *Pteryngium crenatum* (Gyllenhal), *Telmatophilus americanus* LeConte, and *Caenoscelis basalis* Casey are newly recorded in Atlantic Canada; *C. mainensis*, is newly recorded in Canada, and *C. laticollis*, is newly recorded in eastern North America. Nineteen new provincial records are reported, with the result that five species of Cryptophaginae are now known from New Brunswick, 14 from Nova Scotia, four from Prince Edward Island, 10 from insular Newfoundland, and four from Labrador (a total of 11 species from the province of Newfoundland and Labrador) (Table 1). A new early date of detection is reported for the adventive Palaearctic *Telmatophilus typhae* (Fallén) in North America; 1986, nine years earlier than previously known. The fauna is discussed in greater detail below, with records of new jurisdictional records provided.

***Antherophagus convexulus* LeConte, 1863**

Antherophagus convexulus was reported from both New Brunswick and Nova Scotia by Bousquet (1991). There are a number of records from both the mainland of Nova Scotia and Cape Breton Island (Fig. 1), however, we have not been able to locate voucher specimens or published records of this species from New Brunswick. We provisionally retain this species for the New Brunswick fauna (subject to confirmation) since it is also known from the neighbouring jurisdictions of Québec and Maine (Procter 1946; Laplante et al. 1991), and is to be expected in the province. *Antherophagus* species are phoretic on bumblebees (*Bombus* spp.) and are often found in their nests or at flowers where their larvae apparently feed on organic detritus (Bousquet 1989; Leschen and Skelley 2002).

***Antherophagus ochraceus* Melsheimer, 1844**

Antherophagus ochraceus was reported from New Brunswick, Nova Scotia, Prince Edward Island, and insular Newfoundland by Bousquet (1991) and it is widely distributed in the region (Fig. 1). *Antherophagus* species are associated with bumblebees (*Bombus* spp.) (see *A. convexulus*). Blatchley (1910) reported this species from the flowers of *Hydrangea arborescens* L. (Hydrangeaceae). In Nova Scotia there are several records from the flowers of *Rosa virginiana* Mill. (Rosaceae).

Table 1. The Cryptophaginae of Atlantic Canada.

	NB	NS	PE	NF	LB	Distribution in NE North America
Cryptophagini						
<i>Antherophagus convexulus</i> LeConte	1	1				ME, NB, NS, ON, QC
<i>Antherophagus ochraceus</i> Melsheimer §	1	1	1	1		MA, ME, NB, NF, NH, NS, ON, PE, QC, RI
<i>Cryptophagus acutangulus</i> Gyllenhal §		1		1		CT, MA, ME, NF, NH, NS, NY, ON, QC
<i>Cryptophagus difficilis</i> Casey				1	1	LB, NF, QC
<i>Cryptophagus fallax</i> Balfour-Browne †	1	1	1			ME, NB, NS, PE
<i>Cryptophagus histricus</i> Casey					1	LB
<i>Cryptophagus jakowlewi</i> Reitter *		1	1			NS, PE, QC
<i>Cryptophagus laticollis</i> Lucas †		1				NS
<i>Cryptophagus mainensis</i> Casey		1		1		ME, NF, NH, NS, NY
<i>Cryptophagus scanicus</i> (Linnaeus) †				1		NF
<i>Cryptophagus setulosus</i> Sturm §				1	1	LB, NF, NY, ON, QC
<i>Cryptophagus tuberculatus</i> Mäklin *		1		1		ME, NF, NH, NS
<i>Henoticus serratus</i> (Gyllenhal) *		1		1	1	LB, MA, NF, NH, NS, ON, QC, RI
<i>Henotiderus centromaculatus</i> Reitter *		1				NH, NS, ON, QC
<i>Pteryngium crenatum</i> (Gyllenhal) †		1				NH, NS, QC
<i>Telmatophilus americanus</i> LeConte	1	1		1		MA, ME, NB, NF, NH, NS, ON, QC
<i>Telmatophilus typhae</i> (Fallén) †	1	1	1			NB, NS, PE
Caenoscelini						
<i>Caenoscelis basalis</i> Casey		1		1		ME, NF, NH, NS, NY, QC
Total	5	14	4	10	4	

Notes: †, adventive Palaearctic; *, Holarctic; §, probably Holarctic; no symbol, Nearctic.

For the purposes of this treatment, northeastern (NE) North America is taken to consist of the following jurisdictions: CT, Connecticut; LB, Labrador; MA, Massachusetts; ME, Maine; NB, New Brunswick; NF, insular Newfoundland; NH, New Hampshire; NS, Nova Scotia; NY, New York; ON, Ontario; PE, Prince Edward Island; QC, Québec; RI, Rhode Island; PM, Saint-Pierre et Miquelon; and VT, Vermont.

Cryptophagus acutangulus Gyllenhal, 1827

NOVA SCOTIA: Halifax Co.: Dartmouth, January 27, 1987, D. Seguin (1, NSMC); Halifax, December 11, 1990, P. Hyslop (2, NSMC); Halifax, July 18, 2002, D. Holland (3, NSMC); Halifax, December 4, 1989, J. Newman (1, NSMC); Halifax, July 23, 1991, collector not recorded (5, NSMC); Halifax, July 18, 2002, D. Holland (1, NSMC); Halifax, July 6, 1992, D. McCarthy (3, NSMC); **Kings Co.:** Kentville, July 10, 1965, C.J.S. Fox (1, ACNS); Kentville, July 10, 1965, C.J.S. Fox (1, ACNS); **Richmond Co.:** Lake Uist, July 3–6, 1990, B. Wright, feeding on dead horsefly (21, NSMC).

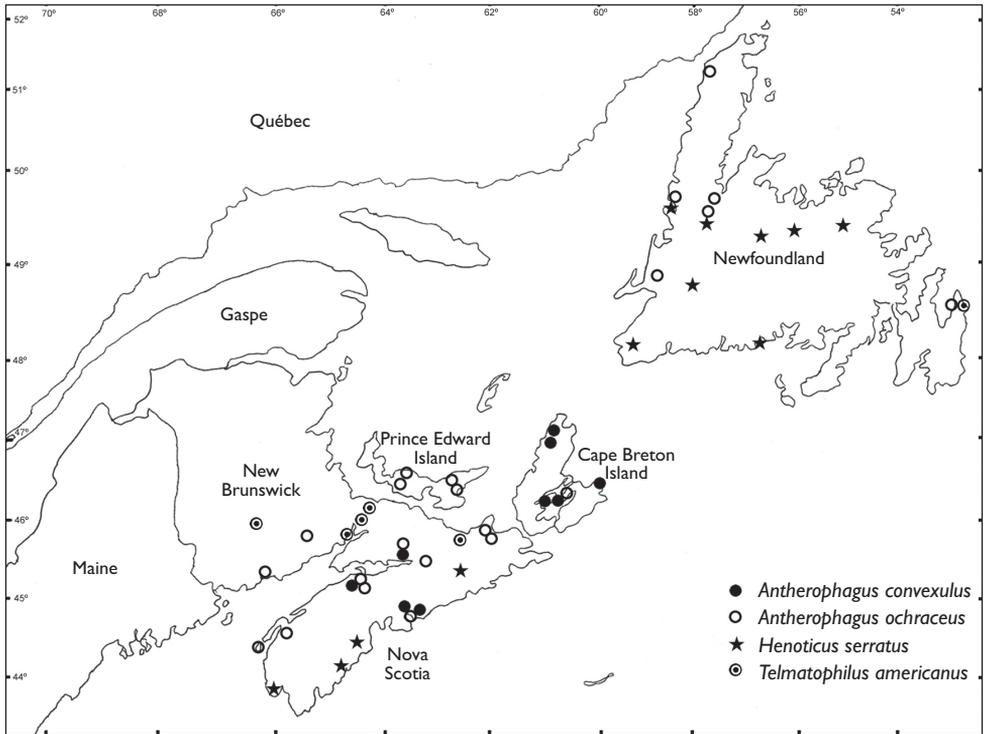


Figure 1. Distribution of *Antherophagus convexus*, *Antherophagus ochraceus*, *Henoticus serratus*, and *Telmatophilus americanus* in Atlantic Canada.

Cryptophagus acutangulus is newly recorded in Nova Scotia, on both the mainland of the province and Cape Breton Island. It was reported previously from insular Newfoundland by Bousquet (1991) (Fig. 4). It is probably a Holarctic species, generally distributed in North America (Woodroffe and Coombs 1961). Woodroffe and Coombs (1961) noted that in Europe this species occurs on stored produce and it is possible that its North American distribution may have been influenced by commercial activities. In the Palearctic region it is found throughout Europe, in North Africa, across the Middle East and Caucasus, through Central Asia, the Russian Far East, south to Japan, North Korea, and China. It is also found in sub-Saharan Africa and the Neotropical Region (Johnson et al. 2007). It occurs both on stored products and in wild habitats (Woodroffe and Coombs 1961). A very distinctive species on account of the strongly produced lateral pronotal callosities.

Cryptophagus difficilis Casey, 1900

LABRADOR: Goose Bay, military base, July 28–August 6, 2008, G.R. Pohl & D.W. Langor, weedy *Salix*/grass clearing, pitfall (1, MUN); Middle Brook, June 2–17, 2005, July 4–18, 2005, July 18–2, August 2–11, 2005, August, 2005, August 11–24, 2005,

August 24-September 12, 2005, S. Pardy, boreal forest, pitfall (73, MUN); Muskrat Falls, June 2-17, 2005, June 17-July 5, 2005, July 5-19, 2005, July 19-August 3, 2005, August 3-12, 2005, August 12-25, 2005, August 25-September 13, 2005, S. Pardy, boreal forest, pitfall (215, MUN); Muskrat Falls, July 31, 2008, G.R. Pohl & D.W. Langor, wooded trails, ex mushrooms (3, MUN); Ossak Camp, August 11-29, 2004, September 22-October 8, 2004, September 27-October 8, 2004, S. Pardy, subarctic black spruce forest, pitfall (7, MUN); Port Hope, July 22-August 5, 2004, August 5-25, 2004, August 25-September 13, 2005, S. Pardy, subarctic black spruce forest, pitfall (22, MUN); St. Lewis, July 5-22, 2004, August 10-25, 2004, August 25-September 7, 2004, S. Pardy, coastal barrens, heath, pitfall (16, MUN). **NEWFOUNDLAND:** Baker's Brook, Gros Morne National Park, July-August, 2000, N. Chalk (7, MUN); Burnt Cape, July 24-7 August, 2003, August 7-21, 2003, A.M. Hynes, cow parsnip patch, pitfall (2, MUN); Burnt Cape, July 24-7 August, 2003, A.M. Hynes, shoreline, pitfall (1, MUN); Gambo, August 26, 1949, E. Palmen (6, MZHF); Glide Lake, August 30, 1994, W. Bowers (1, CFS); St. John Island, August 3, 1949, C.H. Lindroth (1, MZHF); St. John's, September-November, 1994, Biology 4150 (3, MUN); St. John's, September 30, 1997, J. Coombs (1, AAFC); Windsor Lake, August 30, 1977, D. Larson (5, MUN).

Cryptophagus difficilis is newly recorded in insular Newfoundland, Labrador and in Atlantic Canada (Figs. 3, 6). In Canada, previous records of the species are from British Columbia, Alberta, the Yukon, and Québec; in the United States it has been found from Idaho to New Jersey, and south to Georgia (Woodroffe and Coombs 1961). In British Columbia it has been collected from fungus (Woodroffe and Coombs 1961). It is a flightless species, and in most of the specimens examined from this region, the wings were vestigial (although one specimen had reduced wings equal to approximately half the length of the abdomen).

***Cryptophagus fallax* Balfour-Browne, 1953**

NEW BRUNSWICK: Westmorland Co.: Moncton, November 24, 1982, Pest Control (1, UMNB); Moncton, September 14, 1982, S.R. Michaud (1, UMNB); Moncton, September 14, 1982, S.R. Michaud (1, UMNB). **NOVA SCOTIA: Halifax Co.:** Halifax, June 30, 1989, N. Patterson (3, NSMC). **PRINCE EDWARD ISLAND: Prince Co.:** Summerside, June 6, 1988, M. Drake, in house (3, ACPE); **Queens Co.:** Charlottetown, September 24, 1981, L.S. Thompson (5, ACPE); Charlottetown, summer, 1991, J.G. Stewarton (1, ACPE); Charlottetown, July 15, 1985, M.E.M. Smith (1, ACPE); Charlottetown, June 20, 1988, M.E.M. Smith, in house (2, ACPE); Charlottetown, June, 1973, collector not recorded (2, CNC); Earnscliffe, September 7, 1983, M.E.M. Smith, in house (1, ACPE); Mount Stewart, June 10, 1976, L.S. Thompson (5, ACPE).

Cryptophagus fallax is newly recorded in New Brunswick (Fig. 2). Previous North American records are from Maine (Woodroffe and Coombs 1961), Sable Island, Nova

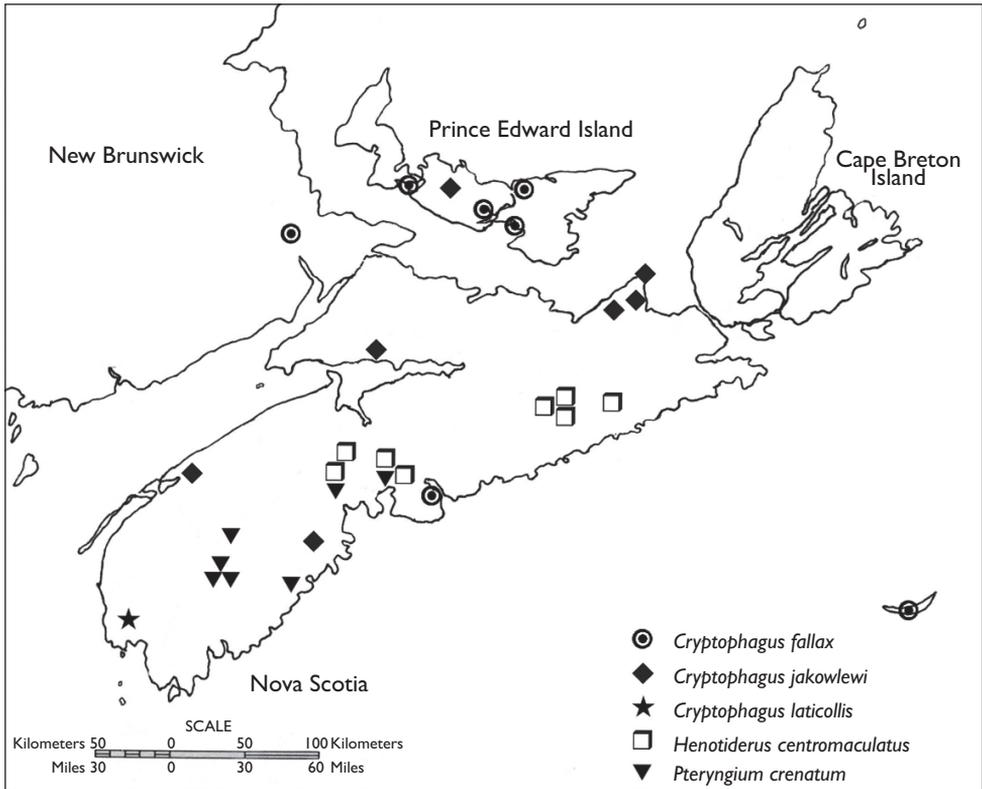


Figure 2. Distribution of *Cryptophagus fallax*, *C. jakowlewi*, *C. laticollis*, *Henotiderus centromaculatus*, and *Pteryngium crenatum* in Atlantic Canada.

Scotia (Howden 1970), and Prince Edward Island (CAIPR 1973). The above record from Halifax also establishes the presence of this species on the mainland of Nova Scotia. It is an adventive species in North America and is found in the Palearctic region throughout Europe, east through the Caucasus to Kazakhstan and Uzbekistan, and south to Egypt (Johnson et al. 2007). All the specimens collected in this region have been found in buildings on stored products except for two collected on Sable Island in an Ipswich Sparrow (*Passerculus sandwichensis princeps* Maynard) nest (Howden 1970). The narrow quadrate pronotum (compared to the enlarged, convex elytra), and the large pronotal callosities with their face turned upwards, make this a distinctive species amongst the North American fauna (Woodroffe and Coombs 1961).

***Cryptophagus histicus* Casey, 1900**

Cryptophagus histicus was reported by Woodroffe and Coombs (1961) from a bumblebees' nest in Tallik Nagvak Fjord in northern Labrador (Fig. 6). This is the only record of this Nearctic species in the region. It is otherwise recorded from scattered states in

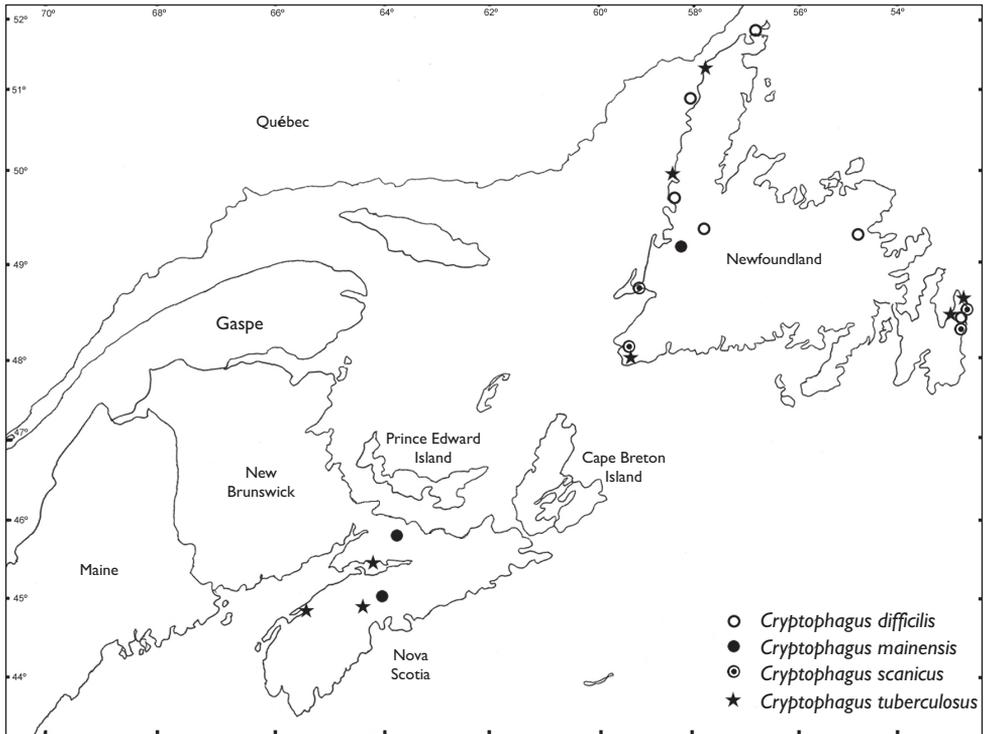


Figure 3. Distribution of *Cryptophagus difficilis*, *C. mainensis*, *C. scanicus*, and *C. tuberculosus* in Atlantic Canada.

western and eastern portions of the continent. Other records are from fungi, on cord wood, and in malt (Woodroffe and Coombs 1961).

Cryptophagus jakowlewi Reitter, 1888

NOVA SCOTIA: Antigonish Co.: Cape George, June 23, 1994, M. LeBlanc (1, NSNR); Fairmont Tower Rd, June 16, 1994, M. LeBlanc (1, NSNR); Fairmont Tower Rd, May 17, 1995, M. LeBlanc (1, NSNR); Fairmont Tower Rd, July 6, 1995, M. LeBlanc (2, NSNR); **Colchester Co.:** Five Islands Park, June 13, 2004, J. Ogden, FIT (1, NSNR); **Lunenburg Co.:** Bridgewater, June 30, 1965, B. Wright, red oak (1, NSMC); **Pictou Co.:** Marshy Hope, June 7, 1995, M. LeBlanc (2, NSNR). **PRINCE EDWARD ISLAND: Queens Co.:** St. Patricks, July 13, 2002, C.G. Majka, old field (1, CGMC).

Cryptophagus jakowlewi is newly recorded in Nova Scotia, Prince Edward Island, and Atlantic Canada (Fig. 2). Nearctic specimens of this species were previously known under the name of *Cryptophagus confertus* Casey, 1900 (synonymized by Johnson et al. 2007). It is a Holarctic species found across Canada and the northern United States, in Europe in the Alps and Scandinavia, across Siberia to the Russian Far East, and south

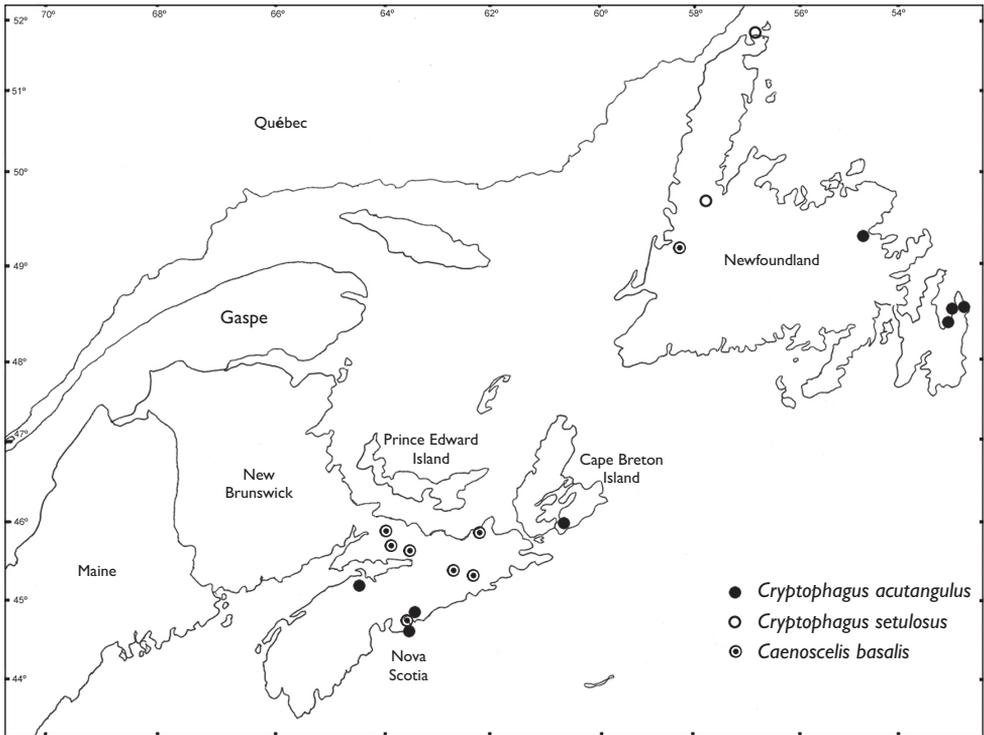


Figure 4. Distribution of *Cryptophagus acutangulus*, *C. setulosus*, and *Caenoscelis basalis*, in Atlantic Canada.

to Mongolia, Inner Mongolia, and Central Asia. In Europe, Lohse (1967) describes it as a boreo-alpine species. Some specimens of this species can be separated from *Cryptophagus bidentatus* Mäklin on the basis of external morphology only with great difficulty. The aedeagi of both species are indistinguishable, however, the shape of the parameres of the two species are quite distinct (Woodroffe and Coombs 1961).

Cryptophagus laticollis Lucas, 1846

NOVA SCOTIA: Yarmouth Co.: Carleton, Perry Rd, July 18, 1993, J. & T. Cook, car netting (1, JCC).

