

# ***Chordodes mizoramensis* (Nematomorpha, Gordiida), a new species of horsehair worm from Mizoram, North-East India**

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## **Abstract**

*Chordodes mizoramensis*, a new species of freshwater gordiid horsehair worm, is described from Mizoram, NE India on the basis of scanning electron microscopic and morphometric studies. The new species can be distinguished from its congeners in that the apical filaments of the crowned areoles are branched several times, a pattern that has not been observed in other species. An additional distinguishing character is that it has more bulging areoles, which are distributed among simple areoles alone or in groups, do not form clear patterns.

## **Keywords**

Nematomorpha, Gordiida, *Chordodes*, new species, hairworm, cuticle

## **Introduction**

About 350 species of freshwater horsehair worms (Nematomorpha: Gordiida) are currently known. Of these, only 14 species (plus an additional undetermined *Gordius* sp.) have been reported from India (Schmidt-Rhaesa and Yadav 2004). Considering the

size of India and the diversity of habitats, this number appears to be only a fragment of the existing gordiid diversity. We describe here a new species of the genus *Chordodes* Camerano, 1897.

*Chordodes* includes mainly tropical and subtropical species. All horsehair worms are parasites of arthropods, which leave their host for reproduction (Hanelt et al. 2005). Praying mantids form the main group of final hosts for species of *Chordodes* (see Schmidt-Rhaesa and Ehrmann 2001). Recently, the terminology for cuticular structures was unified and an overview and key were developed (Schmidt-Rhaesa et al. 2008). Characteristic for *Chordodes* species is, in comparison with other freshwater genera, the diversity of cuticular structures. The cuticle is often structured into polygonal or roundish structures named areoles. While in other genera not more than two different types of areoles can be recognized, species of *Chordodes* may exhibit up to seven types.

## Material and methods

The specimens investigated were preserved in 70% ethanol, directly after their emergence from the host, an undetermined praying mantis. Pieces about 1 mm long were cut from the mid-body region of each worm. These and the entire posterior ends were prepared for Scanning Electron Microscopy (SEM). The pieces were dehydrated in an increasing ethanol series, critically point dried and coated with gold in a sputter coater. Observation took place using a LEO SEM 1524 under 10 kV. Digital images were taken.

## Results

### *Chordodes mizoramensis* sp. n.

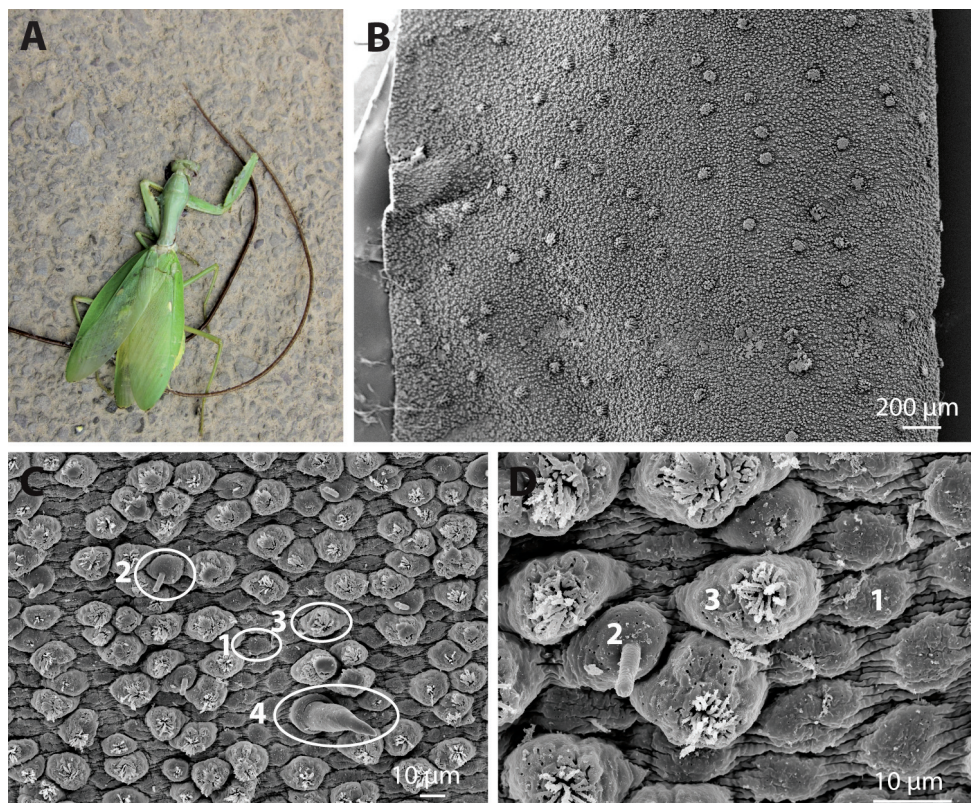
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Figs 1–3

**Type locality.** Mamit Village, Mamit District, Mizoram, India, 23°54'54.94"N, 92°29'16.75"E. Collected July 21, 2010 by Lalramliana and Remsangpuia.

**Holotype.** Male specimen from the type locality emerged from *Hierodula* sp. (type-host). Deposited in the Zoological Museum in the Department of Zoology at Pachhunga University College, Aizawl-Mizoram, India, accession number PUCZM - A/V/1114.

**Paratype.** Male specimen from the same host specimen and same locality as the holotype. Deposited in the Zoological Museum in the Department of Zoology at Pachhunga University College, Aizawl-Mizoram, India, accession number PUCZM - A/V/1115.



**Figure 1.** *Chordodes mizoramensis*, sp. n. **A** *Hierodula* sp., with both specimens of hairworm emerging from it. The darker specimen is the holotype **B** Overview of a stretched piece of cuticle from an entire section in the mid-body region, showing the distribution of areoles. Elevations are clusters of crowned and circumcluster areoles **C** Cuticle with simple (1), tubercle (2), bulging (3) and thorn (4) areoles **D** Magnification of the structure of simple (1), tubercle (2) and bulging (3) areoles. **B–D** from paratype, SEM.

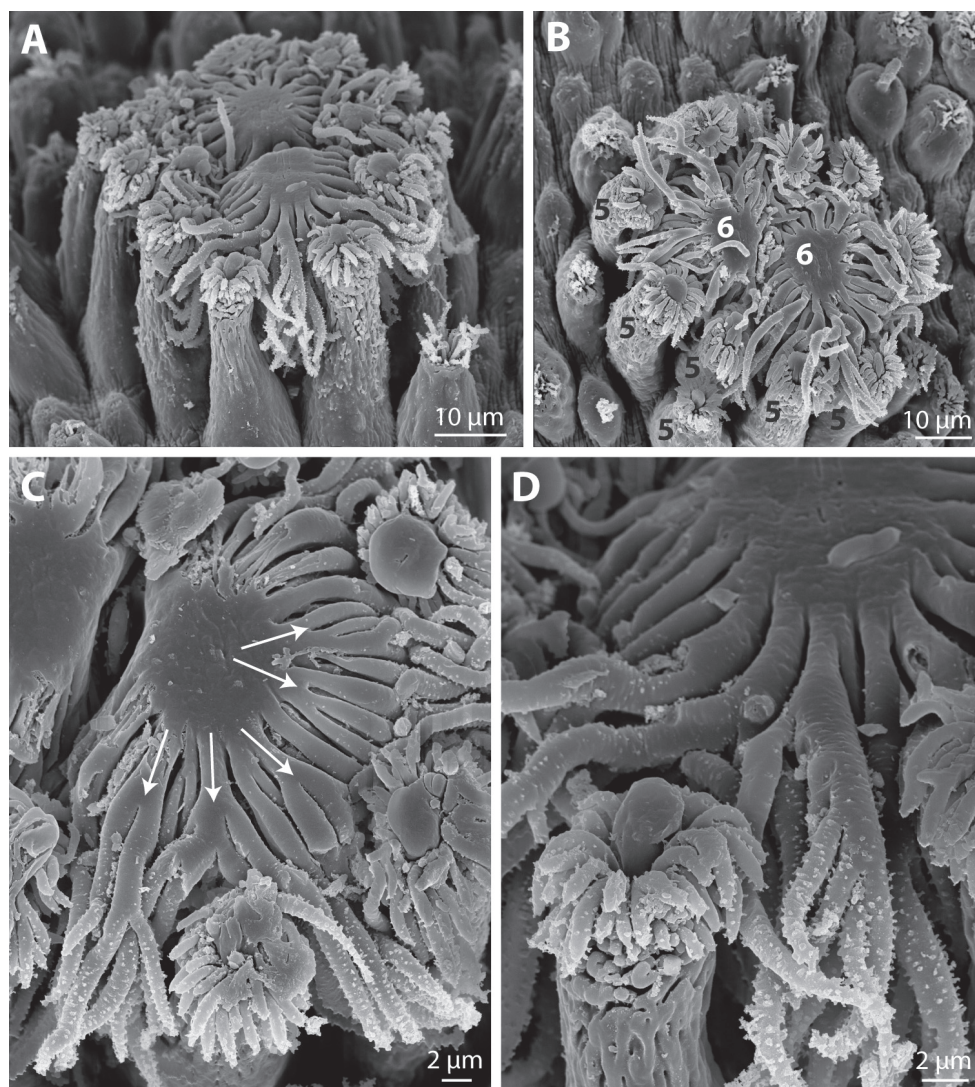
**Host.** Both specimens emerged from one specimen of *Hierodula* sp. (Mantodea) (Fig. 1A).

**Etymology.** The name refers to the region in which the new species was found, Mizoram in NE India.

**Description.** The holotype is 200 mm long, with a diameter of 1.3 mm in the mid-body region. Towards the posterior end, the diameter decreases to about 0.7 mm at the level of the cloacal opening. The anterior end is also tapered. The paratype is 265 mm long and has a diameter in the mid-body region of 1.5 mm; at the level of the cloacal opening the diameter is 0.79 mm. The frontal tip in both specimens is white, whereas the remaining body is medium brown. A pattern of darker patches (the “leopard pattern”) is present in both specimens; in the holotype this is more pronounced than in the paratype.

The cuticle contains six types of areoles (areoles are elevated cuticular structures), for which the terminology of Schmidt-Rhaesa et al. (2008) will be applied. Most abun-

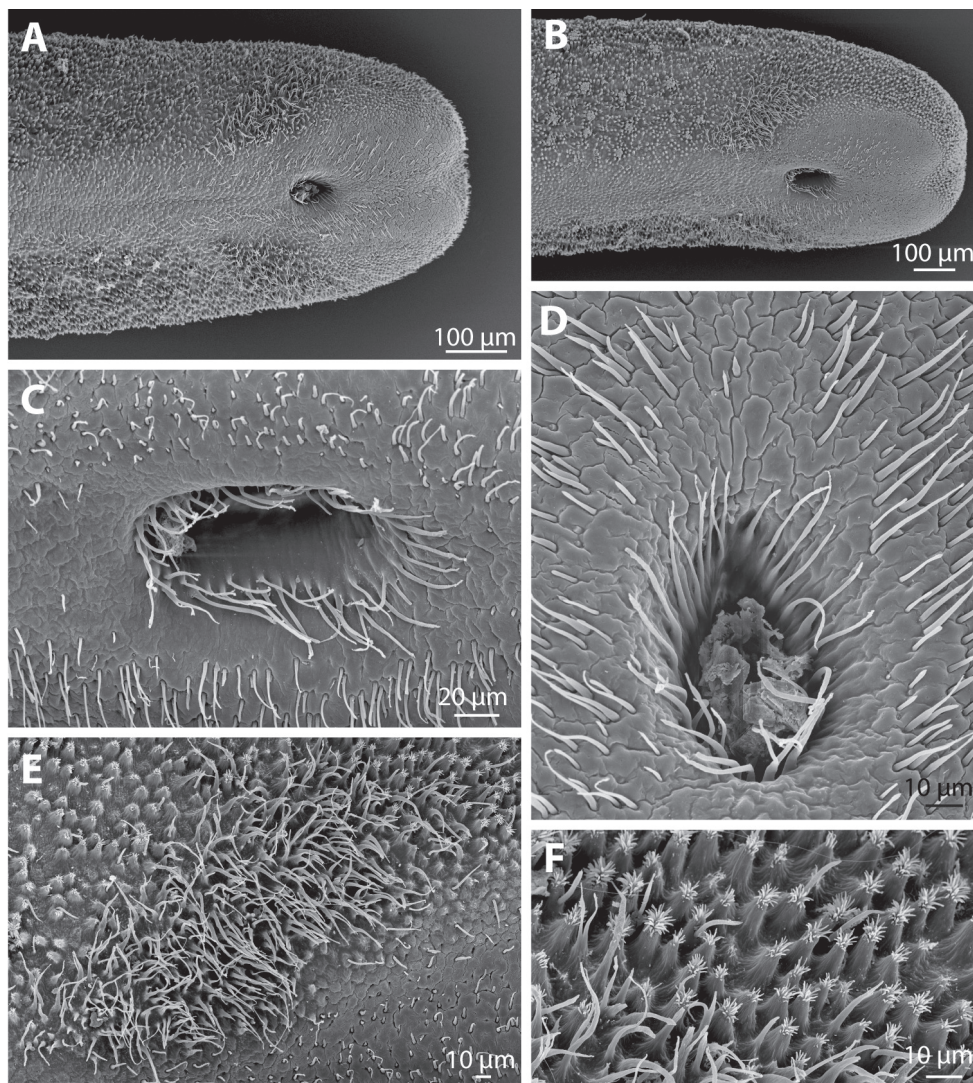




**Figure 2.** *Chordodes mizoramensis*, sp. n. **A–D** Crowned (6 in B) and circumcluster areoles (5 in B), **C** and **D** at magnifications demonstrating the branching of apical filaments. **A–D** from paratype, SEM.