Cryptophagus laticollis is newly recorded in Nova Scotia and eastern North America (Fig. 2). It is an adventive Palearctic species, previously recorded in North America from the west coast in British Columbia, Alberta, California, Oregon, and Washington (Woodroffe and Coombs 1961; Bousquet 1991). It is a cosmopolitan species found throughout the Palearctic in Europe, North Africa, and Asia, and in Australia, sub-Saharan Africa, and the Orient (Johnson et al. 2007). It is found on stored products and in vegetable refuse (Woodroffe and Coombs 1961). The small conical eyes of *C. laticollis* distinguish this species from the similar *Cryptophagus setulosus* (Woodroffe and Coombs 1961).

***Cryptophagus mainensis* Casey, 1924**

NEWFOUNDLAND: Steady Brook, July 10, 1949, E. Palmén (2, MZHF). **NOVA SCOTIA: Cumberland Co.:** Westchester-Londonderry, August 22, 1992, S. & J. Peck, forest road, car netting (1, JCC); **Hants Co.:** Panuke Lake, 16–29 July, 1997, D.J. Bishop, red spruce/eastern hemlock (old growth), FIT (1, NSMC); Panuke Lake, 29 July–13 Aug, 1997, D.J. Bishop, red spruce (45 years), FIT (1, NSMC); Panuke Lake, 29 July–13 Aug, 1997, D.J. Bishop, red spruce (45 years), FIT (1, NSMC).

Cryptophagus mainensis is newly recorded in insular Newfoundland, Nova Scotia, and Canada as a whole (Fig. 3). This is a Nearctic species previously known only from Maine, New Hampshire, New York, and Ohio (Woodroffe and Coombs 1961; Chandler 2001). In Nova Scotia specimens were collected in red spruce (*Picea rubens* Sarg., Pinaceae) and mixed eastern hemlock (*Tsuga canadensis* (L.) Carr., Pinaceae) and red spruce forests varying in age from old growth (120+ years) to 45 years. This is the first habitat information about this species. It is a very distinctive species on account of its small size (1.5–1.7 mm.) and very large pronotal callosities which subtend 1/3 of the lateral margin of the pronotum.

***Cryptophagus scanicus* (Linnaeus, 1758)**

NEWFOUNDLAND: Goulds, September 27, 1982 (1, AAFC); St. John's, June 9, 1949, W.J. Brown (5, AAFC); Stephenville, 9 mi. west, August 17, 1981, D. Langor, bog pools (1, AAFC); Upper Ferry, August 18, 1981, D. Langor (6, MUN).

Cryptophagus scanicus was reported in North America by Woodroffe and Coombs (1961) from the five specimens collected in St. John's in 1949 by W.J. Brown. Additional records are given indicating that the species is established and occurs more widely in southern Newfoundland (Fig. 3). It is an adventive Palaearctic species found throughout Europe, in parts of North Africa, across Siberia to the Russian Far East, and in Turkey and Iran in the Middle East. It is also found in sub-Saharan Africa (Johnson et al. 2007). In Europe, it is found in various habitats including stored produce (Woodroffe and Coombs 1961).

***Cryptophagus setulosus* Sturm, 1845**

LABRADOR: Mealy Mts, July, 2002, Anions, Sutton & Quicke (1, MUN); Middle Brook, June 2–17, 2005, June 17–July 4, 2005, July 4–18, 2005, July 18–2 August, 2005, S. Pardy, boreal forest, pitfall (18, MUN); Muskrat Falls, June 2–17, 2005, June 17–July 5, 2005, S. Pardy, boreal forest, pitfall (5, MUN); Ossak Camp, June 28–July 11, 2004, July 11–August 11, 2004, August 11–29, 2004, August 29–September 22, 2004, September 22–October 8, 2004, S. Pardy, subarctic black spruce forest, pitfall (10, MUN); Red Bay, July 4–20, 2004, July 20–August 6, 2004, August 6–23, 2004, August 23–September 2,

2004, S. Pardy, coastal barrens, heath, pitfall (12, MUN); St. Lewis, July 22–August 10, 2004, August 10–25, 2004, August 25–September 7, 2004, S. Pardy, coastal barrens, heath, pitfall (10, MUN). **NEWFOUNDLAND:** Burnt Cape, July 10–24, 2003, A.M. Hynes, crowberry lawn, pitfall (1, MUN); Burnt Cape, July 10–24, 2003, A.M. Hynes, cow parsnip patch, pitfall (1, MUN); Deer Lake, 7 km NE Cormack, July 23–August 18, 1997, S. & J. Peck, mixed, FIT (1, MUN); Gambo, August 26, 1949, E. Palmen (1, MZHF).

Cryptophagus setulosus is newly recorded on insular Newfoundland (Fig. 4). It was previously recorded by Woodroffe and Coombs (1961) from one specimen collected in Labrador. Additional records above indicate that it is abundant and widespread in southern Labrador (Fig. 6). There are scattered records of this species from a number of Canadian and American provinces and states. Woodroffe and Coombs (1961) refer to it as a possibly Holarctic species, while Bousquet (1991) lists it as Holarctic. Woodroffe and Coombs (1961) noted that in Europe this species occurs on stored produce and it is possible that its North American distribution may have been influenced by commercial activities. In the Palaearctic region it is found throughout Europe, in Algeria and Morocco in North Africa, and in Turkey and Central Asia north to Eastern Siberia (Johnson et al. 2007). In Europe it is most frequently found in nests of bees and wasps, but also in fungi and on stored produce (Woodroffe and Coombs 1961).

Cryptophagus tuberculosus Mäklin, 1853

NEWFOUNDLAND: Cow Head, August 13, 1949, E. Palmen (2 females, MZHF); Portugal Cove: Indian Meal Line, August 18, 1986, September 15, 1986 (2, MUN); Portugal Cove: Indian Meal Line, May 16, 1979 (1, AAFC); St. Barbe, July 26, 1949, E. Palmen (1 male, 2 females, MZHF); St. John's, September 15, 1995, October 11, 1996, Biology 4150 (3, MUN); Upper Ferry, August 18, 1981, D. Langor (1, MUN). **NOVA SCOTIA: Annapolis Co.:** Annapolis Royal, July 30, 1941, H.T. Stultz, dried corn (1, ACNS); **Lunenburg Co.:** New Ross, August 1, 1990, M. Russell, in plastic wrapping on hay ladder (1, NSMC); **Colchester Co.:** Five Islands, June 16, 1995, C. Corkum, young coniferous forest, FIT (1 male, NSMC).

Cryptophagus tuberculosus is newly recorded on insular Newfoundland, in Nova Scotia, and in Atlantic Canada (Fig. 3). This Holarctic species has previously recorded in North America from Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, New Mexico, Oregon, Utah, Washington, and Wyoming in western North America (Woodroffe and Coombs 1961), and in Maine and New Hampshire in eastern North America (Chandler 2001). In the Palaearctic region it is found in Scandinavia and northern Russia, east to the Russian Far East, Mongolia, and Inner Mongolia (Johnson et al. 2007). Woodroffe and Coombs (1961) reported it from coniferous trees, nests, and stored produce (especially dried fruit). In Nova Scotia it has been found on dried corn and in a coniferous forest. This is a highly variable, polytypic species which can be difficult to separate from *Cryptophagus subfumatus* Kraatz. The shape of the parameres, however, are quite distinctive (Woodroffe and Coombs 1961).

The occurrence of *C. tuberculosis* in eastern North America is noteworthy. Woodroffe and Coombs (1961) drew attention to the wide Holarctic distribution of this species and its apparent absence in eastern North America. They also noted three “forms” of this species in western North America and suggested that the species was rather easily isolated by geographical or ecological barriers. They further proposed that the species may have dispersed to North America at a time when a land bridge existed across the Bering Strait. Therefore, the occurrence of *C. tuberculosis* in eastern North America may suggest that this species has a typical Holarctic distribution.

***Henoticus serratus* (Gyllenhal, 1808)**

NEWFOUNDLAND: Bishop’s Falls, August 12, 1979, E. John (1, AAFC); Bonne Bay, Woody Point, July 16, 1949, E. Palmen (1, MZHF); Catamaran Park, 10 mi. north, July 3, 1985 (1, CFS); Gander, July, 1979 (1, MUN); Gander, July 14, 1981, R.F. Morris, hospital operating room (1, AAFC); Glide Lake, July 5, 1994, W. Bowers et al. (1, CFS); Little Grand Lake, 2 km east of Martin Pond, June 8–July 13, 1993, pitfall (1, MUN); Rocky Harbour, Gros Morne National Park, July 24–August 17, 1994, S. & J. Peck, mixed forest, FIT (2, MUN); Rencontre West, June 17–19, 1949, C.H. Lindroth (1, MZHF); South Branch, July 2, 1949, C.H. Lindroth (1, MZHF); South Branch, July 2, 1949, E. Palmen (1, MZHF). **NOVA SCOTIA: Guysborough Co.:** Dayspring Lake, 29 July–13 Aug, 1997, D.J. Bishop, red spruce, FIT (1, NSMC); **Lunenburg Co.:** Bridgewater, July 1–16, 1965, B. Wright, red oak forest, pitfall trap (1, NSMC); **Queens Co.:** Ponthook Lake, July 13, 1993, J. Cook, uv light trap (11, JCC); **Yarmouth Co.:** Carleton, Perry Rd, July 18, 1993, J. & T. Cook, car netting (1, JCC).

Henoticus serratus is newly recorded in insular Newfoundland and Nova Scotia (Fig. 1). Downie and Arnett (1996) reported the species from Labrador, although it is not clear where this record originates. Bousquet (1991) reported the species from Alaska and British Columbia east to Québec, and Downie and Arnett (1996) reported records from a variety of eastern and western states in the USA. In the Palearctic region this Holarctic species is found throughout Europe (except for the Iberian peninsula, the southern Balkans and the Mediterranean islands) southeast to Georgia, and east across Siberia to the Russian Far East (Johnson et al. 2007). All the specimens collected in Atlantic Canada are from wild habitats such as red spruce and red oak (*Quercus rubra* L., Fagaceae) forests. Blatchley (1910) reported it from dry fungi about the stumps of oaks. Bousquet (1989) noted that adults in the genus *Henoticus* are usually found in leaf litter, fungi, under the bark of dead or dying trees, and on leaves of trees or shrubs.

***Henotiderus centromaculatus* Reitter, 1877**

Henotiderus centromaculatus was recorded from Nova Scotia by Bousquet (1991) (as *H. obesulus*). There are scattered records from the central part of mainland Nova Scotia

(Fig. 2). This Nearctic species has been recorded from Alaska and across Canada from the Northwest Territories east to Nova Scotia, and in New Hampshire and New York (Bousquet 1991; Downie and Arnett 1996; Chandler 2001). It is also found in the Eastern Palaearctic in China, Japan, and the Russian Far East (Johnson et al. 2007). Species of *Henotiderus* are found in leaf litter or associated with polypore fungi such as *Polyporus*, *Pleurotus*, and *Fomes* in forested habitats (Bousquet 1989). All the specimens collected in Nova Scotia were found in red spruce forests, varying in age from young to old growth, except for one specimen collected in a mixed red spruce-eastern hemlock forest (unpublished data).

***Pteryngium crenatum* (Gyllenhal, 1808)**

NOVA SCOTIA: Annapolis Co.: Durland Lake, May 21, 2003, P. Dollin, hemlock/balsam fir/black spruce (120+ years): bracket fungus (1, NSMC); Durland Lake, May 21, 2003, P. Dollin, hemlock/balsam fir/black spruce (120+ years): bracket fungus (1, NSMC); **Halifax Co.:** Big Indian Lake, June 23, 2003, P. Dollin, red spruce (80–120), funnel trap (1, NSMC); Big Indian Lake, July 16, 2003, P. Dollin, red spruce (80–120 years), funnel trap (1, NSMC); Big Indian Lake, June 23, 2003, P. Dollin, red spruce (80–120 years): belted bracket fungus (2, NSMC); **Lunenburg Co.:** Card Lake, 2–15 June, 1997, D.J. Bishop, red spruce/hemlock (old growth forest), FIT (1, NSMC); **Queens Co.:** Black Duck Lake, June 9, 2003, P. Dollin, white pine/red spruce (40–80 years): underside of bracket fungus (1, NSMC); Eight Mile Lake, June 5, 2003, P. Dollin, red spruce (40–80 years): belted bracket fungus (1, NSMC); Sixth Lake, June 18, 2003, P. Dollin, hemlock (120+ years) (1, NSMC); Tobetic Lake, June 17, 2003, P. Dollin, red spruce (80–120 years) (1, NSMC).

Pteryngium crenatum is newly recorded in Nova Scotia and Atlantic Canada (Fig. 2). This species has previously been recorded in North America from British Columbia, Indiana, New Hampshire, Oregon, Québec, and Washington (Bousquet 1991; Downie and Arnett 1996; Chandler 2001). It is an adventive Palaearctic species found throughout Europe (Johnson et al. 2007). In Nova Scotia, all the specimens were collected in coniferous forests, most on bracket fungi (Polyporaceae).

***Telmatophilus americanus* LeConte, 1863**

NEWFOUNDLAND: St. John's, Oxen Pond Botanical Park, September, 2000, S. Lilly, Biology 4150 (1, MUN). **NEW BRUNSWICK: Albert Co.:** Mary's Point, August 21, 2003, C.G. Majka, coastal marsh (1, CGMC); **York Co.:** Canning-Scotchtown, June 25, 2003, R.P. Webster, oak forest, at light (1, RPWC). **NOVA SCOTIA: Cumberland Co.:** Amherst, June 6, 1993, J. Ogden (1, NSNR); Amherst, June 24, 1994, J. Ogden (1, NSNR); Amherst Marsh, July 24, 1989, J. Ogden, marsh plants, sweep netting (6, NSNR); Amherst Marsh, June 11, 1993, J. Ogden, marsh

plants, sweep netting (1, NSNR); **Pictou Co.:** McLellan's Brook, June 16, 1988, E. Georgeson (1, NSMC).

Telmatophilus americanus is newly recorded in insular Newfoundland, New Brunswick and Nova Scotia (Fig. 1). It has previously been recorded in Canada from British Columbia to Québec, south to Colorado, Indiana, and New York in the United States (Bousquet 1991; Downie and Arnett 1996). It is found on the flowers of *Sparganium* spp. (Sparganiaceae) (Hatch 1961; Leshen and Skelley 2002). Blatchley (1910) also reported it from arrow arum (*Peltandra virginica* L., Araceae). Both *Sparganium fluctuans* (Morong) B.L. Robins and *S. angustifolium* Michx. (Sparganiaceae) occur in the area of the Oxen Pond Botanical Park where *T. americanus* was collected in Newfoundland (Todd Boland, pers. comm.).

***Telmatophilus typhae* (Fallén, 1802)**

NOVA SCOTIA: Colchester Co.: Debert, April 21, 1993, J. Ogden (1, NSNR); Debert, May 14, 1993, J. Ogden (1, NSNR); Debert, May 14, 1993, J. McPhee, funnel trap (1, NSNR); Debert, May 21, 1993, J. Ogden, grasses, sweep netting (1, NSNR); Masstown, May 6, 1993, J. C. McPhee (1, NSNR); Masstown, April 14, 1993, J. Ogden (1, NSNR); **Cumberland Co.:** Amherst, June 24, 1994, J. Ogden (1, NSNR); Amherst Marsh, July 24, 1989, J. Ogden, marsh plants, sweep netting (1, NSNR); Westchester-Londonderry, July 20, 1992, S. & J. Peck, forest road, car netting (2, JCC); **Guysborough Co.:** Trafalgar, July 19, 1992, S. & J. Peck, car netting (2, JCC); **Halifax Co.:** Conrod Island, July 23, 1986, B. Wright (1, NSMC); **Inverness Co.:** Cheticamp, June 25, 1994, V. Jessome (1, CBU); **Queens Co.:** Medway River, July 13, 1993, J. & T. Cook, car netting (1, JCC).

Telmatophilus typhae was reported in North America from New Brunswick, Nova Scotia, and Prince Edward Island by Hoebeke and Wheeler (2000) (Fig. 5). The specimens collected by Hoebeke and Wheeler (2000) were from 1995 and 1997. It is an adventive Palaearctic species known in North America only from these three provinces. The above records establish the presence of this species in Nova Scotia, and hence North America, from as early as 1986. In the Palaearctic region it is found throughout Europe and in the Russian Far East, Japan, North Korea, and China. In North America it is found on the male flowers of cattails, *Typha latifolia* L. and *Typha angustifolia* L. (Typhaceae).

***Caenoscelis basalis* Casey, 1900**

NEWFOUNDLAND: Corner Brook, Loggers Sch Rd, July 29-August 21, 1992, 60 year old fir forest, pitfall (2, MUN). **NOVA SCOTIA: Colchester Co.:** Debert, June 19, 1993, J. Ogden (1, NSNR); **Cumberland Co.:** Oxford, May 25, 1995, J. Ogden (1, NSNR); Westchester-Londonderry, July 20, 1992, S. & J. Peck, forest

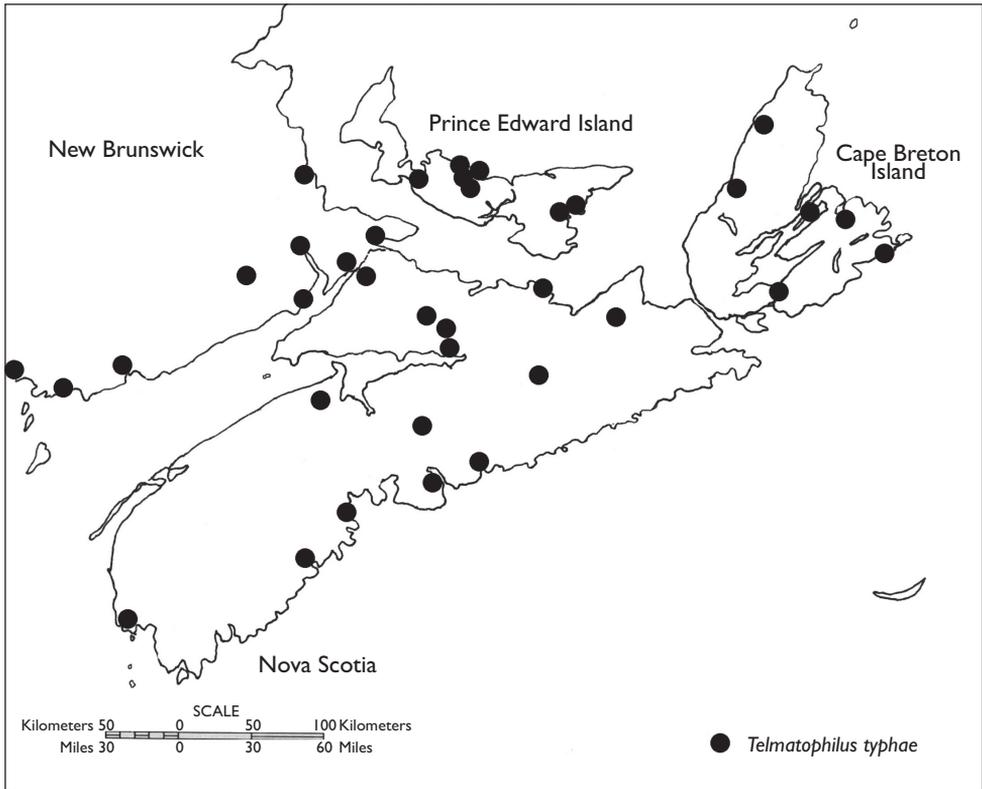


Figure 5. Distribution of *Telmatophilus typhae* in Atlantic Canada.

road, car netting (2, JCC); **Guysborough Co.:** Malay Lake, 1–16 July, 1997, D.J. Bishop, red spruce, FIT (1, NSMC); Trafalgar, July 19, 1992, S. & J. Peck, car netting (1, JCC); **Halifax Co.:** Point Pleasant Park, June 22, 1990, R. Ballard, red spruce forest, pipe trap (2, NSMC); **Pictou Co.:** Marshy Hope, August 10, 1995, M. LeBlanc, FIT (1, NSNR).

Caenoscelis basalis is newly recorded in Newfoundland, Nova Scotia, and Atlantic Canada (Fig. 4). Previous records of this Holarctic species are from Maine, New Hampshire, New York, and Québec (Bousquet 1991; Downie and Arnett 1996; Chandler 2001). Specimens in Nova Scotia were collected in red spruce forests, and in Newfoundland it was found in a balsam fir (*Abies balsamea* (L.) Mill, Pinaceae) forest. Members of this genus are found in leaf litter, organic matter, nests of small mammals, and beneath the bark of logs (Bousquet 1989).

Discussion

Eighteen species of Cryptophaginae are now known to occur in Atlantic Canada. Eight of these including *Cryptophagus difficilis*, *C. jakowlewi*, *C. laticollis*, *C. mainensis*, *C.*

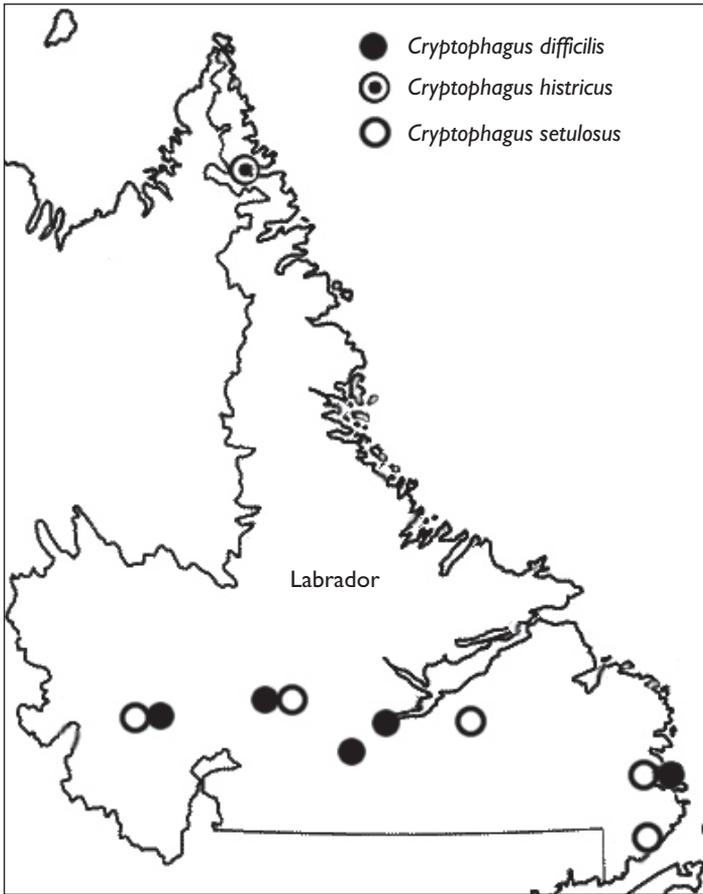


Figure 6. Distribution of *Cryptophagus difficilis*, *C. histricus*, and *C. setulosus* in Labrador.

tuberculosis, *Pteryngium crenatum*, *Telmatophilus americanus*, and *Caenoscelis basalis* are newly recorded in Atlantic Canada; one of which, *C. mainensis*, is newly recorded in Canada, and another, *C. laticollis*, is newly recorded in eastern North America. Nineteen new provincial records are reported (Table 1). These records increase the known fauna of Atlantic Canada by more than 40% and more than double the number of provincial records. Nonetheless, it is clear that knowledge of this group in the region is still far from adequate. Voucher specimens are lacking for records of *Antherophagus convexulus* in New Brunswick and *Henoticus serratus* in Labrador. Although 14 species of Cryptophaginae have been recorded in Nova Scotia, only five have been found in New Brunswick. This small number of records from the latter province undoubtedly reflects a lack of collecting effort for this family there. Although six species of *Cryptophagus* have been found in Nova Scotia, all are represented by a small number of specimens, and only one (*C. acutangulus*) has been collected on Cape Breton Island. Except for *Antherophagus ochraceus* and *Telmatophilus typhae*, the recorded distribution of all other species is scattered and local, almost certainly the result of insufficient collecting.

Although collecting effort for this group in the region is still far from adequate, some preliminary observations can be made. *Cryptophagus difficilis* and *C. setulosus* are abundant species in insular Newfoundland and Labrador (particularly in the latter region), and are completely absent from the Maritime Provinces of Canada (the provinces of New Brunswick, Nova Scotia, and Prince Edward Island). In general, species of *Cryptophagus* are rather seldom collected in the Maritimes, yet the above two species are abundant and frequently collected in Newfoundland and Labrador; apparently reflective of differences between the forest micro-habitats of the Atlantic Maritime Ecozone on the one hand, and the Boreal Shield and Taiga Shield Ecozones characteristic of Newfoundland and Labrador on the other. *Cryptophagus histricus* has also been recorded in Labrador, although this study did not find further specimens. Conversely native species such as *Antherophagus convexulus*, *Cryptophagus jakowlewi*, and *Henotiderus centromaculatus*, which have been recorded from a number of localities in Nova Scotia (and Prince Edward Island in the case of *C. jakowlewi*), have not been found in Newfoundland and Labrador.

Although islands in general are characterized by a diminished fauna, the number of native cryptophagines recorded from Prince Edward Island (2 species; *A. ochraceus* and *C. jakowlewi*) and Cape Breton Island (3 species; *A. convexulus*, *A. ochraceus*, and *T. americanus*) is very low. This may in part be due to insufficient collecting effort in these areas.

Five of the 18 species (27%) of the fauna consists of adventive species. The dates of earliest detection of these species are shown in Table 2, although it is likely that these species have been present (and undetected) for substantially longer. Note that two of these five species were first detected in North America in Atlantic Canada. Records from this region indicate that except for *Cryptophagus fallax*, which has been found solely in association with stored products in synanthropic situations, all four other adventive species (*C. laticollis*, *C. scanicus*, *Pteryngium crenatum*, and *Telmatophilus typhae*) are all established in wild habitats.

The adventive species, *Telmatophilus typhae*, was first recorded in North America by Hoebeke and Wheeler (2000) from specimens collected in 1995 and 1997. The present account includes a record from 1986, pushing back the date of first detection of this species on the continent by nine years. The very extensive distribution of this species in New Brunswick, Nova Scotia, and Prince Edward Island would appear to indicate that it has been present for much longer, or that its rate of dispersal has been very rapid. The first author has found it to be present everywhere that he has looked

Table 2. Earliest dates of detection of adventive species in Atlantic Canada

	NB	NS	PE	NF	North America	Source
<i>Cryptophagus fallax</i>	1982	1967	1973		?	Woodroffe and Coombs (1961)
<i>Cryptophagus laticollis</i>		1993			1900	Casey (1900)
<i>Cryptophagus scanicus</i>				1949	1949	present study
<i>Pteryngium crenatum</i>	1997				1900	Casey (1900)
<i>Telmatophilus typhae</i>	1997	1986	1995		1986	present study

for it where its host plants (*Typha latifolia* and *T. angustifolia*) are found. Since *T. typhae* has been found adjacent to the American border in St. Stephen, NB (Hoebeke and Wheeler 2000), it almost certainly is present in eastern Maine and should be looked for in that state.

Pteryngium crenatum, while reported to be an adventive species in North America, has been collected in a number of jurisdictions in Canada from British Columbia to Nova Scotia, south to Indiana and New Hampshire. Records in Nova Scotia are exclusively from wild habitats, in coniferous forests associated with Polyporaceae. Given this distribution and the non-synanthropic environments where it is found, the status of this species in North America should be further investigated to ascertain if it might be a native Holarctic species.

Four native *Cryptophagus* species, *C. histricus*, *C. difficilis*, *C. jakowlewi*, and *C. mainensis*, have been recorded only in wild habitats. *Cryptophagus acutangulus*, *C. laticollis*, *C. scanicus*, *C. setulosus*, and *C. tuberculatus*, including both Holarctic and adventive Palaearctic species, are known from both wild habitats as well as being associated with stored products. It appears that the species in this group have considerable ecological plasticity. The adventive, Palaearctic *Cryptophagus fallax* is known primarily from stored products. All other cryptophagines found in Atlantic Canada occur (at least in part) in wild habitats.

Generally cryptophagines are ecologically diverse. Species such as *Cryptophagus difficilis*, *C. mainensis*, *Henoticus serratus*, *Henotiderus centromaculatus*, *Pteryngium crenatum*, and *Caenoscelis basalis* are associated with decomposing wood and fungi, and are components of the region's saproxylic fauna. *Antherophagus convexulus*, *A. ochraceus*, *Cryptophagus histricus*, and *C. setulosus* are exclusively or frequently associated with bumblebee or other Hymenoptera nests where they apparently feed on organic detritus. *Telmatophilus americanus* and *T. typhae* feed on pollen of marsh plants.

Further research is clearly indicated in order to gain a better understanding of cryptophagines in Atlantic Canada.

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Contributions towards an understanding of the Atomariinae (Coleoptera, Cryptophagidae) of Atlantic Canada

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Abstract

The Atomariinae (Coleoptera: Cryptophagidae) fauna of Atlantic Canada are surveyed. Ten species in the genus *Atomaria* are reported in the region, six of which, including *Atomaria distincta* Casey, *Atomaria fuscata* Schönherr, *Atomaria lederi* Johnson, *Atomaria lewisi* Reitter, *Atomaria testacea* Stephens, and *Atomaria nigrirostris* Stephens, are newly recorded in Canada. *Atomaria lederi* and *A. lewisi* are newly recorded in North America. Twenty-three new provincial records are reported. *Atomaria curtula* Casey, 1900 (**syn. n.**) is designated as a synonym of *Atomaria lewisi* Reitter; *Atomaria ovalis* Casey, 1900 (**syn. n.**) is designated as a synonym of *Atomaria apicalis* Erichson, 1846; and *Atomaria saginata* Casey, 1900 (**syn. n.**) is designated as a synonym of *Atomaria fuscata* Schönherr. A key to species is provided, as are species descriptions. Records of all species are given and their distribution in the region is plotted. The global distribution of all Holarctic and adventive species is briefly summarized, and the jurisdictions in North America where they have been reported are compiled. Habitat and bionomic information is also provided for all species, both from within the region, and from observations in European studies.

The fauna is briefly discussed from a zoogeographic perspective; two species are Nearctic in origin, five may be Holarctic in distribution, and three others may be adventive Palaearctic species, although further evidence is required to confirm such preliminary assessments. Similarly, because of the paucity of information on this genus, further fieldwork is required to fully discern the distribution of these species in Atlantic Canada. Three are apparently saproxylic species characteristic of forested habitats; three are primarily grassland species; and the remaining four are eurytopic species found in a wide variety of forested and open habitats.

Keywords

Cryptophagidae, Atomariinae, *Atomaria*, Atlantic Canada, New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, biodiversity, zoogeography, bionomics, taxonomy, synonymy

Introduction

The genus *Atomaria* Stephens is the nominate genus of the Atomariinae, a subfamily of the family Cryptophagidae, the silken fungus beetles. They are small (1.0–2.0 mm), somewhat shiny, oval-oblong, pubescent beetles, typically found in leaf litter, grass litter, decaying vegetation, and in habitats which promote mycelial fungal growth on which adults and larvae feed (Leschen and Skelley 2002).

Members of this genus are divided into two subgenera, *Atomaria s. str.* and *Anchicera* Thomson. Bousquet (1991) reported 12 species in the subgenus *Anchicera* and 10 in *Atomaria s. str.* in Canada, although none were recorded as occurring in Atlantic Canada. Poole and Gentili (1996) listed 30 species in *Anchicera* and 41 in *Atomaria s. str.* from North America (although at least eight of these names have been synonymized) while Leschen and Skelley (2002) reported that there were 10 species in *Atomaria sensu lato* in North America (9 described; 1 undescribed). This confusion, and disparity in the numbers of species, is one indication that the genus is in need of extensive revision, the last comprehensive North American treatment being by Casey (1900).

In the Palearctic region, *Atomaria* is much better known and understood. Recent publications by Lohse (1967) and Johnson (1992) have provided a solid taxonomic foundation for the genus, and Johnson et al. (2007) provided a complete catalogue of the genus in the Palearctic region.

The paucity of knowledge about this genus in North America has impeded the identification of specimens, and limited our understanding of the historical, zoogeographic, distributional, biological, and ecological dimensions of *Atomaria*. The present study is a contribution to the knowledge of this genus in North America.

Methods and conventions

Specimens of *Atomaria* originating from Atlantic Canada in a variety of collections were examined and identified. These collections yielded 725 specimens; 425 from Nova Scotia, 49 from New Brunswick, nine from Prince Edward Island, and 242 from Newfoundland and Labrador. Abbreviations (largely following Evenhuis 2009) of collections consulted and referred to in this study are:

AAFC Agriculture and Agri-Food Canada, St. John's, Newfoundland and Labrador, Canada

ACNS	Agriculture and Agri-Food Canada, Kentville, Nova Scotia, Canada
ACPE	Agriculture and Agri-Food Canada, Charlottetown, Prince Edward Island, Canada
BMNH	The Natural History Museum, London, United Kingdom
CBU	Cape Breton University, Sydney, Nova Scotia, Canada
CFS	Canadian Forest Service, Corner Brook, Newfoundland and Labrador, Canada
CGMC	Christopher G. Majka collection, Halifax, Nova Scotia, 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)
JOC	Jeffrey Ogden collection, Truro, Nova Scotia, Canada
KIC	Kent Island Collection, Brunswick, Maine, United States
MMUE	Manchester Museum, The University, Manchester, United Kingdom
MUN	Memorial University of Newfoundland collection, St. John's, Newfoundland and Labrador, Canada (currently on long term loan to the Canadian Forest Service, Edmonton, Alberta, Canada)
MZHF	Zoological Museum, University of Helsinki, Helsinki, Finland
NSMC	Nova Scotia Museum, Halifax, Nova Scotia, Canada
NSNR	Nova Scotia Department of Natural Resources, Shubenacadie, Nova Scotia, Canada
RWC	Reginald Webster collection, Charters Settlement, New Brunswick, Canada
SMU	Saint Mary's University, Halifax, Nova Scotia, Canada
UMNB	Université de Moncton, Moncton, New Brunswick, Canada

In the species treatments, the number of specimens and the collection abbreviation are indicated in parentheses. Abbreviations employed are: FIT, flight intercept trap; uv, ultra violet; L., body length.

Identification

Key to Atlantic Provinces species of *Atomaria*

1. Antennae close basally, separated from each other by a distance not greater than their distance from eyes; antennomere 1 much longer than 2, obconical; habitus elongate, parallel; width/length ratio < 0.35 - *Atomaria s. str.* Stephens **9**
- Antennae less close basally, more distant from each other than their distance from eye; antennomere 1 slightly longer than 2; habitus oval, short, compact; width/length ratio > 0.40 - *Anchicera* Thomson..... **2**
- 2(1). Elytra distinctly bicoloured (Figs 3, 4) **3**
- Elytral colouration variable, either unicoloured, or gradually paler apically, but not with a distinct bicoloured pattern..... **4**

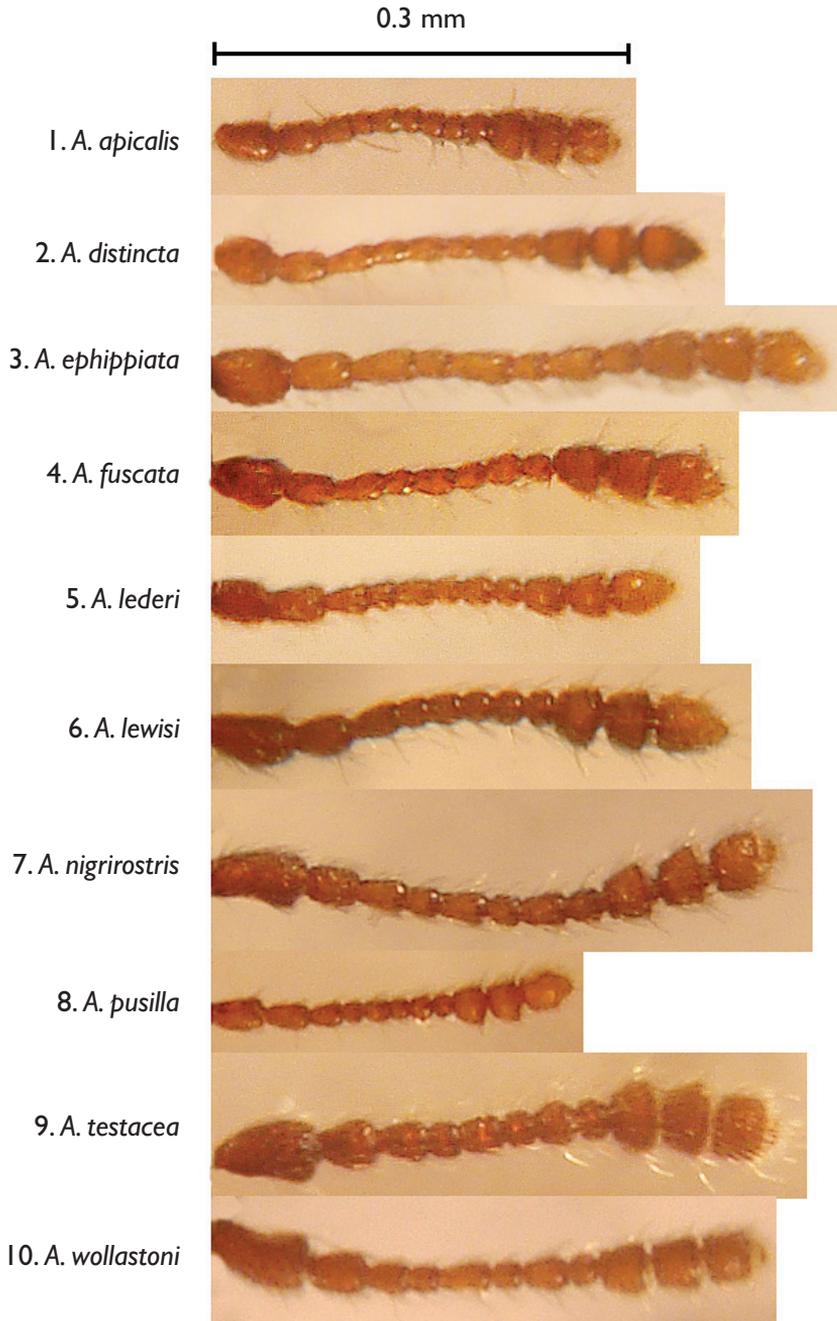
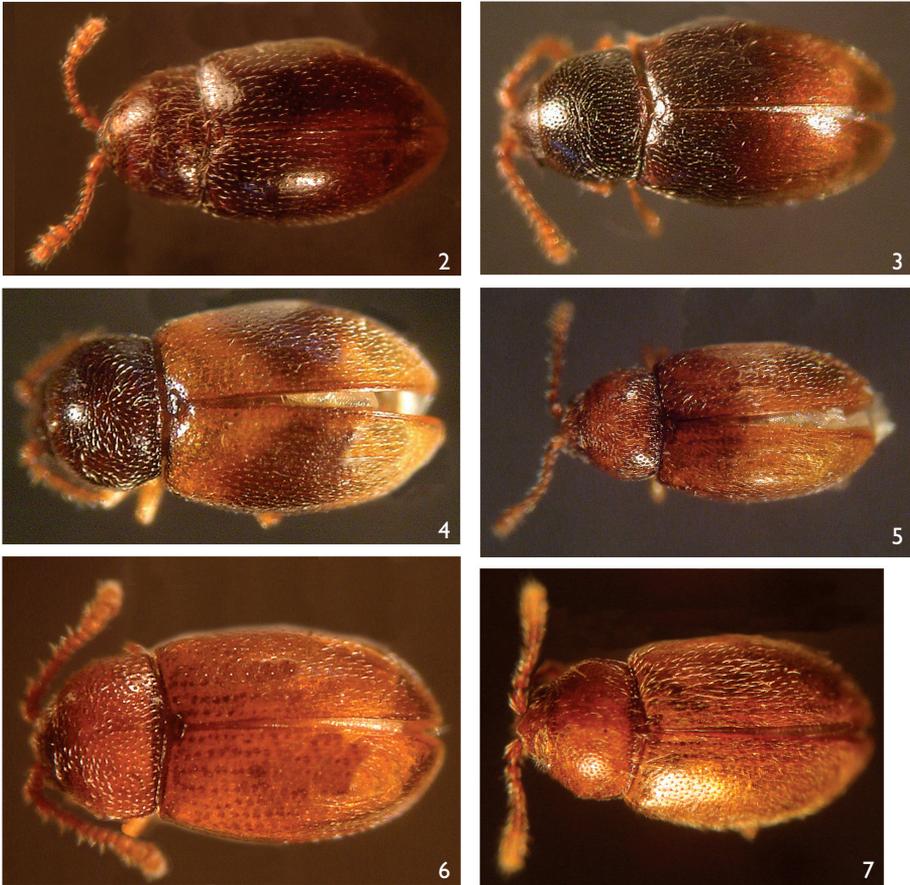


Figure 1. Photographs of antennae of *Atomaria* species. **1.1** *Atomaria apicalis* **1.2** *Atomaria distincta* **1.3** *Atomaria ephippiata* **1.4** *Atomaria fuscata* **1.5** *Atomaria lederi* **1.6** *Atomaria lewisi* **1.7** *Atomaria pusilla* **1.8** *Atomaria testacea* **1.9** *Atomaria nigrirostris* **1.10** *Atomaria wollastoni*

- 3(2) Elytra testaceous with a prominent piceous crossbar at the mid-point, either interrupted or continuous across suture; pronotum and prosternum piceous (Fig. 4). L. 1.5–1.6 mm ***Atomaria ehippiata* Zimmerman**
 – Elytra abruptly ferruginous in apical 1/2 to 2/5 (Fig. 3); pronotum and prosternum (except near coxae) ferruginous. L. 1.4–1.5 mm.....
 ***Atomaria distincta* Casey**
- 4(2) Lateral margin of pronotum evenly arcuate, broadest at point near middle; evenly narrowing to base; pronotal base straight or weakly curved; hind angles obtuse **5**
 – Lateral margin of pronotum in basal half more or less straight, not evenly arcuate; pronotal base sinuate or slightly bi-lobed; hind angles more right-angled..... **6**
- 5(4). Antennomere 1 widening apically, at least 1.5 times as long as width of the antennomere at the apical end; clearly longer than antennomere 2 (Fig. 1.9). Habitus narrower, body width (at maximum width of elytra) to length ratio 0.47; pronotum comparatively shorter, pronotum to elytra ratio 0.46. Elytra clearly gradually paler in apical half (Fig. 9). L. 1.3–1.6 mm.....
 ***Atomaria testacea* Stephens**
 – Antennomere 1 not noticeably wider apically; at most 1.3 times as long as width of the antennomere at the apical end; not or a slightly longer than antennomere 2 (Fig. 1.1). Habitus broader, body width to length ratio 0.54; pronotum comparatively longer, pronotum to elytra ratio 0.64. Elytra indistinctly gradually paler in apical half (Fig. 2). L. 1.3–1.6 mm.....
 ***Atomaria apicalis* Erichson**
- 6(4). Testaceous to ferruginous in colour; antennal club distinct; antennomeres 9 and 10 slightly transverse to transverse..... **7**
 – Usually dark castaneous throughout, sometimes pronotum darker (Fig. 5); antennal club less distinct; antennomeres 9 and 10 frequently quadrate (Fig. 1.4). L. 1.4–1.7 mm ***Atomaria fuscata* Schönherr**
- 7(6) Antennomere 1 long, curved, 1.5–2.0 times as long as width of the antennomere at the apical end; much longer than antennomere 2 (Fig. 1.6). Lateral elytral margins evenly arcuate from widest point at middle. Body and elytra broad; width/length ratio of elytra 0.82, width/length ratio of body 0.53. Elytral setae somewhat erect and “bristling” (Fig. 7). L. 1.3–1.6 mm
 ***Atomaria lewisi* Reitter**
 – Antennomere 1 short, straight, not expanded at apex, hardly longer than wide, approximately as long as antennomere 2 (Figs 1.5, 1.8). Lateral elytral margins almost parallel in basal 3/4, narrowed to apex. Body and elytra narrower; width/length ratio of elytra 0.72, width/length ratio of body 0.50–0.48. Elytral setae short and appressed **8**
- 8(7) Antennomere 2 slender, noticeably narrower than antennomere 1 (Fig. 1.7). Body dorso-ventrally flattened, depth/length ratio (in lateral view) 0.36. 1.2 mm or less in length (Fig. 8). L. 1.0–1.2 mm.... ***Atomaria pusilla* (Paykull)**

- Antennomere 2 robust, at apex the same width (or almost so) as antennomere 1 at apex (Fig 1.5). Body dorso-ventrally deeper and more robust, depth/length ratio (in lateral view) 0.43. 1.2 mm or more in length (Fig. 6). L. 1.2–1.4 mm ***Atomaria lederi* Johnson**
- 9(1). Pronotal base with a strong transverse impression, laterally with several fine and sharp longitudinal ridges; pronotum widest at midpoint, lateral margins parallel to base, hind angles distinct (Fig. 10). L. 1.7–1.9 mm ***Atomaria nigrirostris* Stephens**
- Pronotal base without a strong transverse impression and without sharp longitudinal ridges laterally; pronotum widest at midpoint, lateral margins evenly arcuate to base, hind angles rounded (Fig. 11). L. 1.5–1.8 mm ***Atomaria wollastoni* Sharp**



Figures 2–7. **2** Dorsal habitus photograph of *Atomaria apicalis* Erichson **3** Dorsal habitus photograph of *Atomaria distincta* Casey **4** Dorsal habitus photograph of *Atomaria ephippiata* Zimmerman **5** Dorsal habitus photograph of *Atomaria fuscata* Schönherr **6** Dorsal habitus photograph of *Atomaria lederi* Johnson **7** Dorsal habitus photograph of *Atomaria lewisi* Reitter.

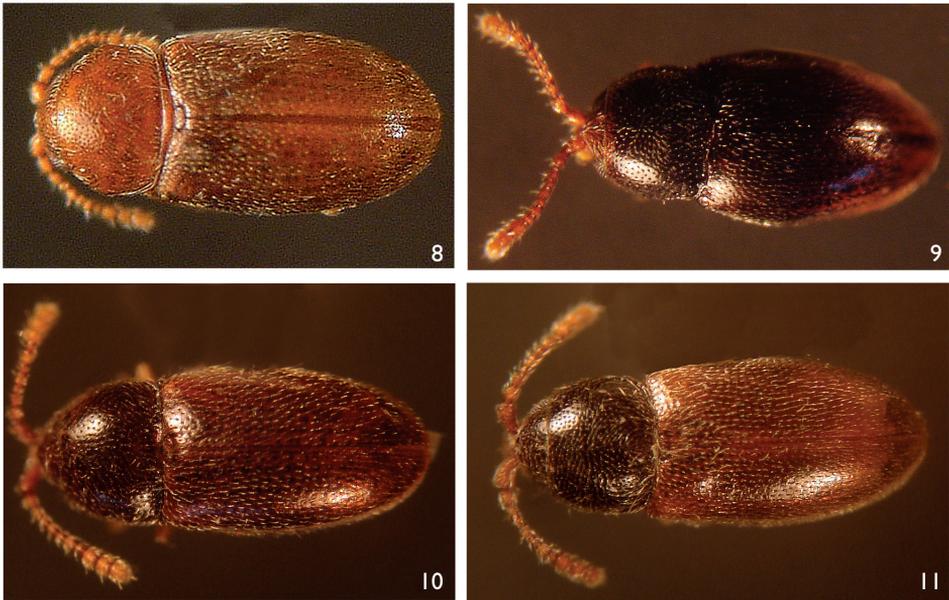
Results

As a result of the present investigation, ten species of *Atomaria* have been recorded in Atlantic Canada; seven in New Brunswick, ten in Nova Scotia, one on Prince Edward Island, five on insular Newfoundland, and four in Labrador (Table 1), a total of 23 new provincial records. Eight are in *Atomaria s. str* and two in *Anchicera*. Of these, six species including *Atomaria distincta* Casey, *Atomaria fuscata* Schönherr, *Atomaria lederi* Johnson, *Atomaria lewisi* Reitter, *Atomaria testacea* Stephens, and *Atomaria nigrirostris* Stephens are newly recorded in Canada. *Atomaria lederi* and *A. lewisi* are newly recorded in North America. Individual species accounts follow.