dant are simple and bulging areoles (Fig. 1B–D). Simple areoles are quite flat semicircular elevations with a rough surface but no further structure (Fig. 1D). Bulging areoles are more elevated and carry a small tuft of very short bristles on top (Fig. 1C, D). Compared with other species, bulging areoles are quite abundant; they are distributed among simple areoles alone or in groups, without forming clear patterns (Fig. 1C). Tubercle areoles regularly occur among the simple and bulging areoles (Fig. 1C, D), as rarely do thorn areoles (Fig. 1C). Tubercle areoles carry a finger-like process on top; thorn areoles have a strong thorn on top of a broader basis.





**Figure 3.** *Chordodes mizoramensis*, sp. n. **A–F** Posterior end. **A, B** Ventral view of posterior end of holotype (**A**) and paratype (**B**) showing the distribution of areoles and the ventral cloacal opening **C, D** Cloacal opening of the holotype (**D**) and paratype (**C**), showing circumcloacal bristles and further bristles in the region around the cloacal opening **E** Field of bristles anterolateral of the cloacal opening (holotype) **F** Form of areoles posterior to the field of bristles (paratype). **A–F** SEM.

Characteristic for species of *Chordodes* are crowned areoles, which carry a crown of apical filaments on an elevated “stem”. Crowned areoles occur in pairs and are surrounded by so-called circumcluster areoles (Fig. 2A, B). This last type resembles the bulging areoles, but is longer (as elevated as the crowned areoles) and more slender (Fig. 2A, B). It also carries an apical tuft of short bristles, some of which can be slightly branched. Several circumcluster areoles have a more or less central “plug” among the

apical bristles (Fig. 2A–D). This “plug” is variable in shape, in some cases appearing as a drop-like structure emerging from the centre of the areole, but in others it is a broader, more voluminous structure. One pair of crowned areoles occurs in the centre, between the circumcluster areoles. Each crowned areole has a flat, smooth surface, with filaments emerging from the margin, except for the region where both areoles face each other (Fig. 2A–C). The filaments spread flat from the central surface and project between the circumcluster areoles. Their length is about 25  $\mu\text{m}$ . Most filaments divide several times, forming multiple branches (Fig. 2A–D). Only one type of crowned areoles could be found.

The posterior end of the males is rounded, and a small median incision may be present (Fig. 3A, B). An approximately 150  $\mu\text{m}$  broad ventral strip is free of areoles of the types described above, but forms polygonal or interdigitating compartments with a smooth surface (Fig. 3A, B). This smooth region extends around the ventral cloacal opening, which is about 200  $\mu\text{m}$  anterior of the posterior margin of the worm. The cloacal opening is oval, with a number of long, fine bristles, the circumcloacal bristles, present in a ring emerging approximately 10  $\mu\text{m}$  below its surface (Fig. 3C, D). In the region around the cloacal opening are further bristles; these are abundant and variable in length (Fig. 3C, D). The areoles described above are replaced at the posterior end, at least on the lateral sides, by elevated, conical areoles with an apical tuft of bristles (Fig. 3F). These areoles may represent bulging areoles, but are distinctly pointed apically and more abundant. In a region anterolateral to the cloacal opening is, in the region with areoles, an oval region with more bristles (Fig. 3A, B, E). These are very dense, appear to be all unbranched and have a lengths of up to about 30  $\mu\text{m}$ .

## Taxonomic remarks

With about 90 described species, *Chordodes* is distributed in tropical and subtropical regions worldwide (Schmidt-Rhaesa et al. 2008). From India, four *Chordodes* species have been reported: *C. liguligerus* Römer, 1895, *C. polloneræ* Camerano, 1912, *C. siamensis* Camerano, 1903 and *C. cf. furnessi* Montgomery, 1898 (see Montgomery 1898, Camerano 1903, 1908, 1912, Römer 1895, Schmidt-Rhaesa and Yadav 2004). Several more species of this genus can be expected to occur in India. Praying mantids are the main host group for species of *Chordodes* (see Schmidt-Rhaesa and Ehrmann 2001).

The types of areoles present on the cuticle of *Chordodes mizoramensis* sp. n. represent the “usual” set of areoles present in other *Chordodes* species, but there are some notable differences. Bulging areoles occur in some, but not all *Chordodes* species (see Schmidt-Rhaesa et al. 2008). They are distinctly more abundant in *C. mizoramensis* than in other species. Crowned areoles surrounded by circumcluster areoles is also a common pattern, but there is no species in which a branching of the apical filaments has been described.

Several *Chordodes* species have two types of crowned areoles; those with distinctly longer apical filaments are present along the ventral and sometimes also the dorsal mid-

line (see Schmidt-Rhaesa et al. 2008). In *C. mizoramensis*, only one type of crowned areoles could be found. However, crowned areoles appear to be a sexually dimorphic character, with females showing both types of crowned areoles, whereas in males the differences appear to be much less distinct or absent (see, e.g. Schmidt-Rhaesa 2002 for *C. queenslandi* Schmidt-Rhaesa, 2002 or De Villalobos et al. 2004 for *C. brasiliensis* Janda, 1894). Therefore, it cannot be excluded that the females of *C. mizoramensis* also exhibit such a dimorphism.

The male posterior end of the new species corresponds, as far as is known, in general with those of the males of other *Chordodes* species. However, the shape of the areoles on the posterior end (conical, with tuft of bristles on top) may be peculiar to *C. mizoramensis*.

In summary, *C. mizoramensis* exhibits some unique features, which justify its description as a new species.

In the key provided by Schmidt-Rhaesa et al. (2008), the new species must be placed in the following way: 1-4-5-7-9-18-19-27-29-31-32-33; under 33 there must be an extra line saying:

“crowned areole filaments branched..... *C. mizoramensis*”

## Acknowledgements

We thank Dr. Tawnenga, Principal, and Dr. K. Lalchhandama, Head, Department of Zoology, Pachhunga University College, Mizoram, India, for providing funding and laboratory facilities. Many thanks also due to Mr. Remsangpuia, who helped with collecting the specimen.

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# ***Coyinema* gen. n., a new genus of nematode (Thelastomatoidea, Hystrignathidae) parasites of Passalidae (Coleoptera) from Cuba**

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## **Abstract**

The new genus *Coyinema* **gen. n.** is described as parasite of the two passalid beetles from Cuba: *Passalus interstitialis* Escholtz, 1829 (type host) and *P. pertyi* Kaup, 1869. Females are characterized by the shape of their cephalic end, cervical cuticle unarmed, a sub-cylindrical procorpus with its base abruptly dilated, fore region of intestine dilated as a sac-like structure, genital system didelphic-amphidelphic and eggs markedly ovoid and smooth-shelled. Males have a digestive system similar to females, tail sharply pointed, bearing a Y-like thickening of the dorsal cuticle. They also present a big, median, mammiiform pre-cloacal papillae and a pair of small, sub-dorsal pre-cloacal papillae anterior to the cuticular thickening of the tail.

## **Keywords**

Nematoda, Hystrignathidae, *Coyinema*, Passalidae, *Passalus*, new genus

## **Introduction**

The family Hystrignathidae Travassos, 1920 (Oxyurida, Thelastomatoidea) includes about 100 species of parasitic nematodes specific of the gut caeca of passalid beetles. At present, 26 genera are recognized, most of them on the basis of females (Adamson and Van Waerebeke 1992). The shortage of male descriptions is mainly due to the difficulty

in assigning specimens to their correct species in co-infections which are common for passalid beetles. The morphological homogeneity of males further contributes to this difficulty.

The Hystrignathidae have a mostly Gondwanian distribution with species in North, Central and South America, West Indies, Africa, Madagascar, Australia and New Guinea. The majority of the genera have been recorded in Brazil (21), most of them being endemic (Travassos and Kloss 1957a, 1957b, 1958; Kloss 1962, Cordeira 1981, Cordeira and Artigas 1983). Some of these genera are also recorded from Mexico (1), Venezuela (2), Saint Lucia (3) and Trinidad (3) (Guerrero 1980, Hunt 1981, 1982, Coy and García 1995, García and Coy 1997).

Australia shows a characteristic fauna of hystrignathids, with the endemic and monotypic genera *Anuronema* Clark, 1978; *Phalacronema* Clark, 1978 and *Sprentia* Clark, 1978 (Clark 1978). Also, *Lepidonema* Cobb, 1898 and *Xyo* Cobb, 1898 have been recorded (Cobb 1898).

In Cuba, the study of this group is recent (Coy 1990). Currently, members of the genera *Artigasia* Christie, 1934; *Glaber* Travassos & Kloss, 1958; *Hystrignathus* Leidy, 1850; *Lepidonema*, *Longior* Travassos & Kloss, 1958 and *Salesia* Travassos & Kloss, 1958 are recorded (Coy et al. 1993, García and Coy 1994, 1995a, b, García et al. 2009a, b, c, Morffe and García 2009, Morffe and García 2010a, b).

Coy et al. (1993) described *Glaber poeyi* Coy, García & Alvarez, 1993 from *Passalus interstitialis*. Subsequent examination of type material and specimens collected from other localities demonstrate that these belong to a new genus described in this paper.

## Materials and methods

Five specimens of *Passalus pertyi* Kaup, 1869 were collected by hand from rotting logs between May, 2007 and March, 2008. Two specimens are from La Melba, Nipe-Sagua-Baracoa, Holguín Province, Cuba, one from El Mulo, Sierra del Rosario, Pinar del Río Province, Cuba and two from La Jaula, San José de las Lajas, La Habana Province, Cuba. Specimens from La Melba and El Mulo were immediately killed and fixed in 70% ethanol. Beetles were dissected by practicing longitudinal incisions in the abdominal pleural membranes and the intestines were extracted and excised in water in Petri dishes under a stereo microscope. The parasites were collected and stored in 70% ethanol.

Beetles from La Jaula were kept alive in plastic jars with moistened wood chips as food and a humidity source. They were killed as soon as possible with ethyl ether vapours and dissected as described above. The intestines were dissected in normal saline instead of water. Nematodes removed from guts were killed with hot water (60–70°C) and fixed in 70% ethanol.

In this study the type material of *Glaber poeyi* deposited in the Colección Helminológica of the Colecciones Zoológicas (CZACC), Instituto de Ecología y Sistemática, Havana, Cuba was included.



Nematodes were clear-mounted on slides in glycerine and coverslips were sealed around the edges with nail polish. Measurements were made after Morffe et al. (2009) and are given in millimetres. Variables are showed as range followed by median plus standard deviation and the number of measurements in parentheses. De Man's ratios a, b, c and V% were calculated.

Micrographs were taken with an AxioCam digital camera attached to a Carl Zeiss AxiosKop 2 Plus compound microscope. Line drawings were made with the softwares CorelDRAW X3 and Adobe Photoshop CS2 using micrographs as templates. Scales of all the plates are given in millimetres.

The materials examined are deposited in the CZACC and the Coleção Helmintologica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil.