Atomaria subgenus *Anchicera* Thomson, 1863

Atomaria apicalis Erichson, 1846

NEWFOUNDLAND: Portugal Cove: Indian Meal Line, June 2, 1979, July 1, 1979, June 22, 1981, September 1, 1981, July 21, 1982 (14, MUN); Gander, July-August, 1998, D. Russell (2, MUN); South Pond near South Brook, June 27, 1980, Brennan & Larson, drift (2, MUN). **NEW BRUNSWICK: Albert Co.:** Mary's Pt., September 8, 2002, C.G. Majka, old field, in compost (7, CGMC); **Westmorland Co.:**



Figures 8–11. 8 Dorsal habitus photograph of *Atomaria pusilla* (Paykull) 9 Dorsal habitus photograph of *Atomaria testacea* Stephens 10 Dorsal habitus photograph of *Atomaria nigrirostris* Stephens 11 Dorsal habitus photograph of *Atomaria wollastoni* Sharp.

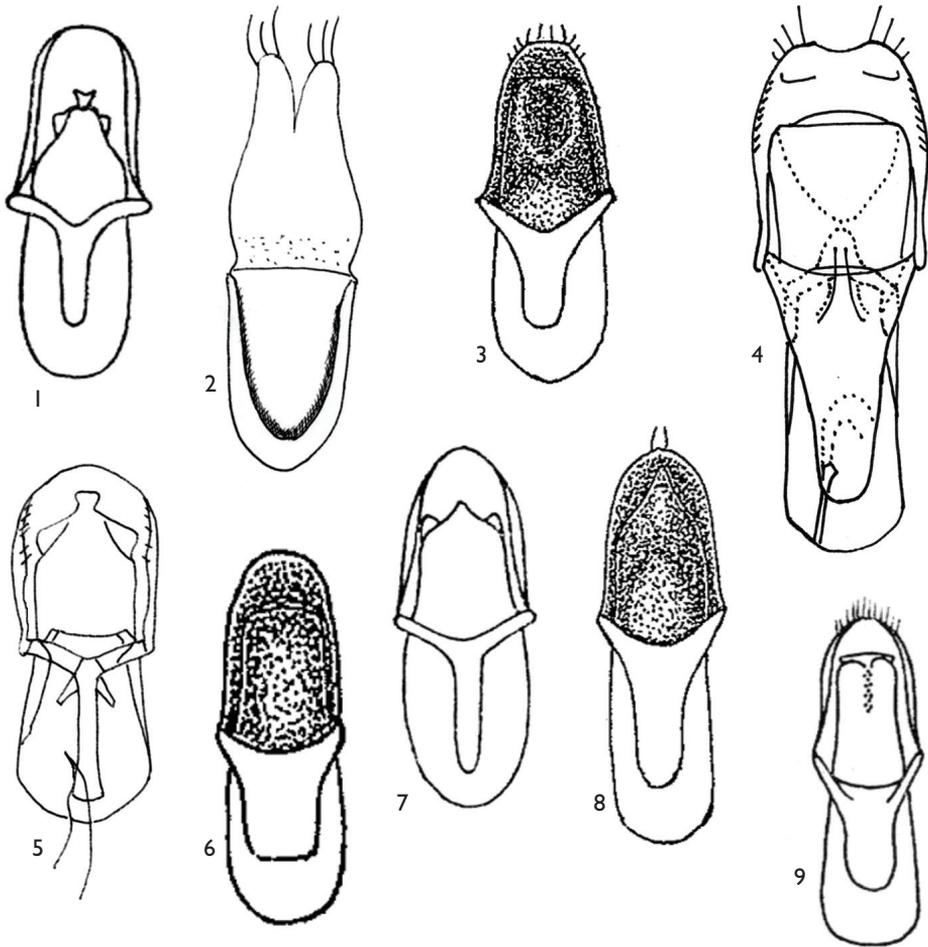


Figure 12. Aedeagus illustrations of *Atomaria* species. **12.1** *Atomaria apicalis* **12.2** *Atomaria ephippiata* **12.3** *Atomaria fuscata* **12.4** *Atomaria lederi* **12.5** *Atomaria lewisi* **12.6** *Atomaria pusilla* **12.7** *Atomaria testacea* **12.8** *Atomaria nigrirostris* **12.9** *Atomaria wollastoni*. Adapted from Sjöberg (1947), Lohse (1967), Johnson (1970, 1971) with additional material. Note: no illustration of the aedeagus of *A. distincta* was available.

Pointe-du-Chene, July 6, 1972, August 24, 1972, D.H. Murray (5, MMUE); **NOVA SCOTIA: Halifax Co.:** Halifax, September 7, 1972, D.H. Murray (2, MMUE); Halifax, July 1988, P.M. Hammond (1, BMNH); **Lunenburg Co.:** Bridgewater, June 30, 1965, B. Wright, red oak, window trap (1, NSMC); **Queens Co.:** Medway River, July 13, 1993, J. & T. Cook, car net (2, JCC).

Atomaria apicalis is newly recorded in insular Newfoundland, New Brunswick, Nova Scotia, and Atlantic Canada (Fig. 16). We have examined the holotype of *Atomaria ovalis* Casey 1900 deposited in the Smithsonian Institution and have found it to

Table 1. *Atomaria* fauna of Atlantic Canada

	NB	NS	PE	NF	LB	Origin
<i>Atomaria (Anchicera) Thomson</i>						
<i>Atomaria apicalis</i> Erichson	1	1		1		Holarctic
<i>Atomaria distincta</i> Casey	1	1				Nearctic
<i>Atomaria ephippiata</i> Zimmerman	1	1		1	1	Nearctic
<i>Atomaria fuscata</i> Schönherr	1	1	1	1	1	Holarctic
<i>Atomaria lederi</i> Johnson		1				Holarctic ?
<i>Atomaria lewisi</i> Reitter	1	1				Palaeartic ?
<i>Atomaria pusilla</i> (Paykull)	1	1				Palaeartic
<i>Atomaria testacea</i> Stephens	1	1				Palaeartic ?
<i>Atomaria (s. str.) Stephens</i>						
<i>Atomaria nigrirostris</i> Stephens		1		1	1	Holarctic ?
<i>Atomaria wollastoni</i> Sharp		1		1	1	Holarctic ?
Total	7	10	1	5	4	

Notes: LB, Labrador; NB, New Brunswick; NF, insular Newfoundland; NS, Nova Scotia; PE, Prince Edward Island.

be identical in all respects to *A. apicalis* Erichson. We therefore designate *A. ovalis* syn. n. as a junior synonym of *A. apicalis*.

In North America this species has previously been reported from Connecticut, Indiana, Iowa, Maine, Manitoba, Massachusetts, New Hampshire, New York, Québec (Blatchley 1910; Britton 1920; Leng 1920; Procter 1946; Bousquet 1991; Downie and Arnett 1996; Chandler 2001). It is widely distributed in the Palaeartic region being found throughout Europe and North Africa, east across Siberia to the Russian Far East, across the Middle East, to Central Asia, Mongolia, and Fujian in China (Johnson et al. 2007). Johnson (1993) reported that it was, “a grassland species which has been recorded especially around farms, gardens and parks but often occurs in other habitats. It has been collected in man-made heaps of refuse, especially cut vegetation, grass, compost and dung heaps, flood debris, and more rarely on carrion and rotting fungi.”

Description: A variable species; head, pronotum, and elytra piceous to castaneous or (more rarely) black; elytra sometimes paler in apical 2/5. Legs, prosternum, and abdominal sterna reddish-testaceous. Pronotum weakly constricted from middle to base; from middle to apex even more strongly. Rarely, in males the basal half of the pronotum is parallel-sided, or very weakly constricted basally. Punctures of the pronotum and elytra very variable; on the base of the pronotum, interspaces between punctures ~ 1.0 times the diameter of punctures. Punctuation of elytra similar to that of pronotum, or finer and shallower, but always less dense. Distance between furrows of prosternal process approximately half the width of the prosternal process. Body strongly convex in cross-section (Fig. 2). Antennae: antennomere 1 swollen, slightly longer than 2; 3 as long as 2 but narrower; 4–8 short and bead-like; club distinct, antennomeres 9 and 10 slightly transverse (Fig. 1.1). Body: width/length ratio, 0.41; length, 1.3–1.6 mm.

***Atomaria distincta* Casey, 1900**

NEW BRUNSWICK: Westmorland Co.: Moncton, July 6, 1972, D.H. Murray (1, MMUE). **NOVA SCOTIA: Halifax Co.:** West Dover, September 7, 2003, C.G. Majka, salt marsh (4, CGMC).

Atomaria distincta is newly recorded in New Brunswick, Nova Scotia, and Canada (Fig. 14). This Nearctic species has previously been reported from the District of Columbia, Massachusetts, New York, and Québec (Leng 1920; Downie and Arnett 1996).

Description: Head piceous, finely sparsely punctate. Pronotum piceous, finely sparsely punctate; pronotum widest at or slightly ahead of midpoint, not appreciably flattened across base; finely sparsely punctate; interspaces between punctures 1.5–2.0 times the diameter of punctures. Scutellum black. Basal 3/5 of elytra black, becoming abruptly yellow in apical 2/5, the yellow portion extending slightly anterad in the region of the suture. Punctuation very fine and sparse; interspaces between punctures 2.0–3.0 times the diameter of punctures; elytral setae very fine and short, shorter than interspace intervals and appressed. Legs, prosternum, and abdominal sterna reddish-testaceous; sterna darker basally and laterally (Fig. 3). Antennae: antennomere 1 short, almost quadrate, not longer than 2; 2 slightly shorter than 1 and slightly narrower; 3 as long as 2 and slightly more slender; 4, 5 and 7 slightly shorter than 3; 6 and 8 still shorter, each approximately 1/2 the length of 3, not bead-like; antennal club distinct, antennomeres 9 and 10 almost quadrate, not noticeably transverse (Fig. 1.2). Body: width/length ratio, 0.43; length, 1.4–1.5 mm.

***Atomaria ephippiata* Zimmerman, 1869**

LABRADOR: Otter Creek, Goose Bay, July 28–August 8, 2008, G.R. Pohl & D.W. Langor, forb meadow, 15 m, pitfall (4, MUN). **NEW BRUNSWICK: Sunbury Co.:** Burton, May 25, 1972, D.H. Murray (3, MMUE); **Westmorland Co.:** Pointe-du-Chene, August 24, 1972, D.H. Murray (2, MMUE); Sackville, August 27, 1982, P. Maltais (1, CGMC); **York Co.:** New Maryland, June 26, 2003, R.P. Webster, mixed forest, at light (1, RWC); New Maryland, April 15, 2004, R.P. Webster, mixed forest, compost (1, RWC). **NEWFOUNDLAND:** Cinq Cerf River, June 16, 1949, E. Palmén (1, MZHF); Burnt Cape, August 7–21, 2003, A.M. Hynes, coastal meadow, pitfall (1, CFS); Glide Lake, June 13, 1996, July 11, 1996, July 25, 1996, pitfall, August 8, 1996 (4, CFS); Glide Lake, July–August, 1994, C. Bassler (1, MUN). **NOVA SCOTIA: Annapolis Co.:** Durland Lake, June 6, 2003, P. Dollin, hemlock/balsam fir/black spruce (120+ years), sweeping (1, NSMC); **Colchester Co.:** Bible Hill, June 15–24, 2005, May 31, 2005, K.R. Aikens, pasture, pitfall trap (4, CBU); Bible Hill, June 15, 2007, June 19, 2007, July 8, 2007, C.W. D’Orsay, pasture, sweeping (6, CBU); Debert, July 13 1994, J. Ogden (1, NSNR); **Cumberland Co.:** Amherst, June 24, 1994, J. Ogden (1, NSNR); Oxford, July 31, 1988, August 11, 1988, E. Georgeson, uv light trap (2,

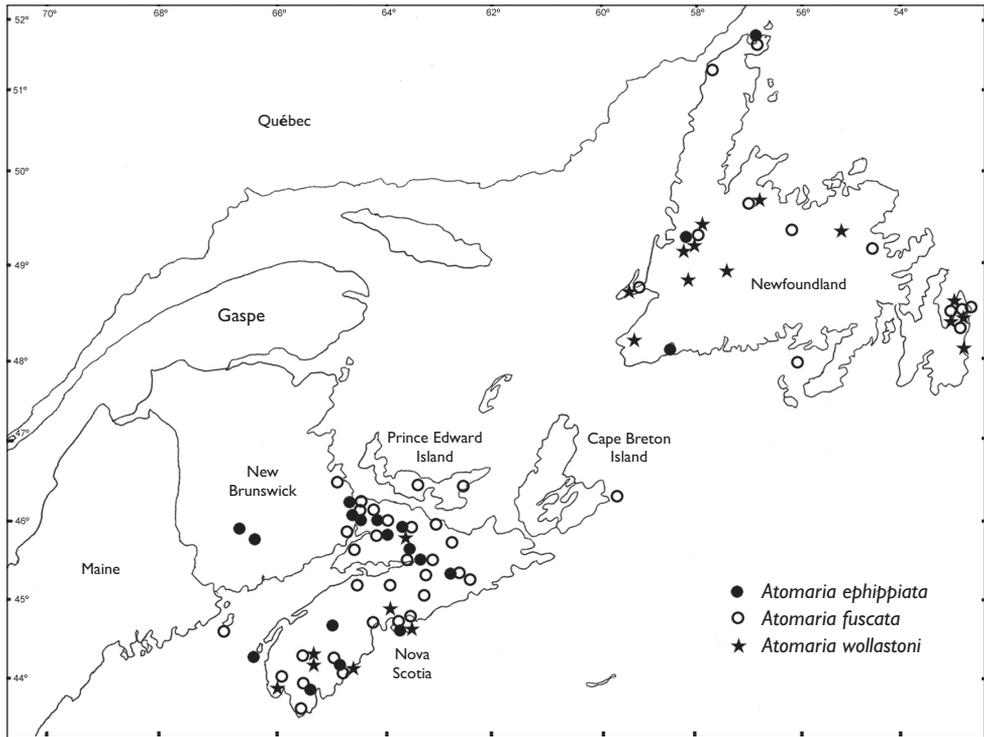


Figure 13. Distribution of *Atomaria ephippiata*, *Atomaria fuscata*, and *Atomaria wollastoni* in Atlantic Canada.

NSMC); Wentworth Park, July 12, 1993, J. & T. Cook, car net (1, JCC); Westchester-Londonderry, August 22, 1992, S. & J. Peck, forest road, car net (12, JCC); Digby Co.: Brier Island: Western Light, June 24, 2003, J. Ogden & K. Goodwin, raised bog, pitfall trap (1, JOC); **Guysborough Co.:** Trafalgar, Liscomb Sanctuary, July 19, 1992, S. & J. Peck, car net (3, JCC); **Halifax Co.:** West Dover, September 7, 2003, C.G. Majka, salt marsh (4, CGMC); **Queens Co.:** Medway River, July 13, 1993, J. & T. Cook, car net (13, JCC); **Shelburne Co.:** Clyde River Rd, July 16, 1992, S. & J. Peck, forest, car net (1, JCC).

Atomaria ephippiata is newly recorded in Labrador, New Brunswick, insular Newfoundland, and Nova Scotia (Figs 13, 17). This Nearctic species has previously been recorded in Alberta, British Columbia, Colorado, Connecticut, Idaho, Indiana, Iowa, Maine, Manitoba, Massachusetts, New Hampshire, New York, Ontario, Oregon, Québec, Rhode Island, Washington, and Wisconsin (Blatchley 1910; Britton 1920; Leng 1920; Procter 1946; Hatch 1961; Oatman et al. 1964; Bousquet 1991; Downie and Arnett 1996; Schwartz 1996; Chandler 2001; Jacobs et al. 2006; Sikes 2004). It has been reported on fungi and molds in litter and nests (LaBonte 1998). In Atlantic Canada it has been found in mixed forests, coniferous forests, along forest roads, in raised bogs, salt marshes, and pastures. Jacobs et al. (2006) and Hammond et al. (2001) both reported this species as a member of saproxylic beetle assemblages on *Populus tremuloides* Michx (Salicaceae) in Alberta.

Description: Head piceous; finely sparsely punctate. Pronotum piceous; distinctly widest at midpoint, narrowing to base and apex; flattened across basal margin; finely sparsely punctate, interspaces between punctures ~ 2.0 times the diameter of punctures. Scutellum piceous. Elytra testaceous, slightly darker along suture, with a prominent piceous crossbar at approximately the 2/5 point of the elytra, slightly curved posterad and frequently extending across the suture; punctures slightly coarser and slightly denser than on pronotum; interspaces between punctures ~ 1.5 times the diameter of punctures; elytral setae slightly longer than interspace distance and appressed (Fig. 4). Antennae: antennomere 1 swollen, wider and longer than 2; 3 almost the same length as 2; 4, 6, and 8 short and of similar length; 5 and 7 somewhat longer; antennal club somewhat indistinct and not clearly demarcated, antennomere 9 only slightly wider than 8; 9 and 10 quadrate, not transverse (Fig. 1.3). Body: width/length ratio, 0.46; length, 1.5–1.6 mm.

***Atomaria fuscata* Schönherr, 1808**

LABRADOR: Happy Valley, near Churchill River, July 29, 2008, G.R. Pohl & D.W. Langor, at dusk, 15 m (1, MUN). **NEW BRUNSWICK: Albert Co.:** Mary's Pt., August 23, 2003, August 12, 2004, C.G. Majka, ocean beach, in beach drift (4, CGMC); **Charlotte Co.:** Kent Island, Grand Manan archipelago, June 25, 2008, M. Steck, west beach (1, KIC); **Kent Co.:** Bouctouche, May 25, 2007, J.-P. Michaud, on decaying pig (1, UMN); **Westmorland Co.:** Pointe-du-Chene, July 6, 1972, June–July, 1972, D.H. Murray (6, MMUE); Sackville, August 27, 1982, P. Maltais (1, CGMC). **NEW-FOUNDLAND:** St. Barbe, July 26, 1949, E. Palmén (1, MZHF); Piccadilly, July 7, 1949, E. Palmén (1, MZHF); Glide Lake, August 30, 1994, pitfall (1, MUN); Goulds, May 22, 1953, May 29, 1953, June 3, 1953, June 4, 1953, June 5, 1953, June 6, 1953, June 9, 1953, June 10, 1953, June 11, 1953, June 19, 1953 (52, AAFC); Goulds, June 9, 1953, R.F. Morris (1, AAFC); Kilbride, St. John's, June 6, 1982, R.F. Morris (1, AAFC); Mount Pearl, November 10, 1995, Dave McKenzie (1, AAFC); Portugal Cove: Indian Meal Line, June 13, 1978, D. Larson (1, MUN); Portugal Cove: Indian Meal Line, May 16, 1979, May 21, 1979, July 1, 1979, July 31, 1982 (19, MUN); Portugal Cove: Indian Meal Line, July 1, 1979 (4, CFS); St John's, July 12, 1974, July 16, 1974, R.F. Morris (2, AAFC); St John's, October 18, 1977, D. Larson (1, MUN); St John's, September, 1988, Biology 4150 (6, MUN); St John's, Long Pond, May 29, 1981 (1, MUN); Bishop's Falls, August 17, 1979, E. John (1, AAFC); South Pond near South Brook, June 27, 1980, Brennan & Larson, drift (1, MUN); Millville, Granddys Brook, June 16, 1979, Larson & Swales (1, MUN); 1 mi. east of Traytown, July 27, 1970, D.E. Bright (4, MUN); Burnt Cape, July 10–24, 2003, August 7–21, 2003, August 21–September 4, 2003, A.M. Hynes, shoreline, pitfall (8, MUN); Burnt Cape, July 10–24, 2003, July 24–August 7, 2003, A.M. Hynes, coastal meadow, pitfall (8, MUN); Burnt Cape, July 24–August 7, 2003, A.M. Hynes, cow parsnip patch, pitfall (7, MUN); Brunette Island, June 26–30, 1995, A.G. Raske, dense vegetation, pitfall

(2, MUN). **NOVA SCOTIA: Cape Breton Co.:** Scatarie Island: E. Harbour, July 15, 2006, A. MacDonald, freshwater pond (2, CBU); Scatarie Island: NW Cove, August 8, 2005, A. MacDonald, beach, under wrack (1, CBU); **Colchester Co.:** 4 km N of Brookfield, June 23, 1995, J. Cook, mixed forest, uv light trap (1, JCC); Bible Hill, May 31, 2005, June 15–24, 2005, K.R. Aikens, pasture (3, CBU); Bible Hill, May 31, 2005, June 30, 2005, July 21, 2005, S.M. Townsend, pasture, sweeping (12, CBU); Bible Hill, May 27, 2004, D.B. McCorquodale, pasture, sweeping (1, CBU); Bible Hill, May 31, 2007, C.W. D’Orsay, pasture, sweeping (2, CBU); Masstown, June 7, 1990, T.D. Smith (1, NSNR); **Cumberland Co.:** Chignecto Game Sanctuary, July 30, 1988, E. Georgeson, uv light trap (1, NSMC); Oxford, August 16, 1986, August 12, 1988, E. Georgeson, uv light trap (4, NSMC); Wentworth Park, July 12, 1993, J. & T. Cook, car net (5, JCC); Westchester-Londonderry, July 20, 1992, S. & J. Peck, forest road, car net (12, JCC); **Guysborough Co.:** Malay Lake, 2–15 June, 1997, D.J. Bishop, red spruce, FIT (1, NSMC); Trafalgar, Liscomb Sanctuary, July 19, 1992, S. & J. Peck, car net (25, JCC); **Halifax Co.:** Middle Musquodoboit, September 3, 1988, E. Georgeson, uv light trap (1, NSMC); Halifax, July, 1988, P.M. Hammond, 5 specimens brachypterous (8, BMNH); Pt. Pleasant Park, July 5, 1990, S. Robertson, coniferous forest, stovepipe trap (1, NSMC); West Dover, September 7, 2003, C.G. Majka, salt marsh (3, CGMC); **Hants Co.:** Upper Rawdon, June 25, 2008, J. Renkema, highbush blueberry field, pitfall trap (4, CGMC); **Kings Co.:** Kentville, August 19, 2007, D.H. Webster, compost, moldy corncobs (1, DHWC); **Lunenburg Co.:** Chester, June 22, 1960, B. Wright (1, NSMC); **Pictou Co.:** McLellan’s Brook, August 5, 1988, E. Georgeson, uv light trap (1, NSMC); Seafoam, August 11, 2008, C.G. Majka, seashore, beach drift (1, CGMC); **Queens Co.:** Medway River, July 13, 1993, J. & T. Cook, car net (5, JCC); Ponhook Lake nr. Greenfield, July 13, 1993, J. Cook, uv light trap (1, JCC); Kejimikujik National Park, September 26–19 October, 1994, B. Wright, hemlock stand (1, NSMC); **Shelburne Co.:** Clyde River Rd, July 16, 1992, S. & J. Peck, forest, car net (3, JCC); Sevim Beach, July 19, 1993, J. & T. Cook (1, JCC); **Yarmouth Co.:** Carleton: Perry Rd., August 22, 1992, J. & F. Cook, mixed forest, car net (2, JCC); Carleton: Perry Rd., July 18, 1993, J. & T. Cook, car net (3, JCC). **PRINCE EDWARD ISLAND: Queens Co.:** Harrington, June 14, 2004, C. Noronha, barley field, pitfall trap (1, ACPE); Harrington, June 1, 1987, L.S. Thompson, potato field (3, ACPE); Harrington, September 8, 2005, M.E.M. Smith, barley & hedgerows, sweep (1, CGMC).

We have examined the holotype of *Atomaria saginata* Casey 1900 deposited in the Smithsonian Institution and have found it to be identical in all respects to *A. fuscata* Schönherr. We therefore designate *A. saginata* (syn. n.) as a junior synonym of *A. fuscata*.

Atomaria fuscata is newly recorded in Labrador, New Brunswick, insular Newfoundland, Nova Scotia, and Prince Edward Island (Figs 13, 17). Johnson et al. (2007) designated *Atomaria ochracea* Zimmerman, 1869 as a junior synonym of *A. fuscata*, and *Atomaria lacustris* Casey, 1900 and *Atomaria pennsylvanica* Casey, 1900 had previously been designated as junior synonyms of *A. ochracea* (by Leng 1920). Majka and Shaffer’s (2008) discussion of *A. ochracea* is attributable to *A. fuscata*.

This species has been recorded in British Columbia, the District of Columbia, Idaho, Indiana, Maine, Manitoba, Maryland, Michigan, New Hampshire, New York, Ontario, Oregon, Pennsylvania, Rhode Island, Québec, Virginia, Washington, and Wisconsin (LeConte 1869; Blatchley 1910; Leng 1920; Procter 1946; Hatch 1961; Oatman et al. 1964; Bousquet 1991; Downie and Arnett 1996; Chandler 2001; Sikes 2004). In the Palaearctic region it is known throughout Europe, across Siberia to the Russian Far East, south to Tibet and northern China, and in the Middle East in Turkey and Israel (Johnson et al. 2007). Hatch (1961) reported it as very common on herbage and in grass clippings, compost, leaf litter, and humus. In Atlantic Canada it has been collected in mixed and coniferous forests, pastures, blueberry and potato fields, hedgerows, in coastal dunes and on ocean beaches under drift, by freshwater ponds, and in compost. Johnson (1993) reported that it, “occurs in a range of habitats – grassland, wetland, and woodland – especially in damp situations, and has been collected in litter, moss, flood refuse, cut vegetation and compost heaps.”

Description: Dorsum and venter usually dark red-brown castaneous, pronotum occasionally darker than elytra. Legs reddish-testaceous. Pronotal punctures moderately fine and dense apically, becoming progressively coarser and denser basally; pronotum widest at middle, strongly narrowing basally and apically; base with a distinct transverse impression, the middle third of the basal margin with a discernable, fine marginal bead. Elytral punctures very fine and sparse; interspaces between punctures 3.0+ times the diameter of punctures. Setae the length of the interspaces, appressed (Fig. 5). Antennae: antennomere 1 swollen, longer and wider than 2; 3 as long as or longer than 2 but more slender; 4–8 small and somewhat bead-like; antennal club distinct; antennomeres 9 and 10 quadrate, not discernibly transverse (Fig. 1.4). Body: width/length ratio, 0.47; length, 1.4–1.7 mm.

***Atomaria lederi* Johnson, 1970**

NOVA SCOTIA: Colchester Co.: Five Islands Park, September 6, 1988, E. Georgeson, uv light trap (2, NSMC); **Cumberland Co.:** Oxford, August 11, 1988, E. Georgeson, uv light trap (1, NSMC); **Guysborough Co.:** Dayspring Lake, 2–15 June, 1997, 1–16 July, 1997, D.J. Bishop, red spruce, FIT (2, NSMC); George Lake, 14 May–2 June, 1997, D.J. Bishop, red spruce (young), FIT (1, NSMC); Malay Lake, 14 May–2 June, 1997, 15–30 June, 1997, 1–16 July, 1997, D.J. Bishop, red spruce, FIT (8, NSMC); Melopseketch Lake, 1–16 July, 1997, D.J. Bishop, red spruce (young), FIT (1, NSMC); Seloam Lake, 14 May–2 June, 1997, 2–15 June, 1997, 15–30 June, 1997, D.J. Bishop, red spruce, FIT (3, NSMC); **Halifax Co.:** Big St. Margarets Bay, 2–15 June, 1997, 29 July–13 August, 1997, D.J. Bishop, red spruce, FIT (2, NSMC); Grassy Lake, 15–30 June, 1997, 1–16 July, 1997, D.J. Bishop, red spruce, FIT (4, NSMC); Moser Lake, 15–30 June, 1997, 1–16 July, 1997, D.J. Bishop, red spruce, FIT (2, NSMC); Pockwock Lake, 29 July–13 August, 1997, D.J. Bishop, red spruce (mature), FIT (1, NSMC); Porters Lake, September 2, 1993, B. Wright (2, NSMC);

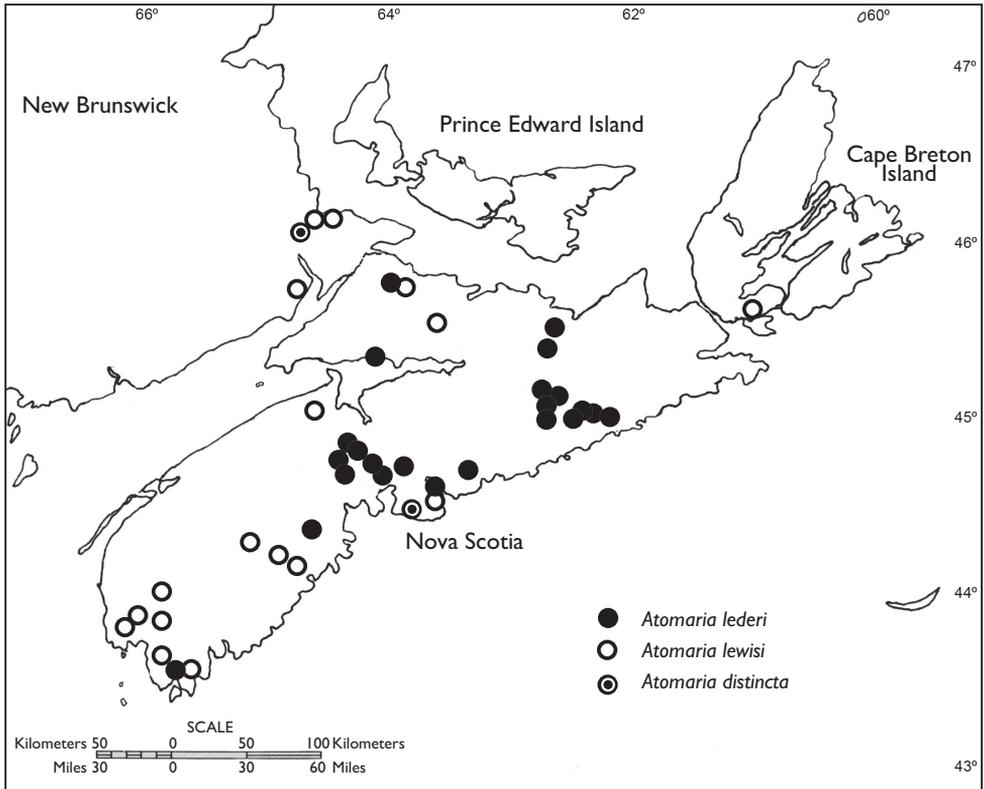


Figure 14. Distribution of *Atomaria lederi*, *Atomaria lewisi*, and *Atomaria distincta* in Atlantic Canada.

Pt. Pleasant Park, June 7, 2001, June 27, 2001, July 7, 2001, May 9, 2002, C.G. Majka, boggy area, (5, CGMC); Sandy Lake, 2–15 June, 1997, 29 July–13 August, 1997, D.J. Bishop, red spruce (120+ years), FIT (2, NSMC); Ten Mile Lake, 15–30 June, 1997, D.J. Bishop, red spruce, FIT (1, NSMC); **Hants Co.:** Armstrong Lake, 14 May–2 June, 1997, D.J. Bishop, red spruce (75 years), FIT (2, NSMC); Leminister, 15–30 June, 1997, D.J. Bishop, red spruce/eastern hemlock, FIT (1, NSMC); Little Armstrong Lake, 14 May–2 June, 1997, D.J. Bishop, red spruce (75 years), FIT (1, NSMC); **Lunenburg Co.:** Bridgewater, May 27, 1965, B. Wright, red oak, window trap (1, NSMC); Card Lake, 15–30 June, 1997, D.J. Bishop, red spruce/eastern hemlock (old), FIT (1, NSMC); **Pictou Co.:** Lorne, 15–30 June, 1997, D.J. Bishop, red spruce/ eastern hemlock (mature), FIT (1, NSMC); McLellan's Brook, July 29, 1988, E. Georgeson, uv light trap (1, NSMC); **Shelburne Co.:** Barrington, May 18, 1966, collector not noted, attic of old meeting house (1, NSMC).

Atomaria lederi is newly recorded in North America (Fig. 14). The reference to North America in Johnson et al. (2007) refers to some of the above records. In the Palearctic region this species has been recorded from central and northern Russia, east across Siberia to the Russian Far East, and south to Mongolia, North Korea, and northern China (Liaoning) (Johnson et al. 2007). In Nova Scotia it has primarily

been found in mixed red spruce (*Picea rubens* Sarg.) and eastern hemlock (*Tsuga canadensis* (L.) Carr.) (Pinaceae) forests of various ages, occasionally in boggy areas in such forests, on *Spiraea alba* Duroi (Rosaceae), and balsam fir (*Abies balsamea* (L.) Mill) (Pinaceae).

Description: Dorsum and venter reddish-testaceous throughout, including legs. Head, pronotum, and elytra moderately coarsely, moderately densely punctate; interspaces 1.0–1.5 times the diameter of punctures; elytral setae the length of the interspaces, appressed. Pronotum widest at middle, narrowing slightly to base and more strongly to apex (Fig. 6). Antennae: antennomere 1 quadrate, swollen; 2 the same length and almost the same width as 1; 3 slightly shorter and narrower; 4–8 similar in size and bead-like; club distinct; antennomeres 9 and 10 quadrate, not transverse (Fig. 1.5). Body: width/length ratio, 0.43; length, 1.2–1.4 mm.

Atomaria lewisi Reitter, 1877

NEW BRUNSWICK: Albert Co.: Mary's Pt., September 8, 2002, C.G. Majka, old field, in compost (3, CGMC); **NOVA SCOTIA: Cumberland Co.:** Oxford, June 16, 1986, E. Georgeson (1, NSNR); Wentworth Park, July 12, 1993, J. & T. Cook, car net (5, JCC); **Halifax:** Pt. Pleasant Park, August 10, 2001, August 18, 2001, C.G. Majka, coniferous forest, boggy area, *Spiraea alba* (3, CGMC); **Kings Co.:** Kentville, August 10, 2005, D.H. Webster, compost, moldy corncocks (5, DHWC); **Queens Co.:** Caledonia, July 25, 1992, J. & F. Cook, interior mixed forest, car net (4, JCC); Medway River, July 13, 1993, J. & T. Cook, car net (1, JCC); Ponhook Lake nr. Greenfield, July 13, 1993, J. Cook, uv light trap (1, JCC); **Richmond Co.:** Louisdale, November 12, 1991, M. Boudreau (4, NSMC); **Shelburne Co.:** Clyde River Rd, July 16, 1992, S. & J. Peck, forest, car net (1, JCC); **Yarmouth Co.:** Carleton, Perry Rd., August 22, 1992, J. & F. Cook, mixed forest, car net (7, JCC); Carleton, Perry Rd., July 18, 1993, J. & T. Cook, car net (3, JCC); Coldstream Rd. E of Quinan, July 19, 1993, J. & T. Cook, car net (1, JCC); Hebron, June 4, 1999, J. Cook, on Hawthorne (1, JCC); north of North Kemptville, August 23, 1992, J. & F. Cook, car net (6, JCC); Wellington, July 11–12, 1997, J. Cook, uv light trap (3, JCC); **Yarmouth-Shelburne Co.:** Oak Park Rd., August 27, 1992, J. & F. Cook, car net (9, JCC).

We have examined the holotype of *Atomaria curtula* Casey 1900 deposited in the Smithsonian Institution and have found it to be identical in all respects to *A. lewisi* Reitter. We therefore designate *A. curtula* syn. n. as a junior synonym of *A. lewisi*.

Atomaria lewisi is newly reported in New Brunswick, Nova Scotia, Canada, and North America (Fig. 14). Under the name *A. curtula* it was reported from Connecticut, Ontario (Casey 1900; Leng 1920; Bousquet 1991; Downie and Arnett 1996), and Maine (Procter 1946). In the Palaearctic region it is found throughout Europe, the Russian Far East, Central Asia, Mongolia, China, Japan, and North Korea, south to Bhutan and northern India (Johnson et al. 2007).

Lohse (1967) called it an adventive species in Europe, and Johnson et al. (2007) referred to it as cosmopolitan. In Nova Scotia it has been found in coniferous and mixed forests, in boggy areas, on *Craetegus* sp. (Rosaceae), and on compost. Johnson (1993) reported that it was, “a grassland species which has been recorded especially around farms, gardens and parks but it often also occurs in other habitats. It has been collected in man-made heaps of refuse, especially cut vegetation, hay, grass, and compost.”

Description: Dorsum and venter brownish-yellow or reddish-yellow throughout, including legs. Head moderately densely, moderately finely punctate. Pronotum moderately densely and moderately coarsely punctate; interspaces 0.5 times the diameter of punctures; base with a distinct flattened depression. Elytra somewhat more finely and sparsely punctate; interspaces 1.0–1.5 times the diameter of punctures; elytral margins strongly rounded; setae rather long and prominently erect giving a “bristling” appearance (Fig. 7). Antennae: antennomere 1 long, swollen, and curved, apex nearly 1.5–2.0 times the width of base, 1.5 times longer than 2; 3 the same length as 2 but more slender; 4–8 almost equal in length and bead-like; club distinct; antennomeres 9 and 10 slightly transverse (Fig. 1.6). Body: width/length ratio, 0.46; length, 1.3–1.6 mm.

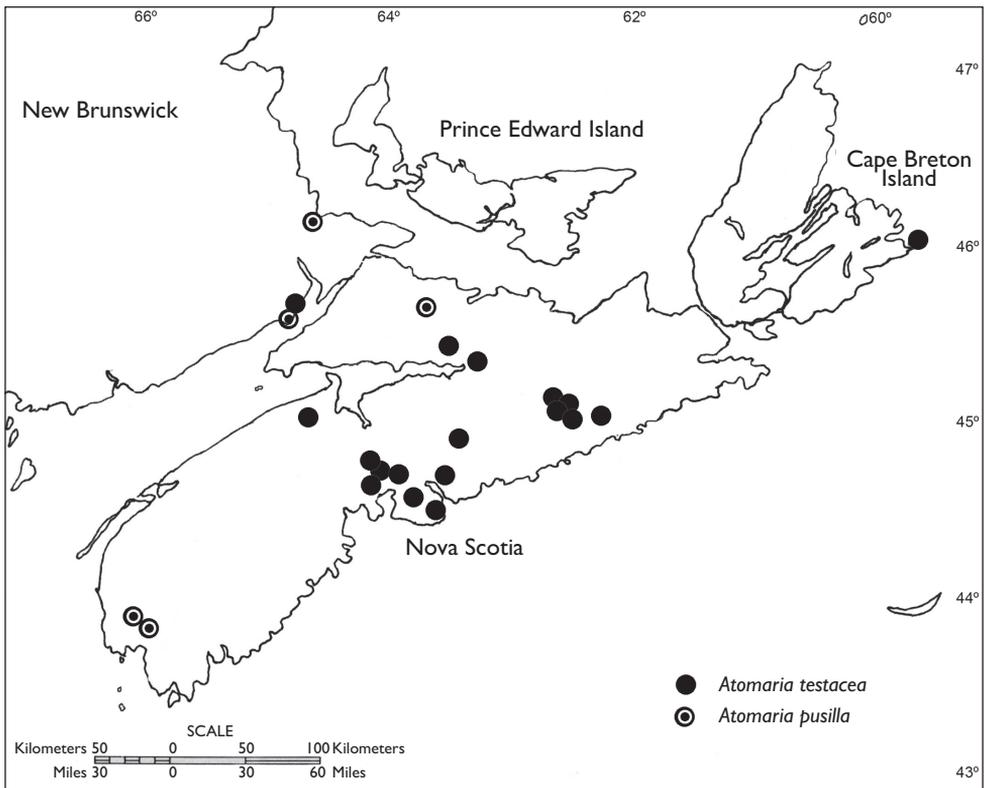


Figure 15. Distribution of *Atomaria testacea* and *Atomaria pusilla* in Atlantic Canada.

***Atomaria pusilla* (Paykull, 1798)**

NOVA SCOTIA: Cumberland Co.: Wentworth Park, July 12, 1993, J. & T. Cook, car net (2, JCC); **Yarmouth Co.:** Carleton: Perry Rd., July 18, 1993, J. & T. Cook, car net (1, JCC); Coldstream Rd. E of Quinan, July 19, 1993, J. & T. Cook, car net (2, JCC). **NEW BRUNSWICK: Albert Co.:** Mary's Pt., August 9, 2002, C.G. Majka, coniferous forest, decaying *Russula virescens* (1, CGMC); **Westmorland Co.:** Shediac, September 30, 1972 (1, MMUE).

Atomaria pusilla is newly recorded in New Brunswick and Nova Scotia (Fig. 15). In North America it has been recorded in Alaska, British Columbia, Connecticut, Idaho, Indiana, New York, Ohio, Oregon, Québec, and Washington (Blatchley 1910; Britton 1920; Notman 1920; Hatch 1961; Bousquet 1991; Williams et al. 1995; Downie and Arnett 1996). Blatchley (1910) referred to it as a “European” species and Bousquet (1991) listed it as “probably introduced” in North America. In the Palaearctic region it is found throughout Europe (including Turkey), across North Africa, and in central Asia in Iran, Afghanistan, and Kazakhstan, northeast to Mongolia and the Russian Far East (Johnson et al. 2007). Blatchley (1910) reported it from the borders of a sphagnum marsh and in other damp vegetable debris. In New Brunswick it was found in a coniferous forest on a decaying gill fungus. Johnson (1993) reported that it was, “a grassland species which is found especially around farms and gardens and only rarely elsewhere. It has been collected in man-made heaps of refuse, cut vegetation, hay, grass, and compost heaps.

Description: Body (dorsally and ventrally) uniformly reddish-yellow. Antennae and legs uniformly yellow-colored. Head very finely and sparsely punctate. Pronotum widest at midpoint, constricted basally and apically. Pronotum moderately finely and closely punctate, interspaces 1.0 times the diameter of punctures; pronotal base with a complete fine marginal line running along the bottom of the basal impression. Elytral punctuation similar to pronotum (Fig. 8). Antennae: antennomere 1 short, straight, not or slightly expanded at apex, slightly longer than wide, approximately as long as antennomere 2; 3 slightly shorter than 2; 4–8 short and bead-like; antennal club distinct; antennomeres 9 and 10 transverse (Fig. 1.8). The smallest species of the genus; body width/length ratio, 0.40; length, 1.0–1.2 mm.

***Atomaria testacea* Stephens, 1830**

NEW BRUNSWICK: Albert Co.: Mary's Pt., August 12, 2004, C.G. Majka, coastal field, in compost (4, CGMC). **NOVA SCOTIA: Cape Breton Co.:** Scatarie Island: Savage Cove, August 10, 2005, K.R. Aikens, beach, under wrack (1, CBU); **Colchester Co.:** Bible Hill, May 31, 2005, June 14, 2005, K.R. Aikens, pasture, sweeping (4, CBU); Bible Hill, May 31, 2005, July 21, 2006, S.M. Townsend, sweeping (2, CBU); Bible Hill, June 3, 2007, June 15, 2007, August 1, 2007, C.W. D'Orsay, pasture, sweeping (5, CBU); Debert, June 19, 1993, J. Ogden (1, NSNR); **Guysborough Co.:**

Dayspring Lake, 2–15 June, 1997, D.J. Bishop, red spruce, FIT (1, NSMC); Malay Lake, 14 May–2 June, 1997, 1–16 July, 1997, D.J. Bishop, red spruce (mature), FIT (2, NSMC); Seloam Lake, 14 May–2 June, 1997, 2–15 June, 1997, D.J. Bishop, red spruce, FIT (2, NSMC); **Halifax Co.:** Abraham's Lake, 1–16 July, 1997, D.J. Bishop, red spruce (old), FIT (1, NSMC); Anti Dam Lake, 1–16 July, 1997, D.J. Bishop, black spruce (90 years), FIT (1, NSMC); Antrim, June 9, 2005, J. Gordon, FIT (1, NSNR); Burnside, May 19, 2004, C. Cormier, field, on dead pig (1, SMU); Campbell Hill, 15–30 June, 1997, D.J. Bishop, red spruce (mature), FIT (1, NSMC); Long Lake, May 25, 2002, C.G. Majka, along stream (1, CGMC); Pockwock Lake, 14 May–2 June, 1997, D.J. Bishop, red spruce (mature), FIT (1, NSMC); Pogwa Lake, 15–30 June, 1997, D.J. Bishop, red spruce, FIT (1, NSMC); Pt. Pleasant Park, July 2, 2001, July 7, 2001, August 18, 2001, June 9, 2002, June 18, 2002, July 23, 2002, C.G. Majka, red spruce forest, boggy area (6, CGMC); Sandy Lake, 16–29 July, 1997, D.J. Bishop, red spruce (120+ years), FIT (1, NSMC); south-end Halifax, May 26, 2001, May 20, 2002, June 21, 2002, C.G. Majka, open area (3, CGMC); south-end Halifax, August 22, 2002, C.G. Majka, compost (1, CGMC); **Kings Co.:** Kentville, August 10, 2005, July 9, 2006, August 19, 2007, D.H. Webster, compost (11, DHWC); Kentville, August 12, 2007, D.H. Webster, at light (1, DHWC).

Atomaria testacea is newly recorded in New Brunswick, Nova Scotia, and Canada (Fig. 15). In North America it has previously been recorded from southern California (Leng 1920) under the name *Atomaria ruficornis* Marsham, 1802, synonymized by Johnson et al. (2007). LeConte (1869, 258) reported a species from South Carolina under the name of *Atomaria testacea* Zimmerman; however, as Bousquet (1989) makes clear, this refers to *Cryptophagus ferrugineus* Sahlberg. In the Palearctic region it is found throughout Europe, in Algeria, Morocco, and Tunisia in North Africa, and in Asia in Turkey, Kazakhstan, Mongolia, and western Siberia (Johnson et al. 2007). In Atlantic Canada it has been found in red spruce forests, boggy areas and marshes, in pastures, fields, meadows, and open areas, on beaches under wrack, in a ravine, and in compost. Johnson (1993) reported that it was, “mainly a grassland species which has been recorded around farms, gardens and parks, but it often occurs in other habitats. It has been collected in man-made heaps of refuse, especially cut vegetation, grass, hay, haystack bottoms and compost, more rarely in dung or dung heaps.”

Description: Head and pronotum piceous. Elytra piceous basally, gradually becoming paler in the apical half. Venter: pro-, meso-, and meta-sterna piceous; abdominal sterna and legs dark testaceous. Head finely, moderately sparsely, punctate. Pronotum and elytra moderately finely and densely punctate, interspaces 1.0–1.5 times the diameter of punctures, elytral punctures becoming finer apically; pronotum widest at midpoint, constricted towards base and apex; base with only a very shallow transverse impression (Fig. 9). Antennae: antennomere 1 swollen, slightly curved and expanded at apex; 2 smaller than 1 but also apically expanded; 3 almost as long as 2 and only slightly more slender; 4–8 short and somewhat bead-like; antennal club distinct; antennomeres 9 and 10 transverse (Fig. 1.8). Body: width/length ratio, 0.46; length, 1.3–1.6 mm.