## Systematics

Family Hystriognathidae Travassos, 1920

### Genus *Coyinema* gen. n.

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**Generic diagnosis.** Female. Body robust, markedly fusiform. Cervical cuticle unarmed. Lateral alae present, from the esophageal region to a distance before the level of the vulva. Head bearing eight small, paired papillae. First cephalic annule slightly expanded, set-off from head by a deep single groove, its fore half with concave margins when totally relaxed. Esophagus consisting of a muscular sub-cylindrical procorpus, its base abruptly expanded in its joint with the short isthmus. Intestine simple, its fore region very expanded, forming a sac-like structure. The end of this region of the intestine is abruptly set-off and next to it the gut continues as a simple, rectilinear tube. Nerve ring encircling procorpus at its posterior half. Excretory pore post-bulbar. Reproductive system didelphic-amphidelphic. Eggs large, ovoid, smooth-shelled. Tail long, subulate and filiform.

Male. Body shorter and more slender than female. Cervical cuticle without spines. Head similar to female. First cephalic annule inconspicuous. Digestive system similar to female. Nerve ring encircling procorpus at its posterior half. Excretory pore post-bulbar. One testis present. Spicules absent. Tail conical, very short, sharply pointed, ventrally curved, its dorsal cuticle thickened forming a Y-like structure. A single, median, mammiform, big pre-cloacal papilla present. A pair of small, sub-dorsal, pre-cloacal papillae situated before the dorsal thickening.

*Type species.* *Coyinema poeyi* (Coy, García & Alvarez, 1993) Morffe & García, comb. n. (monotypic genus).

**Distribution.** Cuba.

**Etymology.** The generic name is a combination of Coy, after Alberto Coy Otero, eminent Cuban parasitologist and the suffix -nema. The name is in neuter gender.

***Coyinema poeyi* (Coy, García & Alvarez, 1993) Morffe & García, comb. n.**

Figure 1 A–H, Figure 2 A–C, Figure 3 A–H

*Glaber poeyi* Coy, García & Alvarez, 1993: 57–59, fig. 3 A–E

**Type material.** ♂ holotype of *Glaber poeyi*, Cuba, Pinar del Río Province, Sierra del Rosario, El Salón; in *Passalus interstitialis*; IV.1990; A. Coy & N. García coll.; CZACC 11.4168. ♀ allotype of *Glaber poeyi*, same data as holotype, CZACC 11.4169.

**Other material examined.** 5 ♀♀, Cuba, Pinar del Río Province, Sierra del Rosario, El Mulo; in *Passalus pertyi*; X.2007; R. Núñez & O. Madruga coll.; CZACC 11.4468–11.4472. 9 ♀♀, Cuba, La Habana Province, San José de las Lajas, La Jaula; in *Passalus pertyi*; 15.III.2008; E. Fonseca, J. Morffe, G. León & F. Alvarez coll.; CZACC 11.4611–11.4619. 2 ♀♀, same data as anterior, deposited in the CHIOC. 6 ♀♀, Cuba, Holguín Province, Nipe-Sagua-Baracoa, La Melba; in *Passalus pertyi*; V.2007; R. Barba & D. Ortiz coll.; CZACC 11.4460–11.4465. 4 ♂♂, same data as anterior; CZACC 11.4473–11.4476.

**Type host.** *Passalus interstitialis* Escholtz, 1829 (Coleoptera, Passalidae).

**Other host.** *Passalus pertyi* Kaup, 1869 (Coleoptera, Passalidae).

**Site.** Gut caeca.

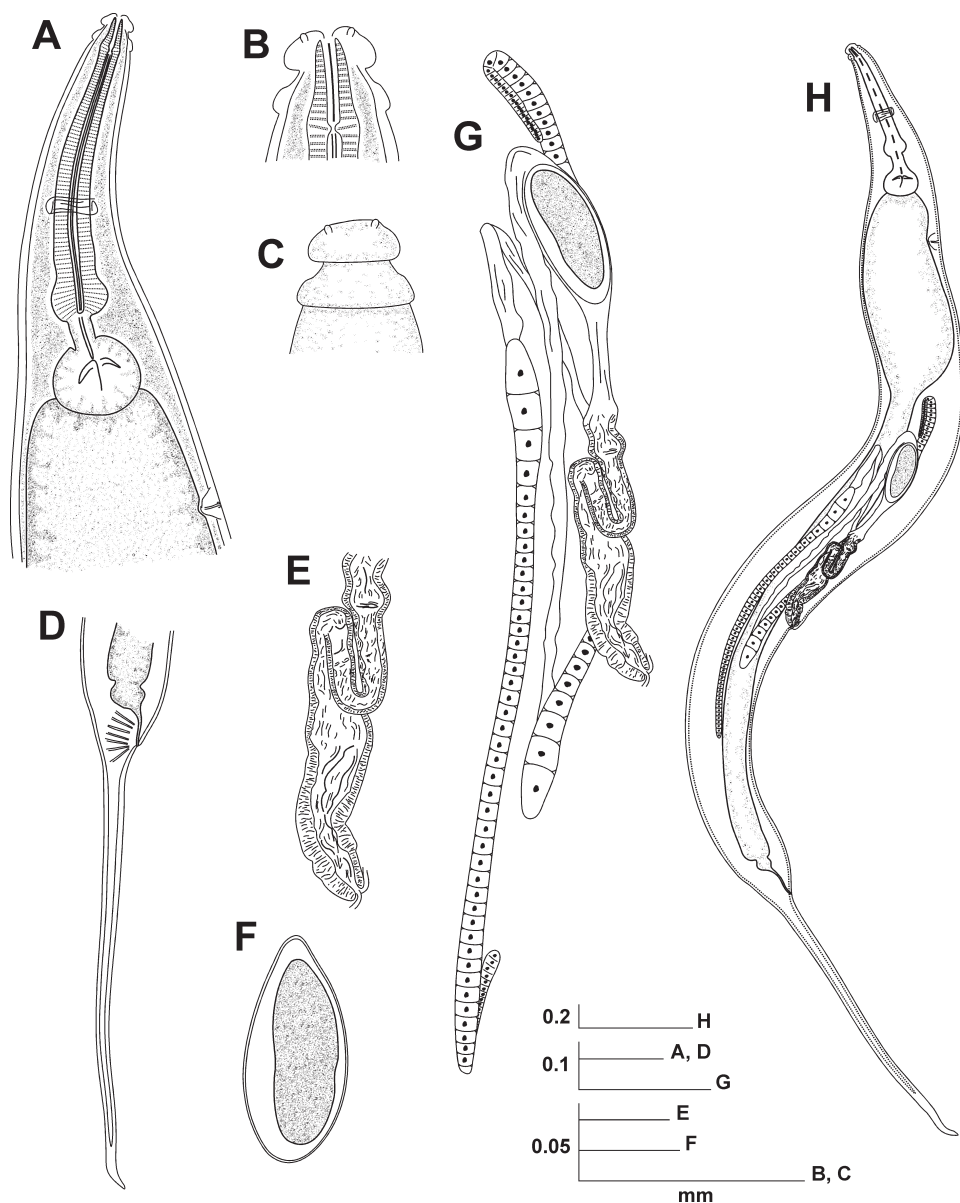
**Type locality.** El Salón, Sierra del Rosario, Pinar del Río Province, Cuba.

**Other records.** El Mulo, Sierra del Rosario, Pinar del Río Province, Cuba; La Jaula, San José de las Lajas, La Habana Province, Cuba; La Melba, Nipe-Sagua-Baracoa, Holguín Province, Cuba.

**Measurements.** Holotype (male)  $a = 14.40$ ,  $b = 5.74$ ,  $c = 83.08$ , total length = 1.080, maximum body width = 0.075, stoma length = 0.018, procorpus length = 0.130, isthmus length = 0.023, diameter of basal bulb = 0.038, total length of esophagus = 0.188, nerve ring to anterior end = 0.098, excretory pore to anterior end = 0.260, cloaca to posterior end = 0.013.

Allotype (female)  $a = 16.69$ ,  $b = 9.15$ ,  $c = 4.41$ ,  $V\% = 52.63$ , total length = 2.470, maximum body width = 0.148, first cephalic annule (length×width) =  $0.013 \times 0.035$ , stoma length = 0.025, procorpus length = 0.200, isthmus length = 0.025, diameter of basal bulb = 0.065, total length of esophagus = 0.270, nerve ring to anterior end = 0.130, excretory pore to anterior end = 0.370, vulva to posterior end = 1.170, anus to posterior end = 0.560, eggs =  $0.113\text{--}0.118 \times 0.048\text{--}0.050$  ( $0.116 \pm 0.004 \times 0.049 \pm 0.001$   $n = 2$ ).

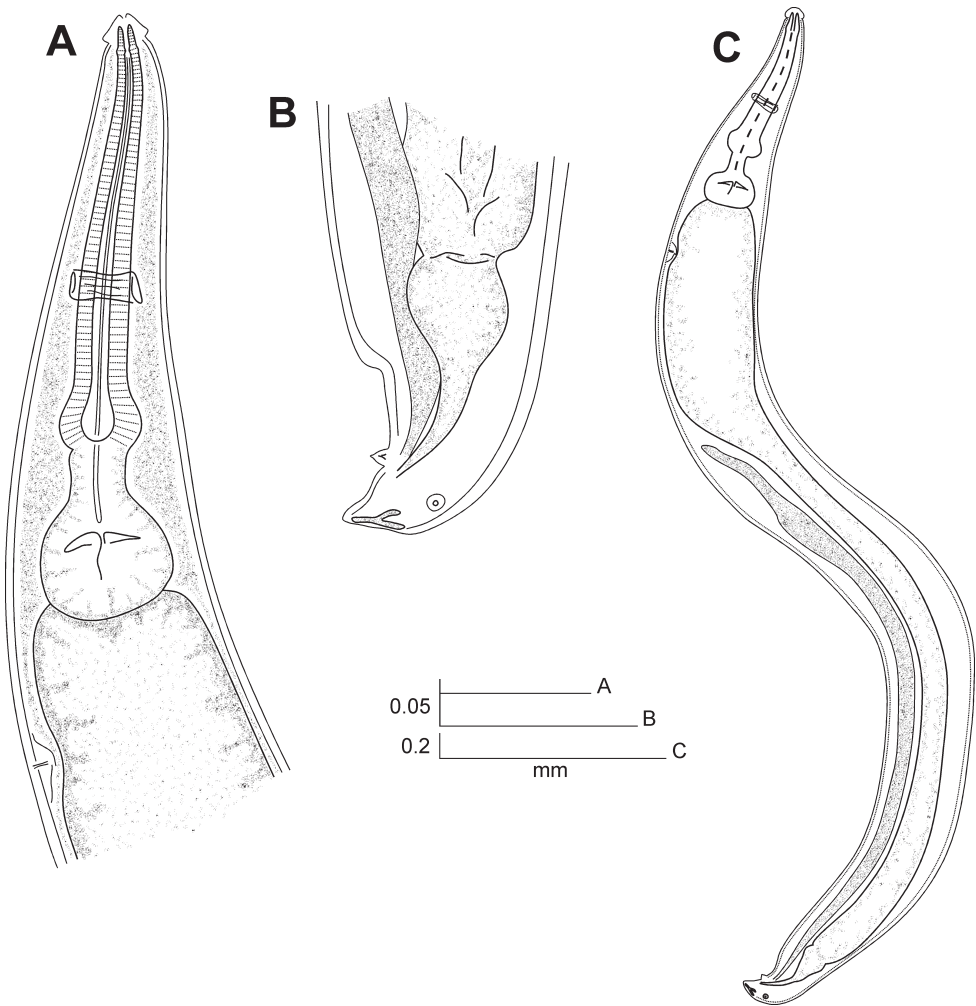
**Population from El Mulo, Pinar del Río Province.** Females ( $n = 5$ )  $a = 17.00\text{--}19.72$  ( $18.25 \pm 1.32$   $n = 4$ ),  $b = 7.73\text{--}8.65$  ( $8.18 \pm 0.38$   $n = 4$ ),  $c = 3.65\text{--}3.99$  ( $3.82 \pm 0.17$   $n = 4$ ),  $V\% = 46.99\text{--}52.94$  ( $49.50 \pm 2.84$   $n = 4$ ), total length =  $1.700\text{--}2.075$  ( $1.863 \pm 0.164$   $n = 4$ ), maximum body width =  $0.090\text{--}0.120$  ( $0.102 \pm 0.011$   $n = 5$ ), first cephalic annule (length×width) =  $0.008\text{--}0.013 \times 0.023\text{--}0.030$  ( $0.010 \pm 0.002 \times 0.026 \pm 0.004$ ), stoma length =  $0.018\text{--}0.020$  ( $0.019 \pm 0.001$   $n = 5$ ), procorpus length =  $0.160\text{--}0.175$  ( $0.166 \pm 0.006$   $n = 5$ ), isthmus length =  $0.023\text{--}0.025$  ( $0.023 \pm 0.001$   $n = 5$ ), diameter of basal bulb =  $0.040\text{--}0.045$  ( $0.043 \pm 0.002$   $n = 5$ ), total



**Figure 1.** *Coyinema poeyi* (Coy, García & Alvarez, 1993) Morffe & García comb. n. Female. **A** Esophageal region, lateral view **B** Cephalic end, internal view **C** Cephalic end, external view **D** Tail, lateral view **E** Vulva, lateral view **F** Egg **G** Reproductive system **H** Entire nematode, lateral view.