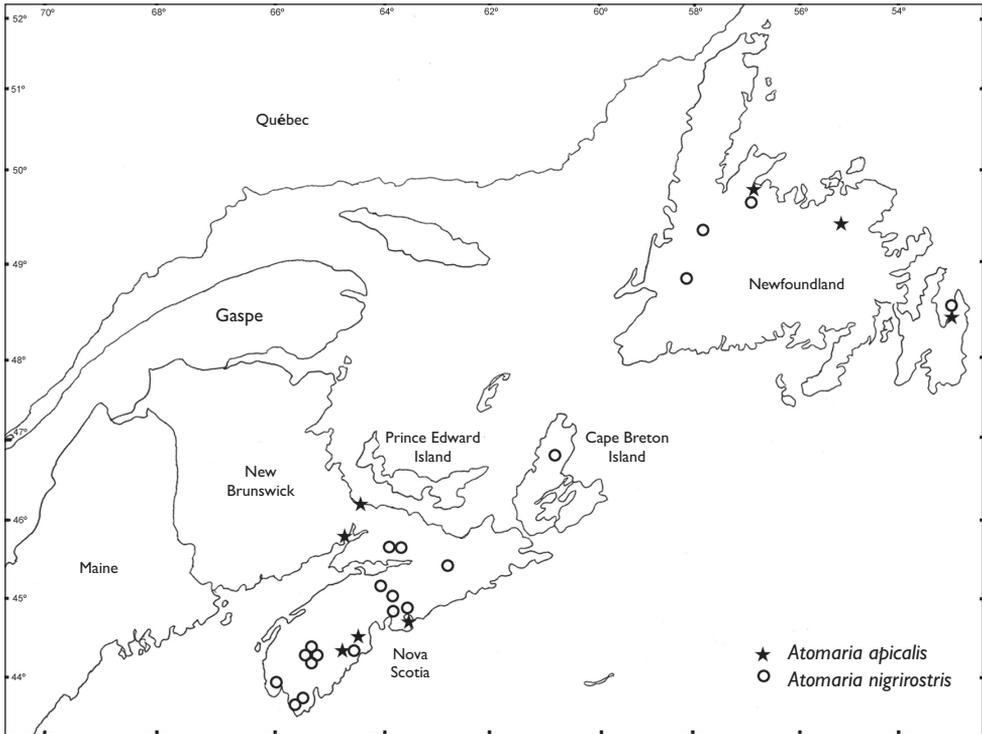


Figure 16. Distribution of *Atomaria apicalis* and *Atomaria nigrirostris* in Atlantic Canada.

Atomaria (s. str.) Stephens, 1829

Atomaria nigrirostris Stephens, 1830

LABRADOR: Middle Brook, June 2–17, 2005, July 4–18, 2005, S. Pardy, boreal forest, pitfall (5, MUN); Ossak Camp, June 28–July 11, 2004, S. Pardy, subarctic black forest, pitfall (1, MUN). **NEWFOUNDLAND:** Portugal Cove: Indian Meal Line, July 1, 1979, June 23, 1980 (2, AAFC); South Pond near South Brook, June 27, 1980, Brennan & Larson, drift (2, AAFC); Little Grand Lake, 2 km E Martin Pond, June 8–July 13, 1993, old fir, pitfall (1, AAFC); Glide Lake, June 23, 1994, W. Bowers et al. (1, CFS). **NOVA SCOTIA: Annapolis Co.:** Big Dam Lake, June 27–July 7, 2004, H. Love, eastern hemlock forest (2, CGMC); **Cumberland Co.:** Wentworth, May 21–July 5, 1965, B. Wright (1, NSMC); Wentworth Park, July 12, 1993, J. & T. Cook, car net (2, JCC); Westchester-Londonderry, July 20, 1992, S. & J. Peck, forest road, car net (5, JCC); **Guysborough Co.:** Trafalgar, Liscomb Sanctuary, July 19, 1992, S. & J. Peck, car net (9, JCC); **Halifax Co.:** Long Lake, May 25, 2002, C.G. Majka, along stream (1, CGMC); Pockwock Lake, 2–15 June, 1997, D.J. Bishop, red spruce (mature), FIT (1, NSMC); Upper Tantallon, Indian Lake Rd., July 17, 1992, S. & J. Peck,

car net (1, JCC); **Hants Co.:** Frenchmen's Cave, July 2, 1998, M. Moseley, gypsum sinkhole (1, CGMC); **Queens Co.:** Caledonia, July 25, 1992, J. & F. Cook, interior mixed forest, car net (4, JCC); Medway River, July 13, 1993, J. & T. Cook, car net (15, JCC); North Cranberry Lake, August 13–24, 2004, June 28–July 8, 2004, H. Love, eastern hemlock forest (2, CGMC); **Shelburne Co.:** Clyde River Rd, July 16, 1992, S. & J. Peck, forest, car net (4, JCC); **Yarmouth Co.:** Wellington, June 1–7, 1999, J. & F. Cook, mixed coastal forest, FIT (3, JCC); **Yarmouth-Shelburne:** Oak Park Rd., August 27, 1992, J. & F. Cook, car net (3, JCC).

Atomaria nigrirostris is newly recorded in Labrador, insular Newfoundland, Nova Scotia, and Canada (Fig. 16, 17). In North America, it has previously been recorded in Alaska (Leng 1920; Bousquet 1991) under the name *Atomaria fuscicollis* Mannerheim, 1852, synonymized by Johnson et al. (2007). In the Palaearctic region it is found throughout Europe (including Turkey), in Algeria in North Africa, across Siberia to the Russian Far East, south to Mongolia, and in central Asia in Iran and Uzbekistan (Johnson et al. 2007). In Atlantic Canada it has been collected in eastern hemlock, red spruce, and mixed forests, along a stream, and in a gypsum sinkhole. Lohse (1967) reported it in Europe from along rivers, under leaves. Johnson (1993) reported that it was, “a woodland species, mostly associated with broadleaved trees, it occurs on and under dead wood on the ground, in moss, leaf litter, flood refuse and general ground litter. It also occurs under hedgerows.”

Description: Head, pronotum, and pro-, meso-, and meta-sterna piceous brown; elytra and abdominal sterna a slightly paler, fuscous brown; elytra becoming slightly paler in apical half. Head, pronotum, and elytra moderately densely, moderately strongly punctate; interspaces 1.0–1.5 times the diameter of punctures; apex of elytra slightly more finely punctate; elytral setae approximately the length of the interspaces, prominent and somewhat erect. Pronotum strongly constricted from midpoint to apex, parallel from midpoint to pronotal base; before base with a strong transverse impression, with several fine and sharp longitudinal ridges. Elytra scarcely, or not, wider than pronotum (Fig. 10). Antennae: antennomere 1 long and curved, twice as long as 2 and approximately twice as wide at apex than at base; 2 cylindrical; 3 as long as 2 but more slender; 4, 6, and 8 short and bead-like; 5 and 7 somewhat longer; club distinct; antennomeres 9 and 10 clearly transverse (Fig. 1.7). Body: width/length ratio, 0.31; length, 1.7–1.9 mm.

Atomaria wollastoni Sharp, 1867

LABRADOR: Middle Brook, June 17–July 4, 2005, July 18–2 August, 2005, August 24–September 12, 2005, S. Parady, boreal forest, pitfall (3, MUN); Muskrat Falls, June 2–17, 2005, S. Parady, boreal forest, pitfall (1, MUN); Ossak Camp, June 28–July 11, 2004, August 11–29, 2004, September 22–October 8, 2004, S. Parady, subarctic black forest, pitfall (19, MUN); St. Lewis, August 25–September 7, 2004, S. Parady, heath, pitfall (1, MUN). **NEWFOUNDLAND:** Picadilly, July 7, 1949, E. Palmen

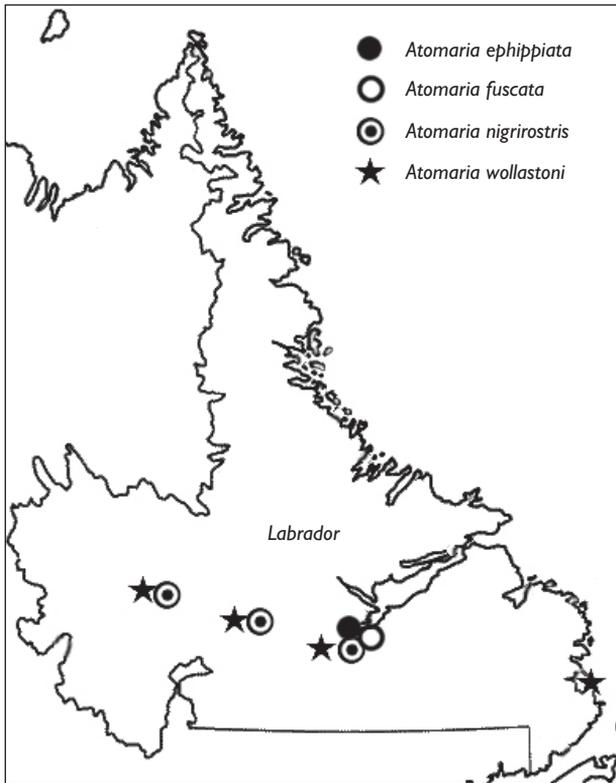


Figure 17. Distribution of *Atomaria ephippiata*, *Atomaria fuscata*, *Atomaria nigrirostris*, and *Atomaria wollastoni* in Labrador.

(1, MZHF); Cape Broyle, June 8, 1949, E. Palmen (1, MZHF); South Branch, July 3, 1949, E. Palmen (1, MZHF); Corner Brook, Cooks Pond Lower, June 24–July 15, 1992, 40 year old fir forest (3, MUN); Conception Bay, May 18, 1980 (1, MUN); Manuals R., 8 km W of St. John's, June 10, 1984, D. Langor (1, MUN); Portugal Cove: Indian Meal Line, May 16, 1979, June 2, 1979, July 1, 1979, October 20, 1980, May 28, 1981, June 22, 1981, July 19, 1981, September 1, 1981, July 21, 1982 (28, MUN); St John's, Oxen Pond Botanical Garden, September 5, 2000, D. Larson (1, MUN); Gander, T.H. Howe Forest, July–August, 1998, D. Russell, wind drift (1, MUN); Red Indian Lake, June 25, 1980, Brennan & Larson, drift (1, MUN); South Pond near South Brook, June 27, 1980, Brennan & Larson (4, MUN); Little Grand Lake, Bakeapple Brook, June 24–July 15, 1992, old fir, pitfall (3, MUN); Glide Lake, July 5, 1994, W. Bowers et al. (1, MUN); Glide Lake, June 20, 1996, pitfall (2, CFS); Glide Lake, July 19, 1996, August 22, 1996, pitfall (2, MUN); Glide Lake, August 30, 1994, pitfall (1, CFS); Pasadena, May 16, 1988, L.H. Hollett (2, MUN). **NOVA SCOTIA: Annapolis Co.:** Durland Lake, June 6, 2003, P. Dollin, eastern hemlock/balsam fir/black spruce (120+ years), under bark of log (1, NSMC); **Cumberland Co.:** Wentworth Park, July 12, 1993, J. & T. Cook, car net (1, JCC); **Halifax Co.:** Halifax,

May 26, 2009, S. MacIvor, open area (1, SMU); Big Indian Lake, June 11, 2003, P. Dollin, red spruce (80–120 years), red spruce stump (2, NSMC); **Queens Co.:** Fifth Lake Bay, July 13, 2003, P. Dollin, hemlock (120+ years), pitfall (1, NSMC); Medway River, July 13, 1993, J. & T. Cook, car net (5, JCC); Sixth Lake, June 20, 2003, P. Dollin, eastern hemlock (120+ years), funnel trap (1, NSMC); **Yarmouth Co.:** Carleton Perry Rd., July 18, 1993, J. & T. Cook, car net (1, JCC).

Atomaria wollastoni is newly recorded in Labrador, insular Newfoundland, and Nova Scotia (Fig. 13, 17). Dollin et al.'s (2008) records of *A. ochracea* are attributable to *A. wollastoni*. Leng (1920) reported it from "Canada." In Europe this species has a northern distribution having been recorded in central and northern Russia, Scandinavia, Estonia in the Baltic region, Great Britain, Ireland, the Netherlands, Germany, and France (Johnson et al. 2007). In Atlantic Canada it has been found in coniferous forests consisting of eastern hemlock, balsam fir, red spruce, and black spruce (*Picea mariana* (Mill.) BSP, Pinaceae). In Europe, Schiegg (2000) classed it as a stenotopic saproxylic species characteristic of high dead wood connectivity, and noted that it is red-listed in Germany. It is also red-listed in Denmark (Stolze and Pihl 1997). In Norway, Hågvar (1999) found it associated with sporocarps of *Fomitopsis pinicola* (Fr.) Karst. (Polyporaceae). It would appear to be a characteristic saproxylic species in both Europe and North America.

Description: Head and pronotum blackish-piceous; elytra, antennae, and legs testaceous. Venter piceous. Head, pronotum, and elytra moderately densely, moderately strongly punctate; interspaces 1.0–1.5 times the diameter of punctures; apex of elytra slightly more finely punctate. Elytral setae approximately the length of the interspaces, appressed. Pronotum widest at approximately the middle, evenly arcuately constricted to apex and base, hind angles rounded; base of pronotum without transverse impression (Fig. 11). Antennae: antennomere 1 long and curved, twice as long as 2 and approximately twice as wide at apex than at base; 3, 5 and 7 shorter and more slender; 4, 6, and 8 short and bead-like; club moderately distinct; antennomeres 9 and 10 quadrate (Fig. 1.10). Body: width/length ratio, 0.33; length, 1.5–1.8 mm.

Discussion

As a result of the present investigation, ten species of *Atomaria* have been recorded in Atlantic Canada. Of these, six including *Atomaria distincta*, *A. fuscata*, *A. lederi*, *A. lewisi*, *A. testacea*, and *A. nigrirostris* are newly recorded in Canada. *Atomaria lederi* and *A. lewisi* are newly recorded in North America.

The paucity of knowledge about many of these species in North America, makes determination of the zoogeographic status of some species uncertain (Table 1). Two species, *Atomaria ephippiata* and *A. distincta*, are clearly Nearctic, not having been recorded outside this region. *Atomaria apicalis* and *A. pusilla*, have previously been categorized as "probably" adventive Palaearctic species by Bousquet (1991). The designation of *Atomaria apicalis*, however, was prior to the synonymy with the Near-

tic *Atomaria ovalis* (in the present study); consequently this designation needs to be re-evaluated since the wide distribution of *A. apicalis* is more indicative of a native Holarctic species. *Atomaria fuscata* has a wide distribution in North America on both Pacific and Atlantic coasts, and in the interior of the continent, also suggestive of a native Holarctic species. The northern boreal distributions of *Atomaria lederi* and *A. wollastoni* in the Palaearctic region could be indicative of species with a Holarctic distribution. However, there are very few records of these species in North America. *Atomaria nigrirostris* is widely distributed in the Palaearctic region, and records in North America (Alaska, Labrador, Newfoundland, and Nova Scotia) are consistent with a Holarctic distribution. *Atomaria lewisi* and *A. testacea* are widely distributed in the Palaearctic region, but have only been reported from a limited number of locations in North America – possibly indicative of adventive species on this continent. Given the limited knowledge about this genus in North America, and the considerable taxonomic confusion that still exists, the zoogeographic status of all these species should be re-evaluated in the future when more information is available and the genus is better understood.

Within Atlantic Canada, few generalizations can be made with respect to the distribution of species as indicated in Figs 13–17. *Atomaria apicalis*, *A. ephippiata*, *A. fuscata*, *A. nigrirostris*, and *A. wollastoni* are represented by a substantial number of records and appear to be relatively widely distributed throughout Atlantic Canada (Figs 13, 16). All but *A. apicalis* are also found in southern Labrador (Fig. 17). *Atomaria lederi*, *A. lewisi*, and *A. testacea* are represented by a moderate number of records and generally distributed in Nova Scotia (although *A. lewisi* has not been found on Cape Breton Island), and the latter two species have additionally been collected in New Brunswick (Figs 14, 15). *Atomaria distincta*, and *A. pusilla* are represented by a small number of records and appear to be relatively restricted in their distribution (Figs 14, 15). However, collecting effort for this genus has been far from adequate in all areas of the region, with the possible exception of the mainland of Nova Scotia. Consequently generalizations about their distribution or abundance in the region must be provisional. The possibility of additional species occurring in the region has certainly not been excluded. Further collecting is clearly indicated in order to gain a better understanding of the members of this genus in Atlantic Canada.

It is evident that there are differences in habitat preferences amongst these species. *Atomaria ephippiata*, *A. fuscata*, *A. lewisi*, and *A. testacea* appear to be eurytopic species found in a wide variety of forested and open habitats; *Atomaria lederi* and *A. wollastoni* have been principally collected in coniferous forests, whereas *Atomaria nigrirostris* has been found in coniferous, deciduous, and mixed forests. All three appear to be primarily saproxylic species. *Atomaria apicalis*, *A. distincta*, and *A. pusilla* are all primarily found in grasslands and other open habitats. *Atomaria fuscata*, *A. ephippiata*, *A. lewisi*, and *A. testacea* have all been collected in compost heaps in this region, and *A. distincta*, *A. fuscata*, *A. ephippiata*, and *A. testacea* have all been found in seashore, salt marsh, and beach drift environments. At least in Great Britain and Ireland, *A. pusilla* appears to be primarily a synanthropic species (Johnson 1993). Further bionomic investigations should be conducted to better understand the macro- and micro-habitat preferences of these species and the ecological roles that they play in their respective environments.

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A new genus of Macrotomini (Coleoptera, Cerambycidae, Prioninae)

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Abstract

A new genus of Macrotomini (Coleoptera, Cerambycidae, Prioninae). *Allomallodon* **gen. n.** is erected to accommodate *Mallodon hermaphroditum* Thomson, 1867, and *M. popelairi* Lameere, 1902. The assignment of this new genus to Macrotomini, and the validity of Mallodontini are discussed. As result, Mallodontini is considered a synonym of Macrotomini. A key to species of the new genus is included as well.

Keywords

Key, *Mallodon*, Mallodontini, new genus, taxonomy

Introduction

Thomson (1867) described *Mallodon hermaphroditum*, noting that it was the only species known in the genus whose male lacks impunctate and shining facets on the pronotum, in contrast with the remainder of the surface. Thus, the pronotum is simi-

lar to that of the female. Later, Lameere (1902) transferred *M. hermaphroditum* to *Stenodontes* (*Mallodon*), described *Stenodontes* (*Mallodon*) *popelairi*, and noted that this species shows different characters, than Thomson's species. Some characters as, for example, body slender, labrum tumid, and prothorax in male without evident sexual dimorphism, allow to allocate these species in a new genus.

Since Lameere (op.cit.), both species were simply included in catalogues, and were not figured until Fragoso and Monné (1995) studied the lectotype male of *M. hermaphroditum*, and Santos-Silva (2005) examined the lectotype male and the paralectotypes (two males and one female) of *M. popelairi*. Neither of the latter two authors questioned the generic assignment of these species.

During the study of another genus (*Nothopleurus* Lacordaire, 1869), which included a cursory analysis of several species of *Mallodon*, it became evident that both *M. hermaphroditum* and *M. popelairi* exhibited an exclusive set of characters that would permit them to be assigned to a new genus. Further evidence is presented to support the inclusion of this new genus in Macrotomini, which includes Mallodontini, sensu Monné and Hovore (2006) and Monné (2006).

Materials and methods

Specimens examined for this study are from the following institutions / private collections:

- ACMT** American Coleoptera Museum (James Wappes), San Antonio, U.S.A.;
DHCO Daniel Heffern Collection, Houston, U.S.A.;
IRSN Institute Royal des Sciences Naturelles de Belgique, Brussels, Belgium;
MNHN Muséum National d'Histoire Naturelle, Paris, France;
MZSP Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil;
ZKCO Ziro Komiya Collection, Tokyo, Japan.

Allomallodon gen. n.

urn:lsid:zoobank.org:act:82000311-6289-45AC-AE36-B50E563117B8

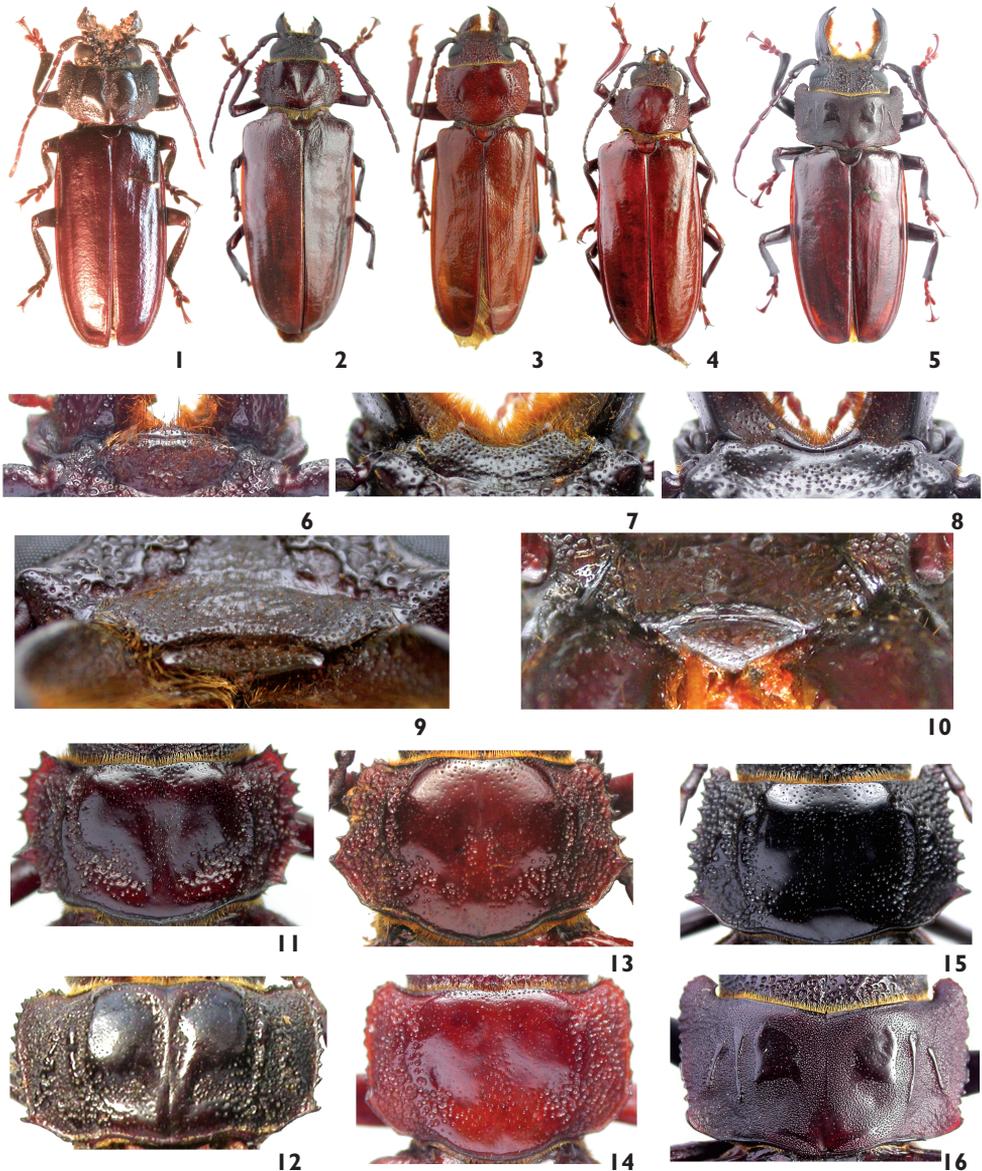
Etymology. Allo- (Greek) = different, (i.e.) different from *Mallodon*. Gender masculine.

Type species. *Mallodon hermaphroditum* Thomson, 1867.

Size from small to large (up to 2 cm). Integument brown to dark-brown.

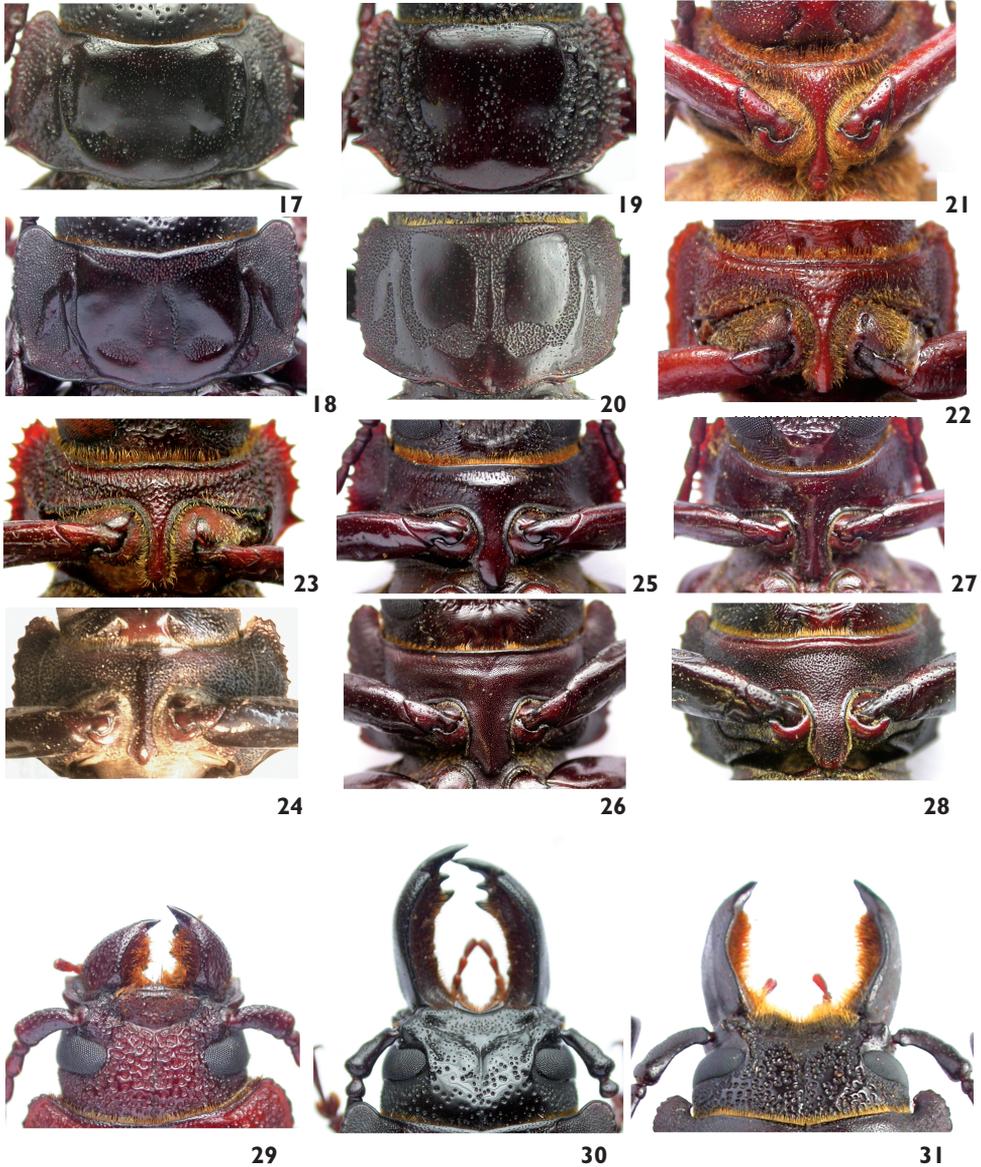
Male (Figs 1, 3). Body not notably depressed; ratio of head (without mandibles) + prothorax and elytra equals to approximately 1:2.5. Head (Figs 1, 3) proportionally large and wide; punctuation of dorsal surface (Fig. 29) coarse, deep and confluent. Eyes large; upper ocular lobe just narrower than lower ocular lobe; distance between upper ocular lobes (Fig. 29) more than 1.2 times the length of scape; distance between lower ocular lobes approximately 1.4 times the length of scape. Ocular carina (Fig. 29) low, narrow and short, distinct only at vertical area of upper ocular lobe. Clypeus wide. La-

brum vertical, but with the basal portion (Figs 6, 10) wide, coplanar or almost coplanar with clypeus, tumid and distinctly visible in dorsal view. Hypostomal area coarsely and anastomosedly punctate. Galea surpassing base of second palpomere of maxillary



Figures 1–16. 1–5 Habitus: 1 *Allomallodon popelairei*, male (photo by Ziro Komiya) 2 idem, female 3 *A. hermaphroditum*, male 4 idem, female 5 *Mallodon spinibarbis*, male 6–10 labro: 6 *Allomallodon hermaphroditum*, male, dorsal view 7 *Mallodon spinibarbis*, male, dorsal view 8 *M. downesii* Hope, 1843, male, dorsal view 9 *M. spinibarbis*, male, frontal view 10 *Allomallodon popelairei*, femëa, frontal view 11–16 Pronotum: 11 *Allomallodon popelairei*, female 12 idem, male (photo by Ziro Komiya) 13 *A. hermaphroditum*, female 14 idem, male 15 *Mallodon spinibarbis*, female 16 idem, male.

palps. Labial palps reaching approximately middle of palpomere III of maxillary palps. Mandibles (Figs 1, 3, 29), at most, as long as the head; dorsal carina (Fig. 29) elevated on basal two-thirds; inner face densely pilose; lower, inner margin projected in plate



Figures 17–31. 17–20 Pronotum: 17 *Mallodon downesii*, female 18 idem, male 19 *M. dasystomus dasystomus* (Say, 1824). 21–28 prosternal process: 21 *Allomalodon hermaphroditum*, fêmea 22 idem, male 23 *A. popelairei*, female 24 idem, male (photo by Ziro Komiya) 25 *Mallodon spinibarbis*, female 26 idem, male 27 *M. dasystomus dasystomus*, female 28 idem, male. 29–31 head and mandibles, dorsal view: 29 *Allomalodon hermaphroditum*, male 30 *Mallodon downesii* 31 *M. spinibarbis*.

at apical two-thirds, where teeth are moderately large. Antennae (Figs 1, 3) attaining basal third of elytra or just surpassing; scape not surpassing the posterior edge of eye.

Prothorax transverse; anterior angles (Figs 12, 14) projected forward, not notably wide, moderately acute at apex; lateral angles (Figs 12, 14) well marked, distinctly more elevated than the posterior angles in dorsal view; posterior angles well marked, obtuse. Pronotal disc (Figs 12, 14) without sexual dimorphism (sexual punctation), without impunctate and shining facets in contrast with the remainder of the central surface; lateral rugose-punctate; lateral margins crenulated between the anterior lateral angles. Proepimera, proepisterna, and lateral of prosternum (Figs 22, 24) moderately, coarsely and confluent punctate, finer than that of lateral areas of pronotum; central area of prosternum finer and more sparsely punctate than laterally. Prosternal process (Figs 22, 24) distinctly narrowed medially. Metepisterna and lateral areas of metasternum moderately, densely, pilose with long hairs. Metepisterna wide (width at central region equal to approximately 0.3 times the length); inner margin subvertical. Femora and tibiae unarmed.

Female (Figs 2, 4). Eyes proportionally larger than in male. Distance between upper ocular lobes equal to length of scape; distance between lower ocular lobes just greater than the length of scape or subequal. Antennae (Figs 2, 4) slightly shorter than in male. Lateral margins of pronotum crenulate (Figs 11, 13), more acute and projected than in male. Proepisterna and proepimera (Figs 21, 23) rugose or slightly rugose, not punctate or with coarse punctures near the prosternum. Punctuation of prosternum similar to that of male. Prosternal process, metasternum and metepisterna (Figs 21, 23) as in male.

Included species: *Allomallodon hermaphroditum* (Thomson, 1867); *A. popelairei* (Lameere, 1902).

Material examined:

Allomallodon hermaphroditum. ECUADOR, Pichincha: Santo Domingo de los Colorados, 3 ♀, III.1982, [no collector indicated] (MZSP). COLOMBIA, ♀, [no date and collector indicated] (MZSP). Santander: Bucaramanga (958 m; 7°07'17"N, 73°07'33"W), ♀, VII.29.1973, H. Arévalo col. (MZSP). Valle del Cauca: Calima-Darién (Cristalina Alta), ♂, ♀, VII.21–28.1992, several collectors (MZSP). Additionally we examined photographs of the lectotype male currently deposited at MNHN.

Allomallodon popelairei. PERU, Cusco: Limatambo, ♀, III.01.1965, [no collector indicated] (MZSP); Huanaco (probably in Cusco), lectotype ♂, 3 paralectotypes (2 ♂, 1 ♀) [no date and collector indicated] (IRSN). Additionally we examined photographs of two males sent by Ziro Komyia (Japan), from his private collection.

Geographical distribution: Peru, Colombia, and Ecuador.

Diagnosis and Discussion. *Allomallodon gen. n.* differs from *Mallodon* Lacordaire, 1830 by the following characters: body (Figs 1–4) slender; mandibles of male (Fig. 29), at most, as long as the head; base of labrum (Figs 6, 10, 29) distinctly visible in dorsal view, coplanar or nearly so with the clypeus; labrum (Fig. 10) tumid; lateral angles of prothorax of male (Figs 12, 14) distinctly more elevated than posterior angles in line; pronotum (Figs 12, 14), proepimera and prosternum (Figs 22, 24) of male without

evident sexual dimorphism; prosternal process (Figs 21–24) distinctly narrowed medially. In *Mallodon* body, in general, more robust (Fig. 5); mandibles of major male (Figs 30, 31) longer than the head; base of labrum (Fig. 7) not visible in dorsal view or when visible (Fig. 8), more distinct laterally, with its basal margin placed, in general, distinctly lower than the edge of clypeus (Fig. 9), and always strongly concave at middle region; lateral angles of prothorax of male (Figs 16, 18) placed in the same line or almost in the same line of posterior ones (sometimes, similar to the species of *Allomallodon* (Fig. 20)); pronotum, proepimera and prosternum of male (Figs 26, 27) with sexual dimorphism very distinct; prosternal process (Figs 25–28) wide and not or, slightly narrowed medially (in female of some species, narrowed medially, but always moderately wide).

Allomallodon differs from the species of *Nothopleurus* Lacordaire, 1869 [Group of Maxillosus: *N. maxillosus* (Drury, 1773); *N. bituberculatus* (Palissot de Beauvois, 1805); *N. subcancellatus* (Thomson, 1867); *N. santacruzensis* Hovore & Santos-Silva, 2004], by the absence of sexual punctation in prothorax of males, and by the metepisterna of male wider (width at central region equal to approximately 0.3 times the length). In males of *Nothopleurus* (Group of Maxillosus) the prothorax has sexual punctation, and the metepisterna is narrower (width at central region equal to approximately 0.25 times the length).

From the species of *Physopleurus* Lacordaire, 1869 with unarmed tibiae, *Allomallodon* differs, mainly, by the prosternal suture straight or substraight, and by the prosternum not tumid. In all species of *Physopleurus* the prosternal suture is distinctly curved, and the prosternum is tumid or strongly tumid.

Allomallodon differs from *Mallodonhoplus* Thomson, 1861 by the unarmed tibiae (distinctly spinose, mainly the protibiae, in *Mallodonhoplus*). It can be separated from the species of *Stenodontes* Audinet-Serville, 1832 by the shorter antennae that do not reach the middle of elytra. In males of *Stenodontes* the antennae surpass the middle of the elytra, and in females they reach the middle. It differs from *Neomallodon* Linsley, 1957 by the pronotum of male being distinctly and abundantly punctate laterally (slightly rugose in *Neomallodon*). From the species of *Olethrius* Thomson, 1861 it differs, mainly, by the scape not surpassing the posterior edge of eye (distinctly surpassing in *Olethrius*).

Fragoso and Monné (1995) noted the following on the pronotum of *A. hermaphroditum*: “Besides the inappropriate epithet, the male pronotal disc shows a large, sub-circular “tache luisante”, with a cluster of points in the middle, as well as a few other points scattered at the periphery of the disc (latero-posteriorly more numerous); the sex-points are limited to lateral areas, close to pronotal borders (including the “oreilletes”)”. These statements, however, are not consistent with the lectotype and specimens examined by us. In fact, the epithet chosen by Thomson is quite appropriate, as the sexual dimorphism in the pronotum is minimal and, above all, there is no the sexual punctation as noted by Fragoso and Monné (op.cit.). The entire sculpture of pronotal disc is quite similar in both sexes of *A. hermaphroditum* (Figs 13, 14), as well as in *A. popelairi* (Figs 11, 12), and very different from what occurs in other species of *Mallodon* (Figs 15–20), in which the sexual dimorphism is strongly evident.

On the placement of *Allomalodon* gen. n.

Allomalodon belongs to the group that some authors (primarily European) exclude from Macrotomini, and include in Mallodontini. Although it may seem obvious that a genus carved out of *Mallodon* belongs to that group, such an assertion, in some cases, can be misleading. Prioninae is a small subfamily in comparison with other cerambycid subfamilies, but the relationship and placement of the genera and species, frequently, are complex. That, in our opinion, is the reason by which Mallodontini is not a well defined group, as suggested by some authors, for example Vitali (2008): “The systematics of the Macrotomini, already partially cleared by European authors (Thomson, Lameere, Quintin [sic], Villiers), still shows uncertainties due to the fact that the American authors (Monné and Hovore 2005; Silva-Santos [sic] and Martins 2005) still consider Macrotomini, Mallodontini and others only one tribe”.

Thomson (1861) erected the group “Mallodontitae” (currently considered Mallodontini) and defining it by the following: head wide, not elongated behind eyes; antennae short, filiform or submoniliform, with the antennomere III short, and barely longer or equal to IV; mandible subvertical or horizontal, robust, frequently elongated; lateral margins of prothorax crenulated or multi-spinose; elytron elongated, subdepressed; prosternum distinct; mesosternum flat; legs cylindrical; protibiae unarmed (except in *Mallodonhoplus*); tarsi mediocre, with the tarsomere V usually not longer than I-IV together. Thomson (op.cit.) included in this group *Chiasmus* Thomson, 1861 (currently *Chiasmetes* Pascoe, 1867); *Basitoxus* Audinet-Serville, 1832; *Colpoderus* Audinet-Serville, 1832 (= *Notophysis* Audinet-Serville, 1832); *Archeotypus* Thomson, 1861; *Mallodon* Lacordaire, 1830; *Mallodonhoplus* Thomson, 1861; *Aplagiognathus* Thomson, 1861; *Platygnathus* Audinet-Serville, 1832; and *Hystatus* Thomson, 1861.

According to Thomson (op.cit.), the characters of “Macrotomitis” that allow separation from “Mallodontitae” are: antennae longer, with antennomere III distinctly longer than IV; upper ocular lobes closer; mandibles not transversal; protibia often with spines and different. The genera that were included in “Mallodontitae” make the group an amalgam of tribes, as currently accepted, be they by European or American authors: Macrotomini, Macrotomini/Mallodontini, Notophysini, Eurypodini, Platygnathini. Thus, the only merit of Thomson’s (op.cit.) regarding “Mallodontitae” was to attribute a name to the group, without contributing substantively to the classification of Prioninae, as noted by Vitali (2008).

Following his previous classification, Thomson (1864) redefined “Mallodontitae” with the following changes sensu Thomson (1861): body wide, mainly in males; antennae just surpassing the middle of elytron (sometimes, shorter); scape thick, longer or as long as the antennomere III; pronotum in male with smooth facets, and scabrous or punctate in female; prosternal process slightly projected; mesosternal process laminiform; legs never with spines [mainly modification]; tarsomere V as long as I-IV together; integument always brownish, shining. Thomson (1864) included in this group the genera recorded in Thomson (1861), except *Mallodonhoplus* (transferred to “Mac-

rotomitae”), and added *Opheltes* Thomson, 1864. Again, this concept joins genera that currently are included in many tribes of Prioninae.

According to Thomson (1867) “les MALLODONITES se distinguent des MACROTOMITES, leurs plus proches voisins, par les pattes qui sont toujours inermes dans les deux sexes”. As in his earlier works, Thomson maintained in “Mallodonites” the same genera (excluding *Mallodonhoplus*), and included *Cronodagus* Thomson, 1867 (= *Cacodacnus* Thomson, 1861).

This concept of Mallodontini, based mainly on the absence of spines on the legs, is very unsatisfactory, and usually does not allow to reliably separate included genera. For example, in *Physopleurus* there are species with spines on tibiae as well as species with the tibiae unarmed. Many other characters are shared by these two species groups of *Physopleurus* (apex of antennal tubercles sub-horizontal and backward; prosternal suture absent or present and distinctly curved in males, etc), which does not allow the division in two genera, much less the inclusion of these species in different tribes. It is important to highlight that the species of *Physopleurus* show a general appearance similar to that of the species of *Mallodon* and often have facets on pronotum of males, mentioned by Thomson (1864), as well as all other characters pointed out by Thomson (1861, 1864). In the description of *Mallodon hermaphroditum*, a species that does not have facets on the pronotum of males, demonstrates that Thomson was deliberately modifying the description of Mallodontini in each of his works, including and excluding genera. This exposes the fragility of the classification of this group that, as previously seen by the concept of Thomson (1867), differs from Macrotomini only by the unarmed legs.

Lameere (1919) summarized his previous works (“Révision des prionides”) and divided Macrotomini in several groups that currently are considered subtribes by some authors, and tribes by others: Archetypi; Basitoxi; Stenodontes; Cnemoplites; Macrotomae; Rhiphipodi; and Xixuthri. According to him, the subgroup “Stenodontes” is characterized: body, in general, large, more or less depressed; eyes not emarginated; antennal tubercle distinct and acute; scape elongated and longer than the antennomere III; mandibles with dorsal carina; ligulae small and weakly whole (almost undivided); prothorax wide, with the sides wide and a little bent down, lateral edge present and crenate, more parallel in male than in female; males with sexual punctation on prothorax; pronotum of males with callosities shining; legs robust, with or without spines; last urosternite of males more or less emarginated. As shown above, Lameere (op.cit.) modified the concept of Macrotomini and Mallodontini established in the works of Thomson considerably. In particular, the main character used by Thomson (1867) to separate these two groups, was not accepted by Lameere (op.cit.), because the subgroup “Stenodontes”, that included *Mallodon*, has species with legs that are spinose or not.

As in the divisions established in Thomson’s works, the division proposed by Lameere maintains separate genera that share many characters (e.g. *Xixuthrus* Thomson, 1864 and *Mecosarthron* Buquet, 1840), and combined other genera with notably different characters (e.g. some species of *Nothopleurus*, and *Mallodon*).

Despite showing inconsistencies in his descriptions of tribes, in which were included genera that contradict the characters that were noted (e.g. body more or less

depressed in “Archetypi”, in relation to *Strongylaspis* Thomson, 1861, whose species has body distinctly not depressed), the concept of “Stenodontes” proposed by Lameere is more consistent than that of Thomson, because it unites genera with generally similar shared characters (body form, length of scape in relation to the antennomere III, prothorax form, etc).

Quentin and Villiers (1975) considered Macrotomini and Mallodontini as distinct and, in their key to the tribes that occur in Madagascar, separated these groups in the following manner: pronotum flat, with sides explanate in Mallodontini, and convex and with the sides bent down in Macrotomini; presence of shining facets on pronotum of males, occupying almost the whole surface in Mallodontini, and without facets or with small facets in Macrotomini. That key, if applied to American genera, would separate into distinct tribes species in the same genus, including species that at that time were in *Mallodon*, as well as genera included in the subgroup “Stenodontes” by Lameere (1919). According to Quentin and Villiers (op.cit.), Mallodontini is characterized by: general form wide and depressed; eyes not or slightly emarginated, coarsely faceted, weakly protruding, not surpassing the antennal tubercles; antennae with eleven segments, filiform, rarely surpassing the middle of elytra; scape, at least, as long as antennomere III; prothorax transverse, explanate laterally; pronotal disc, mainly in males, with facets or callosities flat and shining; prothoracic episterna very wide; legs, in general, short and always unarmed. It is important to note that Quentin and Villiers (op.cit.) characterized the tribe not only for the single species present in Madagascar. This definition of Mallodontini distinctly modifies, again, the limits of the group, resulting in the mandatory exclusion of genera included by Lameere (1919): *Nothopleurus* (part); *Physopleurus*; *Mallodonhoplus*; *Olethrius*; and *Allomallodon* gen. n. (originally included in *Mallodon*). Moreover, it may include species in genera that, by the definition of European authorities, could not belong to Mallodontini, as for example, *Physopleurus rugosus* (Gahan, 1894) and *P. longiscapus* Lameere, 1912, in which the proepisterna is not notably reduced and has all the other characters listed by Quentin and Villiers (op. cit.). Seemingly contradictory, Villiers (1980) allocated *Nothopleurus* in Mallodontini, without realizing that the type species of this genus, *Nothopleurus ebeninus* Lacordaire, 1869, does not fit to his description of the tribe, primarily, by the pronotum of males is without impunctate and shining facets in contrast with the remainder of surface.

As shown above, the divisions proposed, in part by European authors, affirmed the opinion of Vitali (op.cit.) (Mallodontini different from Macrotomini), and did not “clear [up]” the classification of Macrotomini. In fact it has made it more chaotic, mainly by contradicting the vastly different concepts of Thomson (1861, 1864, 1867), Lameere (1919) and Quentin and Villiers (1975).

It is probable that Macrotomini is not a monophyletic group, but the divisions proposed up to now are inconsistent. Thus, we believe that the prudent action is to maintain Macrotomini as a single tribe, including and disregarding the subdivisions presented in Lameere (1919). Monné and Hovore (2006) listed the American genera of Macrotomini, following the concept of American authors.

Key to the species of *Allomalodon*

1. Mandibles tumid on outer face (Figs 1, 2); shining callosity on pronotal disc divided at middle by distinct or moderately distinct furrow (Figs 11, 12). Peru *A. popelairi* (Lameere, 1902)
- Mandibles not tumid on outer face (Figs 3, 4); shining callosity on pronotal disc not or barely divided at middle by furrow (Figs 13, 14). Colombia, Ecuador *A. hermaphroditum* (Thomson, 1867)

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A new species of *Umanella* Gauld (Hymenoptera, Ichneumonidae) from Ecuador

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Abstract

Recently collected specimens of the distinctive pimpline genus, *Umanella*, from Colombia and Ecuador are assigned to *Umanella caerulea* Gauld (now known from Costa Rica and Colombia) and *Umanella giacometti* Broad & Sääksjärvi, **sp. n.** (from Ecuador). Variation within and between species is evaluated.

Keywords

Taxonomy, Pimplinae, Amazonia

Introduction

South America is home to several large, metallic ichneumonids, mostly in the subfamily Cryptinae. Within the subfamily Pimplinae, metallic blue pimplines were known in the genus *Pimpla*, then Ian Gauld described a large, distinctive, metallic blue pim-

pline from Costa Rica as a new genus and species, *Umanella caerulea* (Gauld, 1991). Since then, several more specimens of *Umanella* have been collected in Colombia and Ecuador but no other specimens are known from older collections. As *Umanella* are large and likely to attract attention there are probably not many undescribed species. Here we evaluate the variation between specimens and describe those from Ecuador as a second species, *Umanella giacometti* Broad & Sääksjärvi sp. n.