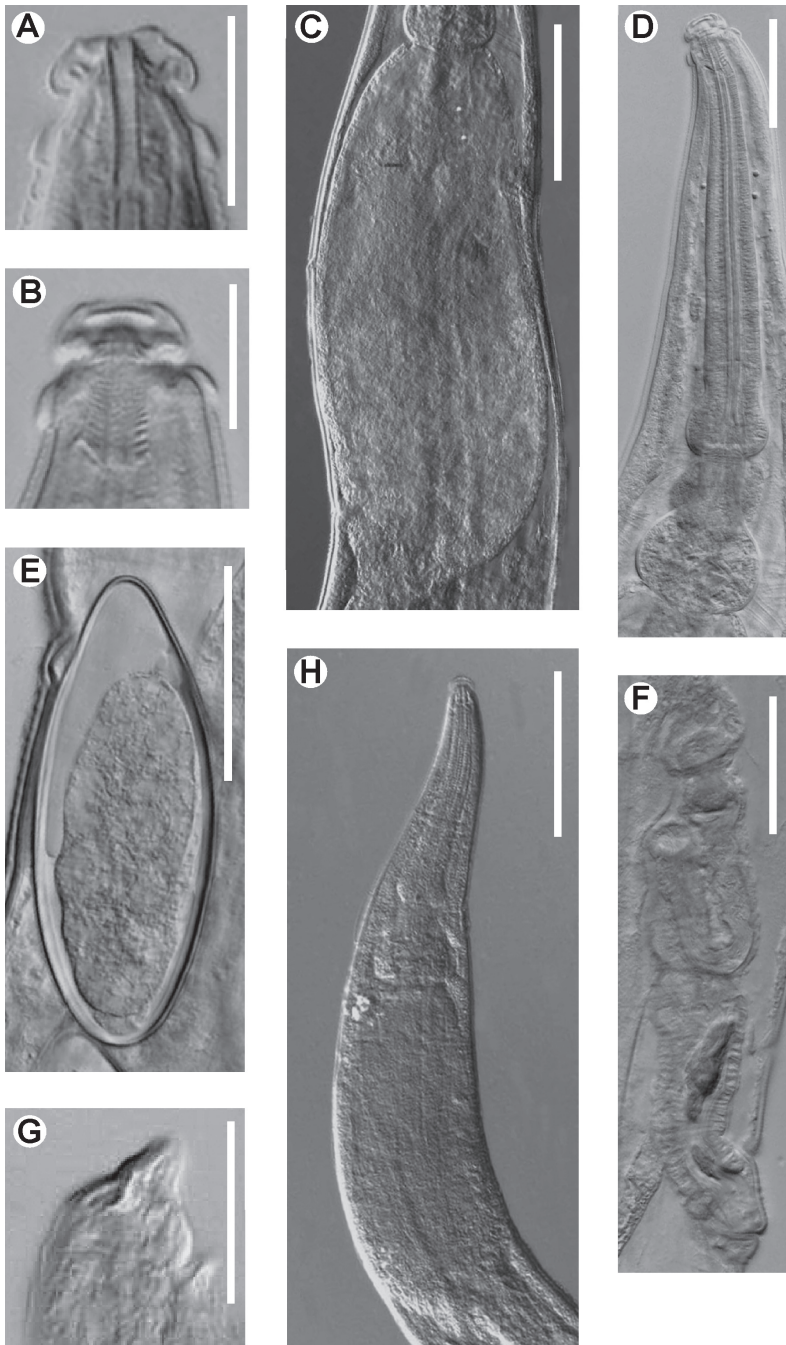
length of esophagus = 0.220–0.240 ( $0.226 \pm 0.009$   $n = 5$ ), nerve ring to anterior end = 0.108–0.128 ( $0.119 \pm 0.009$   $n = 5$ ), excretory pore to anterior end = 0.340 ( $0.340$   $n = 1$ ), vulva to posterior end = 0.800–1.100 ( $0.944 \pm 0.133$   $n = 4$ ), anus to posterior end = 0.430–0.520 ( $0.484 \pm 0.038$   $n = 5$ ), eggs =  $0.105\text{--}0.113 \times 0.035\text{--}0.048$  ( $0.110 \pm 0.003 \times 0.040 \pm 0.003$   $n = 11$ ).





**Figure 2.** *Coyntema poeyi* (Coy, García & Álvarez, 1993) Morffe & García comb. n. Male. **A** Esophageal region, lateral view **B** Tail end, lateral view **C** Entire nematode, lateral view.

**Population from La Jaula, La Habana Province.** Females ( $n = 11$ )  $a = 13.13$ – $20.00$  ( $16.26 \pm 1.95$   $n = 11$ ),  $b = 7.65$ – $9.33$  ( $8.35 \pm 0.53$   $n = 11$ ),  $c = 3.93$ – $4.49$  ( $4.22 \pm 0.19$   $n = 10$ ),  $V\% = 47.72$ – $51.92$  ( $50.44 \pm 1.07$   $n = 11$ ), total length =  $1.740$ – $2.425$  ( $2.010 \pm 0.211$   $n = 11$ ), maximum body width =  $0.108$ – $0.150$  ( $0.125 \pm 0.014$   $n = 11$ ), first cephalic annule (length $\times$ width) =  $0.005$ – $0.008 \times 0.028$ – $0.033$  ( $0.007 \pm 0.001 \times 0.029 \pm 0.002$   $n = 7$ ), stoma length =  $0.020$  ( $0.020$   $n = 11$ ), procarpus length =  $0.163$ – $0.185$  ( $0.174 \pm 0.008$   $n = 11$ ), isthmus length =  $0.020$ – $0.028$  ( $0.023 \pm 0.003$   $n = 11$ ), diameter of basal bulb =  $0.043$ – $0.058$  ( $0.049 \pm 0.005$   $n = 11$ ), total length of esophagus =  $0.228$ – $0.260$  ( $0.240 \pm 0.010$   $n = 11$ ), nerve ring to anterior end =  $0.120$ – $0.140$  ( $0.130 \pm 0.006$   $n = 11$ ), excretory pore to anterior end =  $0.280$ – $0.360$  ( $0.320 \pm 0.029$   $n = 11$ ), vulva to posterior end =  $0.860$ – $1.200$  ( $0.996 \pm 0.107$   $n = 11$ ), anus



**Figure 3.** *Coyinema poeyi* (Coy, García & Alvarez, 1993) Morffe & García, comb. n. Female. **A** Cephalic end, relaxed first cephalic annule (specimen killed inside the host) **B** Cephalic end, first cephalic annule not relaxed (heat killed specimen) **C** Sac-like structure of the intestine **D** Esophagus **E** Egg **F** Vulva, lateral view. Male **G** Tail end showing the dorsal cuticular Y-like thickening **H** Esophageal region. Scale bars: **A**, **B**, **G** 0.025 mm. **D**, **E**, **F** 0.05 mm. **C**, **H** 0.1 mm.

to posterior end = 0.400–0.560 ( $0.478 \pm 0.061$  n = 10), eggs = 0.108–0.125 $\times$ 0.035–0.048 ( $0.116 \pm 0.004 \times 0.042 \pm 0.004$  n = 20).

**Population from La Melba, Holguín Province.** Females (n = 6) a = 13.27–16.00 ( $14.80 \pm 0.95$  n = 6), b = 6.77–8.38 ( $7.53 \pm 0.57$  n = 6), c = 3.35–3.84 ( $3.60 \pm 0.20$  n = 6), V% = 43.18–48.24 ( $44.92 \pm 2.27$  n = 4), total length = 1.460–1.800 ( $1.653 \pm 0.126$  n = 6), maximum body width = 0.110–0.120 ( $0.112 \pm 0.004$  n = 6), first cephalic annule (length $\times$ width) = 0.010 $\times$ 0.025–0.028 ( $0.010 \times 0.027 \pm 0.001$  n = 5), stoma length = 0.018–0.020 ( $0.018 \pm 0.001$  n = 6), procampus length = 0.153–0.173 ( $0.160 \pm 0.008$  n = 6), isthmus length = 0.018–0.200 ( $0.019 \pm 0.001$  n = 6), diameter of basal bulb = 0.043–0.065 ( $0.048 \pm 0.009$  n = 6), total length of esophagus = 0.200–0.240 ( $0.220 \pm 0.014$  n = 6), nerve ring to anterior end = 0.113–0.125 ( $0.119 \pm 0.006$  n = 6), excretory pore to anterior end = 0.270–0.360 ( $0.307 \pm 0.047$  n = 3), vulva to posterior end = 0.820–1.000 ( $0.894 \pm 0.076$  n = 4), anus to posterior end = 0.380–0.530 ( $0.462 \pm 0.052$  n = 6), eggs = 0.105–0.125 $\times$ 0.035–0.048 ( $0.113 \pm 0.006 \times 0.043 \pm 0.004$  n = 11).

Males (n = 4) a = 10.84–13.18 ( $11.87 \pm 1.05$  n = 4), b = 5.62–6.03 ( $5.88 \pm 0.18$  n = 4), c = 55.00–74.67 ( $66.92 \pm 8.39$  n = 4), total length = 1.030–1.120 ( $1.073 \pm 0.044$  n = 4), maximum body width = 0.085–0.095 ( $0.091 \pm 0.004$  n = 4), stoma length = 0.015–0.020 ( $0.017 \pm 0.002$  n = 4), procampus length = 0.125–0.300 ( $0.128 \pm 0.002$  n = 4), isthmus length = 0.015–0.023 ( $0.018 \pm 0.004$  n = 4), diameter of basal bulb = 0.040–0.048 ( $0.044 \pm 0.003$  n = 4), total length of esophagus = 0.175–0.188 ( $0.183 \pm 0.005$  n = 4), nerve ring to anterior end = 0.093–0.100 ( $0.096 \pm 0.003$  n = 4), excretory pore to anterior end = 0.240–0.250 ( $0.248 \pm 0.005$  n = 4), cloaca to posterior end = 0.015–0.020 ( $0.016 \pm 0.003$  n = 4).

**Description.** Female. Body comparatively robust, markedly fusiform, maximum width at level of the anterior part of intestine. Cervical cuticle unarmed, finely annulated (annule more conspicuous toward post-esophageal region). Sub-cuticular longitudinal striae present. Lateral alae from the end of procampus or the beginning of its basal dilation to about half of a body width before the level of vulva. Head well developed, set-off from body by a single, deep groove and bearing eight small paired papillae. First cephalic annule slightly expanded, when totally stretched (in dead nematodes inside the hosts) consisting of an anterior half with concave margins (its diameter initially inferior to that of head and increasing gradually in the posterior direction) and a posterior half wider and with convex margins. In heat-relaxed specimens the cephalic annule appears to be less stretched and only the posterior part is visible. Stoma short, about two first cephalic annule lengths long, surrounded by an esophageal collar. Esophagus consists of a muscular, sub-cylindrical procampus, base abruptly dilated in its joint with the short isthmus. Basal bulb pyriform, valve plate well developed. Intestine simple, sub-rectilinear, anterior portion notably dilated, forming a sac-like structure slightly longer than esophagus. In this part the external surface of intestine almost touching the body wall. The continuation of intestine is about one third of the diameter of the sac-like structure. Rectum short, anus not prominent. Nerve ring encircling procampus at about 60% of its length. Excretory pore situated at about half of a body width pos-



terior to basal bulb. Genital tract didelphic-amphidelphic, both ovaries thin, reflexed. Anterior ovary commencing just behind the saccular structure and posterior ovary arising slightly more than a body width anterior to the level of anus. Vulva a median transverse slit near midbody or slightly displaced forward, lips more or less prominent. Vagina muscular, thin-walled, forwardly directed. Conduct next to the vagina forming a loop. Eggs comparatively large, markedly ovoid in shape, smooth-shelled. Tail comparatively long, filiform and subulate.

Male. Body shorter and slender than female. Cervical cuticle unarmed. Sub-cuticular longitudinal striae present. Cephalic end similar to female, except by the cephalic annule inconspicuous. Digestive system similar to female. Sac-like region of the intestine slightly larger than the esophagus. Rectum short and cloaca inconspicuous, not prominent. Nerve ring encircling procorpus in posterior half, at about 60% of its length. Excretory pore situated at about less than a body-width posterior to the basal bulb. Testis single, commencing just posterior to the sac-like structure of intestine. Tail conical, sharply pointed, very short and ventrally curved. Dorsal cuticle near the tail tip bearing a Y-like thickening, its inferior part posteriorly directed. A single, median, large, mammiform pre-cloacal papilla present. A pair of small, sub-dorsal, pre-cloacal papillae situated before the dorsal cuticular thickening. Spicules absent.

**Discussion.** *Coyinema* gen. n. can be placed in Hystrignathidae by having males with the single median pre-cloacal papilla characteristic of the family, oesophagus with its anterior portion supported by cuticularized rods and elongated eggs (Adamson and Van Waerebeke 1992). The new genus has affinities with the Brazilian genus *Glaber* by having a similar arrangement and form of the first cephalic annule and the characteristic basal dilation of the procorpus. A similar procorpus is present in *Vulcanonema* Travassos & Kloss, 1958, that however differs in its first cephalic annule separated from head by a conical region. These last two genera can be differentiated from *Coyinema* gen. n. in having a monodelphic-prodelphic reproductive system. The marked fusiform shape of *Coyinema* gen. n. only appears in the monotypic Malagasian genus *Pas-salidophila* Van Waerebeke, 1973, which is also monodelphic.

There are eight hystrignathid genera that are digonant and lack spines in the cervical cuticle: *Anomalostoma* Cordeira, 1981; *Anuronema*, *Klossnema* Cordeira & Artigas, 1983; *Papillabrum* Cordeira, 1981; *Phalacronema*, *Sprentia*, *Triumphalinsnema* Kloss, 1962 and *Ventelia* Kloss, 1962. *Coyinema* gen. n. differs from all of them in the form of cephalic end, the esophagus and the sac-like structure of the intestine. At present, the latter feature appears to be unique in the family.

The male of *Coyinema* gen. n. presents the head and digestive system very similar to female. This is unusual in the few genera of Hystrignathidae having males described, which have a cylindrical procorpus. Due to this, the shape of the digestive system differentiates the males of *Coyinema* gen. n. from the other males of Hystrignathidae.

**Comments.** There are small metric differences in the average values among females from some of the populations studied. In spite of this measurements tend to overlap, and there were no evident morphological differences observed. Males from El Sal6n and La Melba did not show marked morphometric variation. In addition, no male

specimens were found in the populations from El Mulo and La Jaula, when looking for more features that would support the existence of other species of *Coyinema* gen. n. These are the reasons why all populations are considered conspecific until larger series of specimens are at hand for further study.

## Acknowledgements

We are indebted to our colleagues Elier Fonseca, Gunnary León (Universidad de La Habana), Ormally Madruga (Museo Nacional de Historia Natural), Rayner Núñez, René Barba (Instituto de Ecología y Sistemática), the undergraduate student Facundo Alvarez and David Ortiz for their help during the field work. To the inhabitants of La Jaula community (La Habana Province) for their hospitality and support. To MSc. Yamir Torres (Instituto de Ecología y Sistemática) and Dr. Alejandro Barro (Universidad de La Habana) for their help with the micrographs. We also thank Dr. Luis F. de Armas from the Instituto de Ecología y Sistemática for his critical review of the manuscript and Dr. Pedro Herrera for the revision of the English manuscript. This work was financed by IDEAWILD and the project “Colecciones Zoológicas, su Conservación y Manejo” (DB-06) of the Ministerio de Ciencia, Tecnología y Medio Ambiente, Cuba.

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# A new species of *Amblyodus* Westwood, 1878 (Coleoptera, Melolonthidae, Dynastinae) from South America

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## Abstract

A second species of *Amblyodus* Westwood, 1878, *A. castroi* **sp. n.**, is described from the northern South America based on 12 specimens from Brazil and Peru (Amazonian subregion). The new species is here compared with the type species of the genus, *A. taurus* Westwood, 1878 and both species and their male genitalia are illustrated. Diagnostic characters for the genus are discussed, especially the metatibial teeth. A distribution map including the type species and the new species is provided. The genus *Amblyodus* is recorded for the first time from Peru and from Brazil states of Pará and Rondônia.

## Keywords

Amazonian subregion, Phileurini, South America, taxonomy

## Introduction

*Amblyodus* was described by Westwood (1878) and until now was known only by the type species, *A. taurus* Westwood, restricted to some Central American countries (Blackwelder 1944; Endrödi 1977, 1985; Lachaume 1992; Ratcliffe 2003 and Ratcliffe and Cave 2006). In a recently published paper, Gasca and Aguiar (2008) re-

corded the genus for the first time from South America (Brazilian Amazon) based on six specimens collected between the Juruá and Purus rivers. However, they wrongly identified the species as *A. taurus*.

After studying these specimens and additional six specimens, three from Peru and three from Brazil, we concluded that all these material belong to a new species of *Amblyodus* which is here described and compared with the type species of the genus. The diagnostic characters are discussed. A distribution map is provided, including a new country locality from Peru.

## Material and methods

The specimens were examined under a dissecting stereomicroscope at magnification of 0.8–50×. Description of external morphological features and conventions follow in part Endrödi (1985) and Ratcliffe and Cave (2006). Images of specimens were captured with a digital camera and assembled in the Automontage software. Label data were separated by single slash “/” for the type material.

The phylogenetic species concept of Wheeler and Platnick (2000) was used in this work: “A species is the smallest aggregation of (sexual) populations or (asexual) lineages diagnosable by a unique combination of characters states.”

Specimens examined for this work were provided by seven institutions and private collections. Acronyms for institutions are mostly taken from Samuelson et al. (2001), as follows:

<b>CEMT</b>	Coleção Entomológica da Universidade Federal do Mato Grosso, Cuiabá, MT, Brazil (F. Z. Vaz-de-Mello)
<b>EPGC</b>	Everardo and Paschoal Grossi Private Collection, Nova Friburgo, RJ, Brazil (E. J. Grossi)
<b>JSC</b>	Jochen P. Saltin Private Collection, Niedernhausen/Taunus, Germany (J. P. Saltin)
<b>IOC</b>	Instituto Oswaldo Cruz, Rio de Janeiro, RJ, Brazil (J. M. Costa)
<b>MIIS</b>	Museo Insectarium Internacional de Santiago, Sanriago, Chile (S. Castro)
<b>UFAM</b>	Universidade Federal do Amazonas, Manaus, AM, Brazil (N. O. Aguiar)
<b>MIUP</b>	Museo de Invertebrados G. B. Fairchild, Universidade de Panamá, Panamá (R. A. Cambra T.)

## Key to the *Amblyodus* species

- 1 Frontal horns distinctly divergent. Pronotal disc weakly declivous, almost horizontal, punctures predominantly C-shaped; lateral carina not high. Internal margin of parameres almost parallel; apical external carina of parameres in lateral view complete ..... *A. taurus* Westwood

- Frontal horns not distinctly divergent, instead parallel. Pronotal disc more declivous, with punctures predominantly reticulated, not C-shaped; lateral carina high. Internal margin of parameres concave; apical external carina of parameres in lateral view incomplete.....***A. castroi* sp. n.**

## Taxonomy

### *Amblyodus castroi* Grossi & Grossi, sp. n.

urn:lsid:zoobank.org:act:37121595-32A5-4339-93DD-BC7F1AE006B9

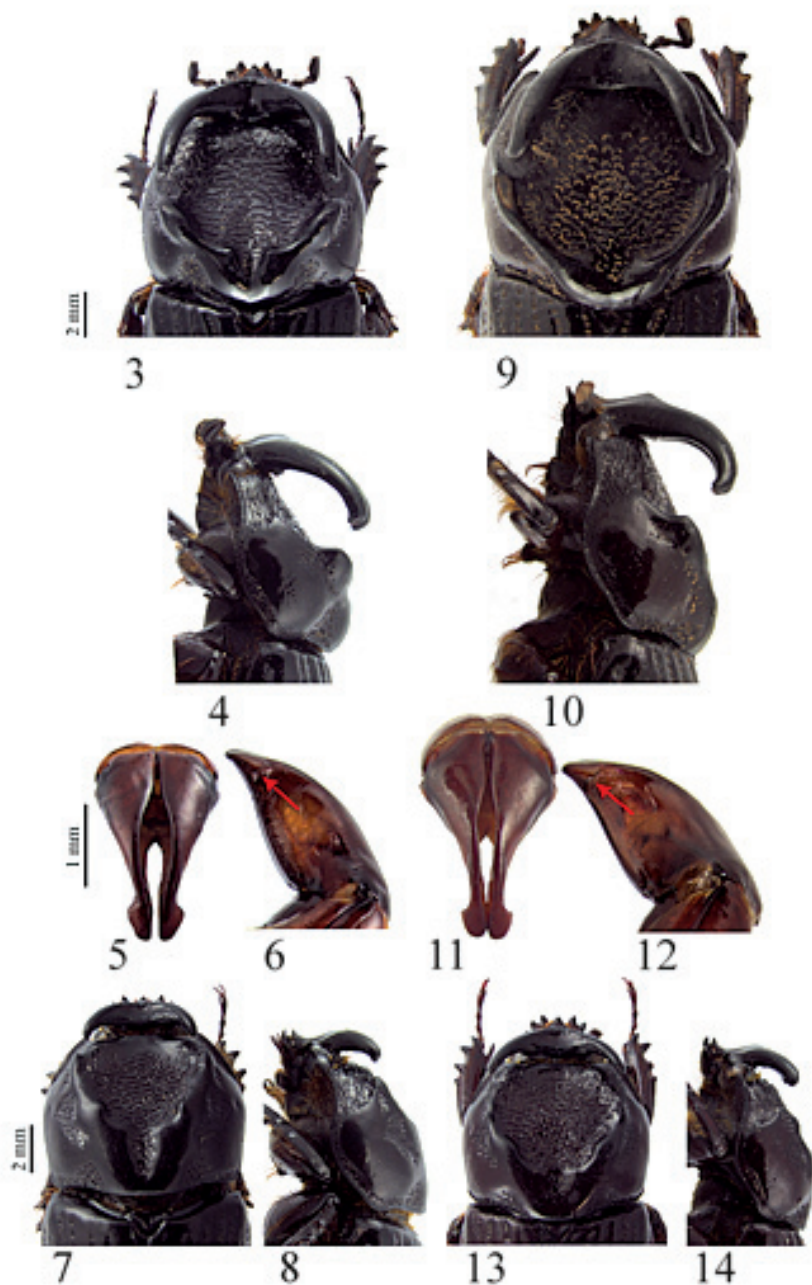
Figs 1–8, 13, 14

**Material examined.** Holotype male, dissected, labeled: a) “male symbol label”; b) “Brasil, Amazonas, Uarini,/ 03°02'57"S/ 65°41'42"W,/ 22/VII-03/VIII/1995, P./ Bührnheim, N.Aguiar & al.”; c) handwritten label “NO ALBURNO DE/ TRONCO CAÍDO/ 01/VIII/1995” (UFAM).

**Paratypes**, 4 males and 7 females labeled: 1 female a) “female symbol label”, b) “Brasil, Amazonas, Uarini,/ 03°02'57"S/ 65°41'42"W,/ 22/VII-03/VIII/1995, P./ Bührnheim, N.Aguiar & al.”; c) handwritten label “NO ALBURNO DE/ TRONCO CAÍDO/ 01/VIII/1995” (CEMT). 3 females labeled “Brasil, Amazonas, Coari,/ Duto



**Figures 1–2.** Habitus of *Amblyodus castroi* sp. n., male holotype. **1** Dorsal view **2** Lateral view.



**Figures 3–14.** *Amblyodus* spp. **3–4** Head and pronotum of a male major of *A. castroi* in dorsal and lateral views respectively **5–6** Parameres of *A. castroi* in caudal and lateral views respectively **7–8** Head and pronotum of a female of *A. castroi* in dorsal and lateral views respectively **9–10** Head and pronotum of *A. taurus* in dorsal and lateral views respectively **11–12** Parameres of *A. taurus* in caudal and lateral views respectively **13–14** Head and pronotum of a male minor of *A. castroi* in dorsal and lateral views respectively. Arrows indicate apical lateral carina, **6** (incomplete) and **12** (complete).