Materials and methods

Specimen depositories are abbreviated as follows:

BMNH Natural History Museum, London

NMNH National Museum of Natural History, Washington

ZMUT Zoological Museum, University of Turku, Finland

IAVH Entomological collection, Instituto Alexander von Humboldt, Villa de Leyva, Colombia

Most images of specimens in BMNH were taken with a Canon EOS 450D digital camera attached to a Zeiss Stemi SV11 stereomicroscope. Several partially focused images were combined using Helicon Focus v. 4.80 software. Layer photos of one male paratype (USNM / ZMUT) were taken with an Olympus SZX16 stereomicroscope attached to an Olympus E520 digital camera. Images were combined using the programmes Deep Focus 3.1 and Quick PHOTO CAMERA 2.3. Morphological terminology follows Gauld (1991). Fore wing length is given from the hind edge of the tegula to the apex of the wing. Ovipositor length is measured from the base of the ovipositor, i.e. anterior to the end of the metasoma.

Taxonomy

The specimen base for this study is small as *Umanella* are rarely collected and apparently sparsely distributed. We have examined a total of 21 specimens, 12 from Costa Rica (10 females, two males) (BMNH, IAVH), four from Colombia (two females, two males) (BMNH, IAVH) and five from Ecuador (two females, three males) (BMNH, USNM and ZMUT). Female specimens of *U. caerulea* predominate.

Although specimens from Ecuador are noticeably larger than those from Costa Rica and Colombia there are no discrete morphological differences between these populations. *Umanella* specimens lack most carinae, the integument being mostly unsculptured and metallic-looking. The only structural differences we could find between females were (1) the shape of the sides of the swelling on the second tergite, and (2) overall size and the relative length of the ovipositor, as compared to fore wing length. In addition, there are distinct colour differences, concerning (3) the presence or absence of a violet tinge on the metasoma, (4) the colour pattern of the mid tibia and,

Table 1. Comparison of ten characters between *Umanella* specimens.

Costa Rica	Colombia (NHM) ♀	Colombia (LAVH) ♀	Colombia (LAVH52644) ♂	Colombia (LAVH52646) ♂	Ecuador
Female maxillary palps with white segments	with white segments	with brown segments	with white segments	with white segments	brown
Female fore trochanter with cream/white streak	with cream/white streak	with cream/white streak	with cream/white streak	with cream/white streak	lacking streak, narrowly white at apex
Male tegula brown	—	—	metallic blue	brown	whitish-transparent
Male mid coxa predominantly white	—	—	brown with metallic blue tinges	mainly brown	white
Male mid femur with hind side brown, distally brown	—	—	hind side brown	hind side brown	only distally brown
Mid tibia with yellowish apex, not abruptly differentiated	yellowish apex, not abruptly differentiated	almost entirely white	yellowish apex, not abruptly differentiated	yellowish apex, not abruptly differentiated	apex abruptly differentiated, white, or entirely white
Male first tergite broader, c. 2.2 × as long as broad	—	—	slenderer, c. 4.0 × as long as broad	slenderer, c. 3.6 × as long as broad	slenderer, c. 3.7–5.0 × as long as broad
Second tergite with sides of median swelling slightly convex	convex	slightly convex	slightly convex	slightly convex	concave
Metasoma blue with purple tinge	blue with purple and brown tinges	blue, with purple and brown tinges	blue, with purple and brown tinges	brown, with purple tinges	blue or brown with blueish tinges
Ovipositor of large specimens relatively long, c. 2.8 × fore wing, of small specimens relatively short, c. 2 × fore wing	c. 2.8 × fore wing	c. 1.6 × fore wing	—	—	c. 2.2 × fore wing

(5) in the amount of white on the fore trochanter (see Table 1). The few known males offer some small differences between populations: the colour pattern of the mid femur and tegula differs between those from Ecuador and those from Costa Rica / Colombia. It seems that the single paratype of *U. caerulea* in BMNH is anomalously small and has a much broader first tergite than the other males examined. Smaller specimens of both sexes are distinctly brown on the metasoma. Table 1 describes the characters that

vary between specimens from Costa Rica, Colombia and Ecuador: we consider variation between Colombian and Costa Rican specimens to be minor, whereas there are distinct differences in several characters when comparing these specimens with those from Ecuador. Therefore we are describing the Ecuadorean specimens as a new species.

Umanella Gauld, 1991

Gauld (1991) provides an excellent description of the genus *Umanella*, which we are not repeating here, and provides a key to Costa Rican Pimplinae genera which serves to diagnose *Umanella* anywhere in South America. Of the South American Pimplinae, *Umanella* is the only genus with a long ovipositor, metallic blue colouration (Fig. 1) and lacking the epicnemial carina (Fig. 2). Some *Pimpla* are metallic blue but can be easily separated by the relatively short ovipositor (less than half as long as fore wing), generally stout body and presence of the epicnemial carina. Some Neotropical *Dolichomitus* resemble *Umanella* in body shape but are never metallic blue in colouration and lack the lateral denticles on the apex of the upper valve of the ovipositor.

Umanella caerulea Gauld, 1991

Description. See Gauld (1991). Essentially similar to *U. giacometti* but differing in the characters listed in Table 1. Only characters that are useful in differentiating *U. caerulea* from *U. giacometti* are emphasised here, although complete descriptions of female and male colour patterns are given.

Female. Fore wing length 12–15 mm. Ovipositor length 23–43 mm, ratio of ovipositor to fore wing (1.60) 1.92–2.87 (n=10); smaller specimens with relatively shorter ovipositor, larger specimens with relatively longer ovipositor (but with one exception, see variation). First tergite of metasoma 3.4–3.7 × as long as apically wide, second tergite 2.1–2.6 × as long as apically wide. Second tergite with narrow, drop-shaped median area defined, sides of raised area slightly convex (Fig. 3A, B).

Colour: metallic blue, duller towards apex of metasoma, fading to dark brown. Metasoma with purple tinge, sometimes strongly so. Ground colour of metasoma brown. Female from Colombia (BMNH) with metasoma largely brown, but with some blue and purple gloss. Antennae black, except for white, sub-apical annulus on five to seven flagellomeres. Maxillary palps dark brown basally and apically, dull white on third and fourth segments. Tegula centrally metallic blue, brown around edges. Wing venation, including stigma, dark brown. Wing membrane slightly infuscate basally, distinctly infuscate in apical quarter. Legs with coxae, trochanters and trochantelli shiny, metallic (dark) blue. Fore leg with large apical patch on trochanter (or entire front side) creamy white, extreme apex of trochantellus brown, conspicuous creamy streak along front edge of femur (from apical half to entire length); fore tibia with basal 0.6 brown (slightly paler sub-basally); fore tarsus brown fading to yellowish on third and fourth tarsomeres, fifth tarsomere black. Mid femur with tiny basal patch to

conspicuous basal streak creamy; mid tibia brown with dull yellowish mark sub-basally and fading to yellowish on apical quarter (black at extreme apex) (Fig. 4A, B) or almost entirely white (black very apically (Fig. 4C)). Legs otherwise marked as in *U. giacometti* but pale markings are duller, usually more yellow.

Paratype male (BMNH). Whole insect: Fig. 6. Fore wing length 7.5 mm, body length (from antennal insertion to apex of genitalia) 7.8 mm. Submetapleural carina complete. First metasomal tergite $2.2 \times$ as long as maximum width (Fig. 5A), second tergite $1.6 \times$ as long as wide. Second and third tergites with strong diagonal, basal grooves cutting off raised, central section which is raised posteriorly. First and second tergites with strong setae laterally, first tergite and basal half of second smooth dorsally, metasoma setose dorsally from second half of second tergite. Sclerotized part of first tergite extending to 0.2 of distance between spiracle and hind edge. Some dorsal punctures on apical half of second tergite, following tergites regularly punctate and setose dorsally.

Colour: head and mesosoma metallic blue. Antennae black, white on 7 (22nd to 28th) flagellomeres. Maxillary and labial palps white. Tegula brown. Wing venation, including stigma, dark brown. Wing membrane clear basally, slightly infuscate in apical quarter. Fore leg white on fore side, except apical tarsomere brown. Hind side of fore leg basally white, trochantellus and femur brown; fore tibia pale brown over basal quarter, apex narrowly dark brown; fore tarsus pale brown except apical tarsomere dark brown. Mid leg with coxa and trochanter white, trochantellus brown, fore side of femur brown on basal 0.15, remainder white, fore side of mid tibia vaguely infuscate brown basally and medially, dark brown at very apex, hind side of femur brown, hind side of tibia brown over basal 0.6, slightly paler patch sub-basally, mid tarsus dark brown on first, second and fifth tarsomeres, third and fourth white. Hind leg with metallic blue coxa, metallic darker blue on trochanter and trochantellus, turning to black on femur; apex of hind trochantellus and base of femur narrowly brown; hind tibia black with narrow annulus sub-basally, white on outer side, brown on inner side; hind tarsus dark brown on first, basal 0.7 of second and apical 0.5 of fifth tarsomeres, remainder white. Metasoma with first tergite metallic blue, second and third tergites brown with dark brown apical rims, remaining tergites dark brown; first sternite with sclerotized part metallic blue, sclerotized sections of other sternites brown, membranous parts of sternites white.

Variation. The single male in BMNH seems to be unusually small and stout, compared to male specimens from Colombia in IAVH and has deformed antennae (Fig. 7). One male in IAVH has the metasoma almost entirely metallic blue. There is variation in the amount of white on the mid tibia of females (Fig. 4A, B, C), in the amount of metallic blue colouration on the metasoma and in the relative length of the ovipositor (Table 1). Much of this variation we assume is size-related (smaller specimens seem to be more extensively white and brown), but one female specimen from Colombia in IAVH is particularly stout, with length to breadth ratios of the 1st and 2nd tergites of 3.4 and 2.1, respectively, and the ovipositor only $1.6 \times$ the length of the fore wing (which is relatively large, at 14 mm). The mid tibia of this specimen is almost entirely white. Whether this specimen represents a third species or is just at the

extreme end of variation within *U. caerulea* we are unable to say at present but it would be desirable to see more *Umanella* specimens from Colombia.

Biology. Nothing is known.

Distribution. Known from from Costa Rica (see Gauld, 1991, Gauld et al., 1998), and now from Colombia: female, Amazonas, PNN Amacayacu, 150m, Malaise trap, 15.X.2001–5.XI.2001, 03°46'S, 70°18'W, D. Chota (IAVH); female, Nariño, Barbacoas, 40 m, 28.X.1990, M. Cooper (BMNH); male, Chocó, PNN Utría, 10m, Malaise trap, 1.VII.2000–5.VII.2000, 06°01'N, 77°20'W, B. Brown (IAVH); male, Valle, PNN Los Farallones, 650m, Malaise trap, 1.VIII.2000–10.IX.2000, 03°26'N, 76°48'W, S. Sarria (IAVH).

***Umanella giacometti* Broad & Sääksjärvi, sp. n.**

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Description. *Female.* Whole insect: Fig. 1. Fore wing length 18.5 (holotype)–20 mm, body length (from antennal insertion to apex of metasoma) 31–34 mm, ovipositor length 41 (holotype)–45 mm, ratio of ovipositor to fore wing length 2.22–2.25. Occipital carina complete, joining hypostomal carina behind base of mandible, dipped mediodorsally with depression on vertex and deep groove on back of head. Epomia present for short distance across trough in pronotum. Notauli deep and long, converging but not meeting posteriorly, petering out at about half the length of mesoscutum. Epicnemial carina absent (Fig. 2). Mesopleurum with posterior suture weakly impressed dorsally, strong ventrally, smooth except for some weak crenulae, and deeply impressed furrow connecting suture to episternal scrobe. Mesepisternal sulcus complete, strong and non-crenulate. Posterior transverse carina of mesosternum absent. Propodeum lacking all carinae except pleural and submetapleural carinae, which are complete, and stubs of median longitudinal carinae, present at posterior end of propodeum. Faint, narrow groove present on dorsal, ventral half of propodeum. Propodeal spiracle about twice as long as medially wide. Whole body elongate and integument entirely smooth and shining except mandible sparsely punctate basally, puncto-striate medially. Upper tooth of mandible slightly shorter than lower tooth. Hind coxa about 1.2 as long as dorsal face of propodeum. First tergite of metasoma 4.4 × as long as apically wide, second tergite 2.8 × as long as apically wide. First tergite with swollen, apical area, posterior end impressed behind it. Sclerotized part of first sternite with low, raised bump just before level of spiracle; extends to half distance between spiracle and posterior end of tergite. Second tergite with deep, diagonal grooves cutting off anterior corners; narrow, drop-shaped median area defined, sides of raised area concave (Fig. 3C). Third and fourth tergites with deep, lateral grooves. Metasoma with strong setae laterally. All tarsal claws with acute basal lobe. Fore tibia with longitudinal patch of stronger, darker setae. Propodeum with coxal foramen narrowly separated from metasomal foramen by sclerotized bridge. Ovipositor with tip angled downwards. Lower valve of ovipositor apically slightly overlapping



Figure 1. *Umanella giacometti*, female holotype; scale bar = 10 mm.



Figure 2. *U. giacometti*, female holotype, detail of head and mesosoma.

dorsal valve, with 13 visible teeth, regularly spaced and inclined. Dorsal valve with row of lateral denticles above teeth on each side.

Colour: metallic blue, duller towards apex of metasoma. Antennae black, except for white, sub-apical annulus on three and a half flagellomeres (23rd to 26th) to five (holotype, 23rd to 27th) flagellomeres. Maxillary palps dark brown, a little paler centrally, ventrally. Tegula metallic blue. Wing venation, including stigma, dark brown. Wing membrane slightly infuscate basally (holotype) or distinctly brown, distinctly infuscate in apical quarter. Legs with coxae, trochanters and trochantelli shiny, metallic (dark) blue. Fore leg with apical edge of trochanter creamy white with white streak extending over basal half of anterior surface of fore femur, extreme apex of trochantellus and base of femur brown; fore tibia with basal 0.6 brown (slightly paler sub-basally); fore tarsus brown except apical half of third and fourth tarsomeres creamy, fifth tarsomere black. Mid tibia black with small, dull creamy mark sub-basally and abruptly

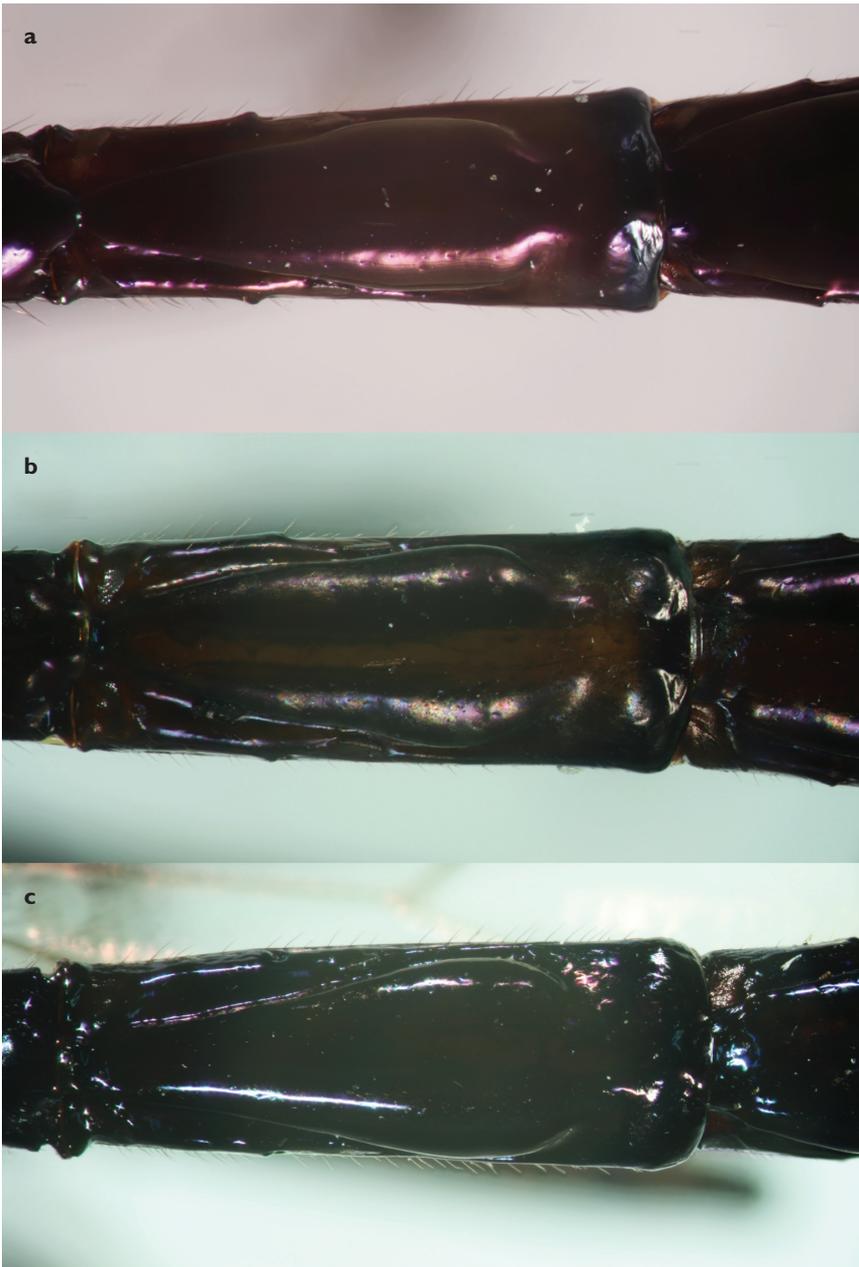


Figure 3. Second tergite of female metasoma of **a** *U. caerulea* from Costa Rica **b** *U. caerulea* from Colombia **c** *U. giacometti*; anterior to the right.

white on apical quarter (black at extreme apex) (Fig. 4D); mid tarsus brown to black, except fourth and apical half of third tarsomere creamy. Hind tibia with white annulus sub-basally; hind tarsus black on first, basal half of second and apical half of fifth tarsomeres, remainder creamy.

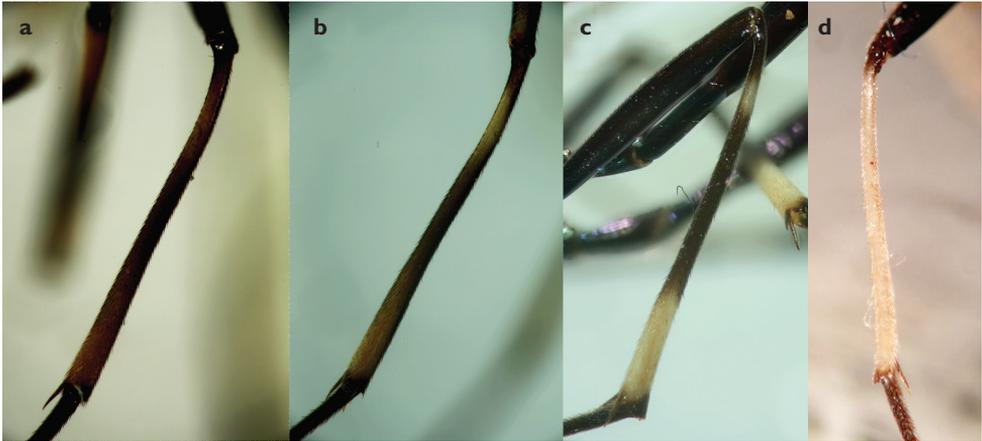


Figure 4. Mid tibia of **a** female of *U. caerulea* from Costa Rica **b** female of *U. caerulea* from Colombia (BMNH) **c** female of *U. caerulea* from Colombia (IAVH) **d** female of *U. giacometti*.

Paratype males. Whole insect: Figs 8, 9. Fore wing length 10–14 mm, body length (from antennal insertion to apex of genitalia) 15–21 mm. Submetapleural carina complete to about two thirds length of propodeum then abruptly weaker (barely traceable on smaller specimen) for remainder. First metasomal tergite 3.7 to 4.0 × as long as maximum width (Fig. 5B), second tergite 2.7 to 3.1 × as long as wide. Second and third tergites with strong diagonal, basal grooves cutting off raised, central section which is raised posteriorly (Fig. 10). First and second tergites with strong setae laterally but smooth dorsally. Sclerotized part of first tergite extending to 0.5 of distance between spiracle and hind edge. Third tergite regularly punctate and setose dorsally. Fourth tergite onwards setose dorsally with inconspicuous punctures.

Colour: head and mesosoma metallic blue. Antennae dark brown to black, white on 3–11 (22nd to 32nd) flagellomeres. Maxillary and labial palps cream coloured. Tegula white-transparent. Wing venation, including stigma, dark brown. Wing membrane clear basally, infuscate in apical quarter. Fore leg white on fore side, except apical tarsomere black or dark brown, other tarsomeres off white, basal half of first tarsomere pale brown to white. Hind side of fore leg basally white, but coxa with slight brown hint, femur with broad ventral streak on apical 0.7, light or dark brown fading into metallic blue; fore tibia brown on basal half, apex narrowly dark brown. Mid leg with coxa and trochanter white, trochantellus dark brown to black, fore side of femur dark brown to black on basal 0.15, remainder white; mid tibia almost totally white or dark brown on basal half, except for slightly paler sub-basal patch, narrowly black at apex; mid tarsus dark brown to black on first and fifth tarsomeres, second and third dark brown fading to off white, fourth white. Hind leg with metallic blue coxa, shiny black or dark brown trochanter, trochantellus and femur; inner apex of hind trochantellus off-white, base of femur narrowly whitish to brown; hind tibia black or brown with narrow white annulus sub-basally, but uniformly black or brown dorsally; hind tarsus dark brown to black on first, basal



Figure 5. First tergite of male metasoma of **a** *U. caerulea* (BMNH) **b** *U. caerulea* (IAVH) **c** *U. giacometti*; anterior to the right.

0.7 of second and apical 0.2–0.5 of fifth tarsomeres, remainder white. Metasoma with first to fifth or sixth tergites metallic blue, fading to dark brown or near black, apical tergites dark brown to shiny black; first sternite with sclerotized part metallic blue, sclerotized sections of other sternites shiny black to brown, membranous parts of sternites white.

Variation. The male in USNM/ZMUT is smaller than the two males in BMNH and is more extensively white on the antennal flagellomeres and mid tibia.



Figure 6. Paratype male of *U. caerulea*.

Biology. No specimens of *Umanella* have been reared but the holotype and three paratypes (BMNH) were collected whilst flying around a standing, dead tree trunk. The hosts may be large coleopteran larvae. The ovipositor shape is rather similar to that of *Dolichomitus* species, which are parasitoids of beetle larvae in dead wood. Three specimens have been found at fairly high (1,100m) altitude whilst one male was collected by canopy fogging at fairly low (216 m) altitude. In this respect the new species resembles *Umanella caerulea*, which also inhabits tropical forests of various altitudes (Gauld et al., 1998).

Distribution. Only known from Ecuador.

Material examined. Holotype female: 'Ecuador, Morona- Santiago, Cord. de Cutucu 6km.e. of Macas 1,100m 30.V.1981 M. Cooper' (BMNH). Paratypes: one female, same data as holotype except 26.VI.1981, one male with same data except 4.V.1981 (BMNH), one male with same data except 26.VI.1981, one male, Ecuador, Orellana, Reserva Etnica Waorani, Onkone Gare Camp, 216.3 m, 21.VI.1994, 00°39'25.7"S, 076°27'10.8"W, fogging, terra firme forest, T.L.Erwin et al. leg. (held in trust for Ecuador at NMNH, but currently on loan to ZMUT).

Etymology. We are pleased to give the name suggested by Mrs Jean Halperin, who won a competition to name this beautiful species in celebration of the opening of the Natural History Museum's Darwin Centre Two, where the holotype is housed. The



Figure 7. Male of *U. caerulea*, Colombia (IAVH).



Figure 8. Paratype male of *U. giacometti* (BMNH).



Figure 9. Paratype male of *U. giacometti* (ZMUT/USNM).



Figure 10. Paratype male of *U. giacometti* (ZMUT/USNM), first and second tergites.

name refers to the wasp's resemblance to the slender, attenuated figures of the Swiss artist, Alberto Giacometti and is a noun in apposition.

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