Urucu/Porto Terminal,/ 04°50'16"S/ 65°20'36"W,/ 16/VI/1996, Buhmheim (*sic*),/ PF, Aguiar, NO, Arruda,/ AMR & Gualberto, TL col." (UFAM). 1 male labeled a) "Brasil, Amazonas, Coari,/ Duto Urucu/Porto Terminal,/ 04°50'16"S/65°20'36"W,/ 16/VI/1996, Buhmheim (*sic*),/ P.F. & Aguiar, N.O. col."; b) handwritten label "Em tronco/ caído" (EPGC). 1 female labeled "PERU, Junin, Puerto/ Ocopa, I-2007, 600m/ 11°07'50"S/74°17'46"W/ S.Castro col." (EPGC). 1 female a) "BRASIL: Rondônia: Porto/ Velho, margem direita/ do Rio Madeira, IX-2004" (EPCG). 1 male labeled "PERU, Ucayali, Via/ Puerto Ocopa-Ucayali,/ XII-2009, 1200m,/ 11°03'51"S/74°15'39"W/ S. Castro col." (MIIS); 1 male labeled "PERU, Junin,Huerto/ Eden c.a, near Puerto/ Prado XII-2009/ 1800m, local collector" (JSC). 1 male labeled a) "BR 14, Km 92/ Pará, Brasil/ E. Lobato XII. 60" (IOC). 1 female labeled a) handwritten label "S. Paulo de/ Olivença/ Solimões/ VIII. – Fassl", b) "Coleção/ J. F. Zikan" (IOC). All paratypes additionally labeled, yellow label, "*Amblyodus castroi*/ PARATYPE/ Grossi & Grossi.

**Diagnosis.** Head with frontal horns less divergent, being almost parallel (Fig 3). Pronotal disc more declivous than in *A. taurus* with lateral carinae distinctly higher in males majors (Fig 4), posterior furrow deeply excavated as opposed to a less excavated furrow in *A. taurus* (Figs 9 and 10). Aedeagus with internal margin of parameres concave, not parallel; external margin less constricted than in *A. taurus* where internal margin is almost parallel, and external margin abruptly constricted (Figs 11 and 12).

**Holotype description** (Figs 1 and 2). Total body length 20 mm. Total pronotal width 9.2 mm. Body elongated, about 2 times longer than wide, color dark brown dorsally and reddish brown ventrally; dorsal surface glabrous, with sterna being setose. *Head:* Surface smooth and glabrous with sparse micropunctures; in frontal view with two lateral, concave areas with scattered C-shaped punctures. Clypeus subtriangular, laterally bordered and slightly upturned, convex and with acute apex. Canthi intruding upon eyes just before first third. Frons with two erect, diverging, posteriorly recurving horns. Interocular width equals 3.3 mm. Mandibles tridentate with inner tooth more acute; teeth upturned. Antennae 10 segmented with scape as long as the 6 next segments; club with segments subequal in length. *Pronotum:* Shape trapezoidal, narrower than both elytra together; discal area with C-shaped punctures combined with reticulated areas, flat and declivous; anterior border incomplete. Lateral and posterior sides of pronotal depression strongly carinated, anterior carina more pronounced, higher, being convex and wider posteriorly; carina at base weakly emarginate; carina posteriorly interrupted at middle by a longitudinal furrow, internally weakly angulate; furrow about 4.5 times narrower than head width. Anterior angles acute, posterior angles rounded. Outer side and lateral posterior side of pronotal surface punctate; punctures ocellate, sometimes coalescent, posteriorly larger. *Elytra:* Discal area with 5 rows of large ocellate punctures, rows weakly impressed. Interstriae slightly convex, with scattered small punctures. Lateral edges with 5 similar rows of ocellate punctures, instead of by some ocellate punctures between third and fourth rows. *Pygidium:* Shape convex in lateral view; surface densely punctate; punctures ocellate, moderately sized, elongate near dorsal margin. Sixth ventrite sinuous at middle. *Legs:* Protibiae quadridentate, proximal tooth smaller, distal ones bigger. Metatibiae with 5 apical teeth. *Parameres:*

Shape symmetrical, narrower at apex; apex dilated, laterally roundly angulated, apically rounded, triangle shaped; internal side of each paramera concave, not parallel (Fig 5). In lateral view shaft constricted, with a post-anterior concavity; dorso-ventral carina incomplete, not reaching ventral margin; with a flat, truncate tooth near base (Fig 6).

Female paratypes. Similar to male in general aspects except for the following characters: *Head*: Frontal horns less developed and never reaching pronotal middle. *Pronotum*: Pronotal depression narrower, near anterior margin smooth, not punctate; lateral carina smaller with a weak acute projection before first third (Figs 7 and 8); pronotal furrow longer, ending just before posterior margin. *Pygidium*: Shape wider laterally and shorter, with punctures smaller. Sixth ventrite not sinuous at middle.

**Variation of male paratypes.** Smaller males possess less developed and less posteriorly recurving frontal horns. Pronotal carina very weakly pronounced (Figs 13 and 14).

**Etymology.** The species is named *castroi* in homage of Sergio Castro who provided us with part of the paratypes from Peru.

**Remarks.** When recording the new occurrence of *A. taurus* for South America, Gasca and Aguiar (2008) misapplied the name *A. taurus* to the material they had on hand. Actually both species of *Amblyodus* are similar in appearance, which is common in Phileurini. The authors also stated that the only two genera of the tribe that possess elongate frontal horns were *Amblyodus* and *Oryctophileurus* Kolbe, 1910. However, *Ceratophileurus* Ohaus, 1911 also possess this character in both sexes (Gillett et al. 2010).

*Amblyodus* and *Oryctophileurus* share the lateral pronotal carina and pronotal shape: elongate, widely flattened, depressed with discal depression totally wrinkled. Additionally, both genera have almost no external sexual dimorphism, as females also possess a well-developed frontal horn, a feature that makes the distinction between genders difficult, being the shape of the last sternite the better way to determine gender in these cases. Moreover parameres have almost the same shape, and the shape of prosternal process is also shared between *Amblyodus* and *Oryctophileurus*, namely flat ventrally and with a spine-like process posteriorly. Based on several morphological characters, there is a possibility that *Oryctophileurus* could be a synonym of *Amblyodus* because the unique feature to distinguishing both genera is the number of frontal horns, one or two, which is not a good character within Dynastinae as some genera are usually extremely allometric. Only with the examination of the type species of *Oryctophileurus*, will it be possible to affirm if they are congeneric or not.

The holotype male is an incomplete specimen and it was apparently damaged by an axe during collecting inside dead logs. It is the same male specimen illustrated by Gasca and Aguiar (2008, figure 1, male in lateral view).

The genus *Amblyodus* is recorded for the first time from Peru and from Brazil states of Pará and Rondônia (Fig 15). It is possible that *A. castroi* occurs in all the Amazonian subregion.

Characters used to diagnose the genus by Ratcliffe (2003) and Ratcliffe and Cave (2006) are confirmed with the new species described here, except for the presence of six teeth on the apex of the metatibiae. In *A. castroi*, that is a variable character, as the number of teeth may be five or six.



**Figure 15.** Known distribution map of *Amblyodus* species. *A. taurus* (circles) and *A. castroi* (squares).

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# Contributions to the faunistics and bionomics of Staphylinidae (Coleoptera) in northeastern North America: discoveries made through study of the University of Guelph Insect Collection, Ontario, Canada

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## Abstract

Staphylinidae (Rove Beetles) from northeastern North America deposited in the University of Guelph Insect Collection (Ontario, Canada) were curated from 2008–2010 by the first author. The identification of this material has resulted in the recognition of thirty-five new provincial or state records, six new Canadian records, one new record for the United States and two new records for eastern Canada. All records are for subfamilies other than Aleocharinae and Pselaphinae, which will be treated in future publications as collaborative projects. Range expansions of ten exotic species to additional provinces and states are reported. The known distributions of each species in northeastern North America are summarized and presented as maps, and those species with a distinctive habitus are illustrated with color photographs. Genitalia and/or secondary sexual characters are illustrated for those species currently only identifiable on the basis of dissected males. The majority of the new records are in groups that have been recently revised, demonstrating the importance of curation and local insect surveys to the understanding of biodiversity, even for taxa and areas considered ‘relatively well-known’.

## Keywords

rove beetles, exotic species, *Sepedophilus*, *Erichsonius*, *Gabrius*, *Philonthus*, *Quedius*

## Introduction

The rove beetles of northeastern North America, defined here as a region from Ontario eastward and south to Virginia, are well known faunistically compared to other regions of the world, with the exception of the western Palaearctic. For the large subfamilies Staphylininae, Tachyporinae, Steninae, Pselaphinae and to some degree Omaliinae, modern monographs by Smetana (1971, 1982, 1995), Campbell (e.g. 1973, 1976, 1979, 1982, 1984a, b, 1991), Puthz (1973, 1974, 1988), Chandler (1989, 1990), Wagner (1975), and several others have contributed much to our knowledge of their distribution and bionomics. Some diverse groups, including the Paederinae, Oxytelinae, and Aleocharinae, remain poorly known although the North American Aleocharinae are under active study (e.g., Gusarov 2003; Klimaszewski et al. 2006). It is apparent that much remains to be discovered in the northeast, even for those groups that have been recently revised, as evidenced by recent papers on the fauna of the Maritime Provinces of Canada (Klimaszewski et al. 2005, 2007; Majka et al. 2008).

Although the University of Guelph Insect Collection (DEBU) is Canada's third or fourth largest collection of invertebrates, relatively few of its staphylinid specimens were considered in the course of the above-mentioned revisions. We assume this oversight was due to the collection's reputation for its coverage of Nearctic and Neotropical Diptera, and the corresponding incorrect assumption that other orders are not well-represented. Although it is true that over half of the 2.5 million or so specimens in the collection are flies, the University of Guelph collection includes several historically important beetle collections and continues to accumulate Coleoptera in the course of ongoing surveys of Ontario's parks and protected areas as well as routine collecting associated with course work and general collection development. The acquisition of the Alan and Anne Morgan Collection (AAMC) in early 2010 further augmented this material. Previously deposited at the University of Waterloo, this collection of mostly Coleoptera has strengths in the subarctic, boreal and eastern deciduous fauna of Canada. Most Staphylinidae at DEBU were inadequately curated and mostly unidentified prior to recent curatorial work by the senior author, but now all rove beetles in the collection are identified at least to the genus level (except the Aleocharinae and Pselaphinae) and a large proportion of identified specimens are now entered into the central database. We here report on the faunistic discoveries made in the process of curating this material and discuss their importance in the context of previous knowledge. Known distributions are summarized for each species and those species with a distinctive habitus are illustrated to aid in their identification. Where necessary, the aedeagi and/or secondary sexual characters of species are illustrated. Identification of the Pselaphinae and Aleocharinae at DEBU is in progress and future publications on these subfamilies are planned.

## Materials and methods

Specimens were examined with a WILD Heerbrugg M5A stereomicroscope and dissections of male genitalia and genital segments of both sexes were performed in distilled

water after preparation following Smetana (1971). All species with a distinct habitus were photographed in dorsal view. All images were prepared using a digital imaging system by Visionary Digital. Maps of the distribution of each species in northeastern North America were prepared using ARC GIS and Adobe Photoshop. Records from the literature at the resolution of state or province are indicated on maps as empty dots, centred on that region. All material examined was from the University of Guelph Insect Collection (DEBU), Ontario, Canada. We follow the taxonomic organization of Newton et al. (2000).

## Results and discussion

### Omaliinae

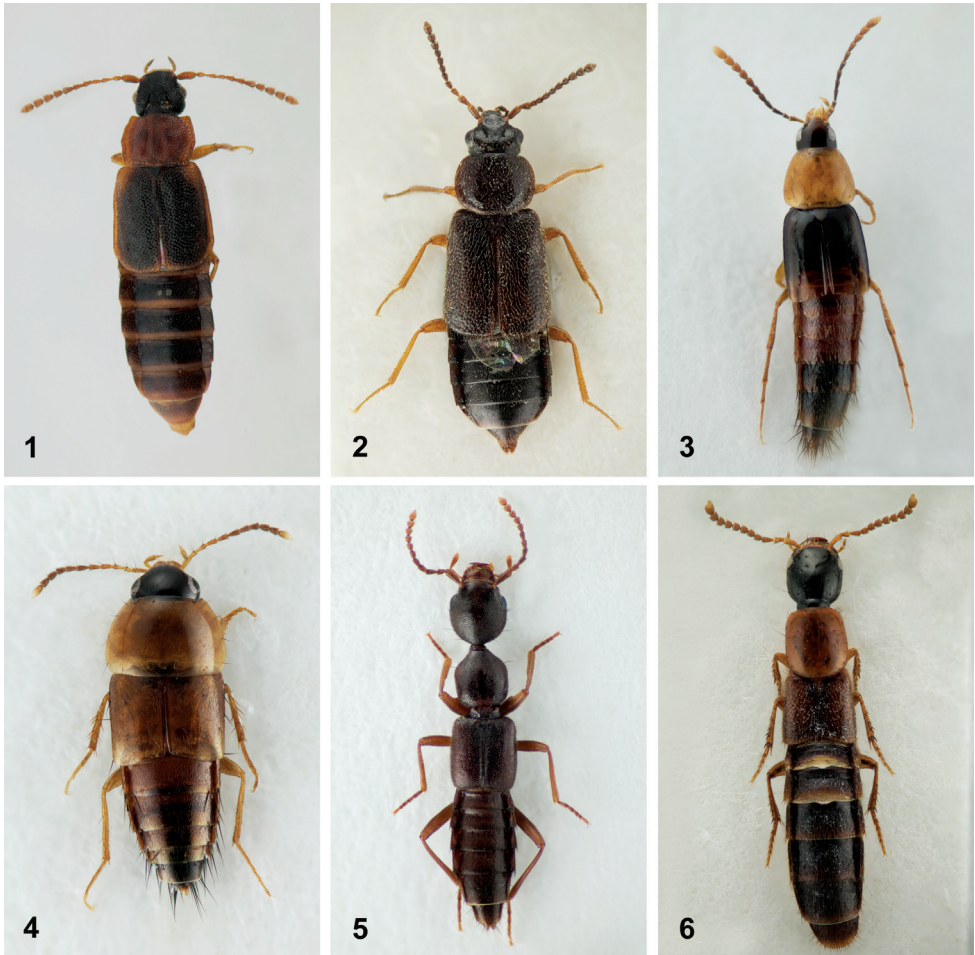
#### *Omalium repandum* Erichson, 1840

**Materials.** CANADA: ON: Chatam-Kent Co., Tilbury, pitfall trap, 9-VI-1994 (2), T. Sawinski; Essex Co., Leamington, pitfall trap, 15 to 22-V-1992 (1), 22-V-1992 (1), 9-VI-1993 (1), Palichuck; Point Pelee Natl. Pk., Visitor Centre, malaise and pans, 22 to 29-V-2000, (2), 26-IX to 10-sX-2000 (1) O. Lonsdale. Huron Co., Auburn, Londesboro Rd. nr. Hwy 8, 43.728 -81.529, hedgerow, pitfall, 26-X-2009, A. Brunke (1); Benmiller, Sharpes Creek Line, 43.691 -81.608, hedgerow nr. creek, pitfall, 2-XI-2009, A. Brunke (1); Brucefield, London Rd. nr. Centennial Rd., 43.509 -81.516, hedgerow nr. creek, pitfall, 27-IX-2009 (1), 12-X-2009 (4) A. Brunke; Waterloo Reg., Blair, Dickie Settlement Rd. nr. WhistleBear golf course, 43.373 -80.400, hedgerow, pitfall, 28-IX-2009 (6), 13-X-2009 (2) A. Brunke; Blair, Dickie Settlement Rd. nr. WhistleBear golf course, 43.373 -80.400, hedgerow, canopy trap in buckthorn, 10-XI-2009, A. Brunke (1); Blair, Fountain St. S. nr Speed River, 43.391 -80.373, hedgerow, pitfall, 24-XI-2009, A. Brunke (1); Blair, Whistlebare Rd. and Township Rd.1, 43.372 -80.362, hedgerow, canopy trap in buckthorn, 18-V-2010, A. Brunke (2); Blair, Whistlebare Rd. and Township Rd.1, 43.372 -80.362, hedgerow, pitfall, 1-VI-2010, A. Brunke (1); Blair, Whistlebare Rd. and Township Rd. 1, 43.367 -80.358, hedgerow, canopy trap in buckthorn, 18-V-2010 (1), 21-IX-2010 (1), A. Brunke; Blair, Whistlebare Rd. and Township Rd. 1, 43.367 -80.358, hedgerow, pitfall, 5-X-2010, A. Brunke (1); St. Jacobs, 'Stuart pitfall', 3-VI-1993 (1), 14-VI-1994 (1), T. Sawinski.

**Diagnosis.** As the genus *Omalium* currently lacks a rigorous definition and consists of a heterogeneous assemblage of species (Newton et al. 2000), this species is distinguished from all others of the subfamily occurring in the northeast by the combination of: tarsomere five longer than one to four combined; tarsomeres one to four not conspicuously broadened and without dense setae ventrally; maxillary palpomere three not greatly enlarged relative to segment four (Newton et al. 2000); antennomeres

eight to ten elongate; pronotum bright orange with finely crenulate, evenly arcuate margins (Fig. 1).

*Omalium repandum* was previously known from Missouri, South Carolina, Texas (Herman 2001), Indiana (Blatchley 1910), Minnesota, Massachusetts, Georgia (Lundgren 1998) and Quebec (Campbell and Davies 1991). Herein we provide the first specimen-based records of this species in Canada and newly record it from Ontario based on several, relatively recent collections made in southern Ontario (Map 1). The above specimens were caught by passive traps placed in or near forests and thus no microhabitat data was available but Blatchley (1910) reported it as ‘frequent, under dead leaves’. *Omalium repandum* therefore appears to be forest litter dwelling and is probably widespread in central and eastern North America. The specimens from Huron County, Ontario and the provincial record from Quebec probably represent the northern limit of its range.



**Figures 1–6.** Dorsal habitus. 1 *Omalium repandum* Erichson 2 *Porrhodites fenestralis* (Zetterstedt) 3 *Ischnosoma flavicolle* (LeConte) 4 *Tachyporus browni* Campbell 5 *Eustilicus tristis* (Melsheimer) 6 *Bisnius cephalicus* (Casey).

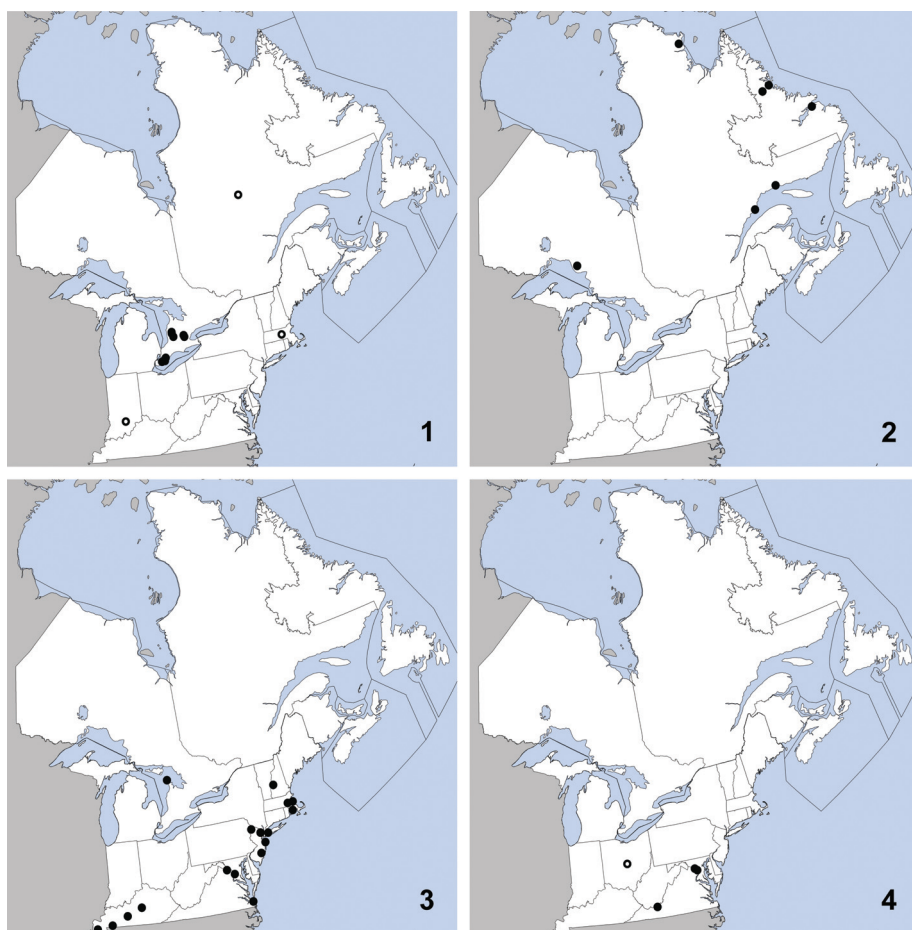


***Porrhodites fenestralis* (Zetterstedt, 1828)**

**Materials. CANADA: ON: Thunder Bay Distr.** Pukaskwa Natl. Pk. beach trail, dunes, 30-VII-2003, S.M. Paiero (1).

**Diagnosis.** This species can be readily distinguished from *P. inflatus* (Hatch), the only other member of the genus in North America, by the combination of: pronotal margins evenly arcuate; metasternum without microsculpture; antennomere two distinctly longer than segment three (Campbell 1984) (Fig. 2).

*Porrhodites fenestralis* is a holarctic, boreal to subarctic species known in the Nearctic region from Alberta, British Columbia, Manitoba, Newfoundland, Northwest Territories, Quebec, Yukon Territory, and Alaska, with a relict population in the Rocky Mountains of Montana and Wyoming (Campbell 1984). In the Palearctic



**Maps 1–4.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **1** *Omalius repandum* Erichson (Blatchley 1910, Campbell and Davies 1991, Lundgren 1998) **2** *Porrhodites fenestralis* (Zetterstedt) (Campbell 1984) **3** *Ischnosoma flavicolle* (LeConte) (Campbell 1991) **4** *Sepedophilus campbelli* Herman (Campbell 1976, Watrous 2008).

it is known from Austria, Czech Republic, Finland, Germany, Italy, Norway, Russia (North European Territory, Far East, East Siberia, and West Siberia), Sweden, and Switzerland (Smetana *in* Löbl and Smetana 2004). Ganglbauer (1895) reported it from “Lake Superior”, which could be Michigan, Minnesota or Ontario; the above specimen thus represents the first Ontario record of this species (Map 2). The new locality in Ontario confirms that *Porrhodites fenestralis* is transboreal in Canada. This species is typically collected in summer to early fall, and most known specimens with collection data were captured in flight; a long series was found swarming on a pine (*Pinus*) tree (Campbell 1984). Another specimen was found in a deer mouse (*Pteromyscus*) nest (Campbell 1984).

## Tachyporinae

### *Ischnosoma flavicolle* (LeConte, 1863)

**Materials.** CANADA: ON: Bruce Co., Dorcas Bay, dunes, pans under malaise, 5 to 13-VI-1999, S.A. Marshall (1).

**Diagnosis.** *Ischnosoma flavicolle* is easily distinguished from others of the genus by the distinctly bicolored elytra that each lack a humeral spot (Campbell 1991) (Fig. 3).

This species is primarily southeastern in distribution, with a northward extension along the Atlantic coast, and was known previously from Alabama, Arkansas, District of Columbia, Florida, Georgia, Illinois, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia (Campbell 1991). Herein we here record this species from Canada (Ontario) for the first time (Map 3). This record represents a significant range expansion and is surprising since the forest of the Bruce Peninsula is known for its dominant boreal elements compared to the more ‘southern’ Carolinian forests in south-western Ontario (Marshall et al. 2001). Throughout its range *Ischnosoma flavicolle* is frequently collected from sifted litter in a variety of forest types, and hammocks in the southern extremes; it has also been found in grasslands, carrion, under bark (Campbell 1991), and in stream drift (Watrous 2008). The record reported here is from an inland dune on the Lake Huron side of the Bruce Peninsula. Further collecting is necessary to delimit the full range of this apparently widespread species.

### *Sepedophilus campbelli* Herman, 2001

**Materials.** UNITED STATES: VA: Giles Co., Cascades Recreation Area, sifted from leaf litter in hardwood forest, 11 to 25-V-2008, A. Brunke (1).

**Diagnosis.** *Sepedophilus campbelli* is distinguished from other species of the genus in northeastern North America by the combination of: pronotum and elytra without

microsculpture and without pale or reddish markings; small size (<1.7mm from the clypeus to the elytral apex); middle-tibia with two apical spines; basal abdominal segments with long lateral bristles.

When Campbell (1976) described this species (under the homonymic name *S. micans*), eight specimens were known from scattered localities in Alabama, Maryland, District of Columbia, and North Carolina. Recently, five specimens of *Sepedophilus campbelli* were found in Cuivre River State Park, Missouri, at blacklight and under bark (Watrous 2008). Watrous (2008) also noted that *Sepedophilus campbelli* has been found in Ohio and Florida but without further details. We here report *S. campbelli* as new for Virginia, contributing to the faunistics of this poorly known species (Map 4). *Sepedophilus campbelli* was recommended for state listing as S3 rank in Missouri based on rarity there and elsewhere (Watrous 2008). Although one specimen has been found on a dead chicken (Campbell 1976), *S. campbelli* is probably a litter or subcortical species.

### ***Sepedophilus marshami* (Stephens, 1832)**

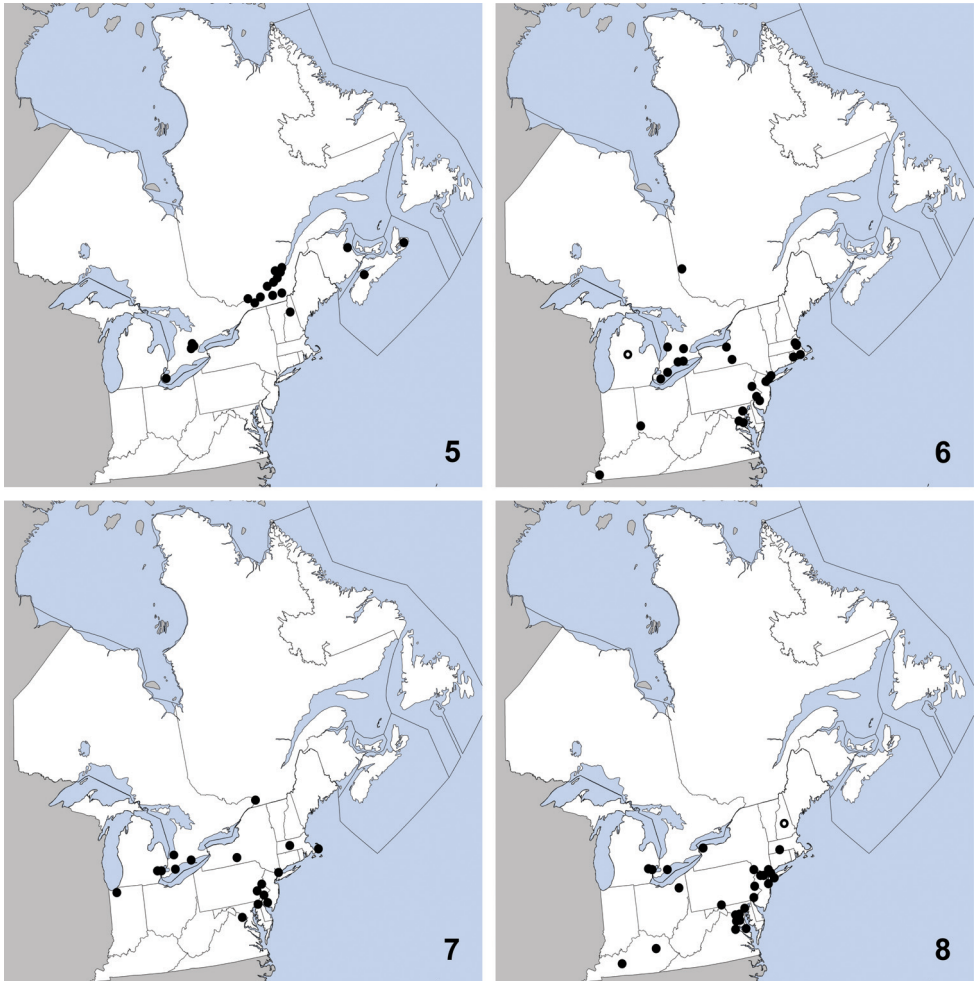
**Materials.** UNITED STATES: NH: Coos Co., Jefferson, under bark, 20-IV-2010, T. Murray (1).

CANADA: ON: Essex Co., Kingsville, 14-V-1973, R. Roughly (1); Waterloo Reg., Blair, RARE, Cruickston Creek, yellow pan traps, 15 to 20-VI-2006, S.A. Marshall and M. Bergeron (1); Blair, Dickie Settlement Rd. nr. WhistleBear golf course, 43.373 -80.400, hedgerow, pitfall, 13-X-2009 (1), 10-XI-2009 (1), A. Brunke; Blair, Fountain St. S. nr Speed River, 43.391 -80.373, hedgerow, pitfall, 13-X-2009 (1), 10-XI-2009 (1); Blair, Whistlebare Rd. and Township Rd.1, 43.372 -80.362, hedgerow near soybean field, pitfall trap, 2-XI-2010 (2); Wellington Co., Arkell, 27-IX-1986, L. Work (1); Belwood Lake, lake margin, fallen log overhang, 3-VI-2008, S.A. Marshall (1); Eramosa, Wellington County Rds. 124 and 29, 43.615 -80.215, hedgerow, pitfall, 4-V-2010, A. Brunke (1); Guelph, 19-V-1981, G.M. Grant (1); Guelph, in rotten wood, 20-IV-2007, S.P.L. Luk (1); Guelph, Preservation Park, under bark, 21-IX-2010, S.P.L. Luk (1).

**Diagnosis.** *Sepedophilus marshami* may be distinguished from all other members of the genus in eastern North America except *S. testaceus* by the following combination of characters: body size large (>2.3mm from clypeus to elytral apex); tergite seven with a white, apical, palisade fringe and at least one pair of bristles; elytra reddish but without distinct, reddish basal markings; middle-tibia with two apical spines (Campbell 1976). It differs from *S. testaceus*, another exotic species in North America, by the distinctly elongate seventh antennomere, which is subquadrate to weakly transverse in *S. testaceus*. Specimens of *S. testaceus* with rather reddish elytra do exist but these individuals are uniformly pale, while in *S. marshami* the pronotum is distinctly darker than the elytra.

This exotic, Palearctic species was first collected in North America in Quebec in 1959 (Campbell 1976) and has since been detected in Nova Scotia (Campbell 1976)

and New Brunswick (Majka and Klimaszewski 2008a). It was listed as questionably present in Ontario (Klimaszewski et al. 2010) but herein we confirm its widespread occurrence in the province as early as 1973 (Map 5). We also newly record *Sepedophilus marshami* for the United States (New Hampshire). This species is widespread in the Palaearctic region (Smetana *in* Löbl and Smetana 2004). In the Nearctic region, *Sepedophilus marshami* is typically collected from leaf litter and under loose, fungusy bark in disturbed woodland fragments although it also inhabits debris along freshwater and marine shorelines (Majka et al. 2008) and open areas including raspberry fields and woodland edges (Levesque and Levesque 1995).



**Maps 5–8.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **5** *Sepedophilus marshami* (Stephens) (Campbell 1976, Levesque and Levesque 1995, Majka and Klimaszewski 2008a) **6** *Sepedophilus occultus* (Casey) (Campbell 1976, Paquin and Dupérré 2001, Sikes 2003) **7** *Sepedophilus opicus* (Say) (Campbell 1976) **8** *Sepedophilus versicolor* (Casey) (Campbell 1976).

***Sepedophilus occultus* (Casey, 1884)**

**Materials.** CANADA: ON: **Huron Co.**, Benmiller, Sharpes Creek Line, 43.691 -81.608, hedgerow nr. creek, canopy trap in buckthorn, 22-VI-2009, A. Brunke (1); **Elgin Co.**, Orwell, 15-VI-1978, D. Morris (1); **Essex Co.**, Point Pelee Natl. Pk., wood area by W beach, malaise/pan traps, 10 to 23-IX-1999, O. Lonsdale (1); **Hald.-Norfolk Reg.**, Turkey Point Provincial Park, malaise trap, 3 to 28-VIII-2009, S. Paiero (1); **Kent Co.**, Rondeau Prov. Park, spicebush trail, 42°18'9N 81°51'6W, Carolinian forest, WPT, 16to17-VI-2003, Paiero and Carscadden (1); **Wellington Co.**, Guelph, University arboretum nature reserve, ex. Beech litter, 3-V-2009, Brunke and Cheung (1); Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, hedgerow, pitfall, 2-VI-2009, A. Brunke (1).

**Diagnosis.** *Sepedophilus occultus* can be distinguished from other northeastern *Sepedophilus* with a reddish area at the base of each elytron by the combination of: basal abdominal segments with short bristles only; elytral epipleuron with few or no setae on its basal half; pronotum uniformly colored; elytra without coarse bristles laterally; apical ctenidium of mesotibia restricted to the apex (Campbell 1976). The individual from Kent County has a uniformly reddish body and may be slightly teneral. Similar specimens can be recognized by the unique combination of the elytral epipleuron with few or no setae on its basal half and the impunctate elytral apex.

This species is widely distributed in eastern North America and was previously known from Connecticut, District of Columbia, Georgia, Illinois, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New York, Ohio, Pennsylvania (Campbell 1976), Missouri (Watrous 2008) Rhode Island (Sikes 2003), and Quebec (Paquin and Dupérré 2001). Herein we report it as new for Ontario (Map 6). *Sepedophilus occultus* is a forest-dwelling species that has been collected mainly from leaf litter and under bark. Its presence in the Boreal Forest Region of Québec (Paquin and Dupérré 2001) is surprising considering its more southern distribution elsewhere but this probably reflects the inadequate knowledge of Canada's boreal insect fauna rather than a disjunct population.

***Sepedophilus opicus* (Say, 1834)**

**Materials.** CANADA: ON: **Hald.-Norfolk Reg.**, Backus Tract Woods, sifting leaf litter under mushrooms, 7-VI-2009, A. Brunke and L. DesMarteaux (5); Backus Tract Woods, sifted litter in sugar maple-dominated, mesic forest, 2-IV-2010, A. Brunke (1); **Kent Co.**, Rondeau Prov. Pk., spicebush trail, carolinian forest, malaise, 16 to 29-VII-2003, S. Marshall et al. (1); Rondeau Prov. Pk., south point trail, slough forest, sifting leaf litter, 27-IX-2009, A. Brunke and D.K.B. Cheung (1). **Lambton Co.**, Pinery Prov. Pk., Carolinian Trail, hardwood forest, litter around white pines, 17-IV-2010, A. Brunke (3).

**Diagnosis.** *Sepedophilus opicus* can be distinguished from other members of genus in northeastern North America by a combination of: base of elytra with reddish mark-



ings extending laterally to the margin; basal abdominal segments with long bristles; elytral epipleuron uniformly setose; pronotal microsculpture distinct (Campbell 1976).

This widely distributed species is known from Alabama, Florida, Illinois, Indiana, Iowa, Maryland, Massachusetts, Michigan, Missouri, New Jersey, New York, North Carolina, Pennsylvania, Québec, Texas, and Virginia (Campbell 1976). Herein we newly record it from Ontario (Map 7). *Sepedophilus opicus* appears to be confined to deciduous forests in litter, under bark and on mushrooms, and reaches its northern distributional limit in southern Canada. A large number of individuals were found on fresh mushrooms (~35, 5 taken as vouchers) in Backus Tract Woods, Ontario and this may be a preferred microhabitat.

### ***Sepedophilus versicolor* (Casey, 1884)**

**Materials. CANADA: ON: Kent Co.,** Rondeau Prov. Pk., spicebush trail, Carolinian forest, malaise, 3 to 16-VII-2003 (1), 15-VIII to 7-IX-2003 (1), Marshall et al., 16 to 29-VII-2003, S.A. Marshall (1).

**Diagnosis.** *Sepedophilus versicolor* can be easily separated from others of the genus except *S. crassus* and *S. ctenidialis* by the apical ctenidium of the mesotibia, which extends upwards along the lateral edge (Campbell 1976). It is best distinguished from *S. crassus* and *S. ctenidialis* by the combination of: abdominal sternites four to six with three lateral bristles; abdominal sternites five and six with only one bristle at each side of the midline; smaller size (2.0–2.5mm from clypeus to elytral apex).

This species is broadly distributed in eastern North America and was previously known from District of Columbia, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, and Virginia (Campbell 1976). Herein we newly record it from Canada (Ontario) (Map 8). This species apparently reaches its northern limit in Ontario's Carolinian forests. Little is known about its bionomics although it has been found on mushrooms (Campbell 1976) like the related *S. crassus* and in a 'rotten stump with a small nest' (Watrous 2008).

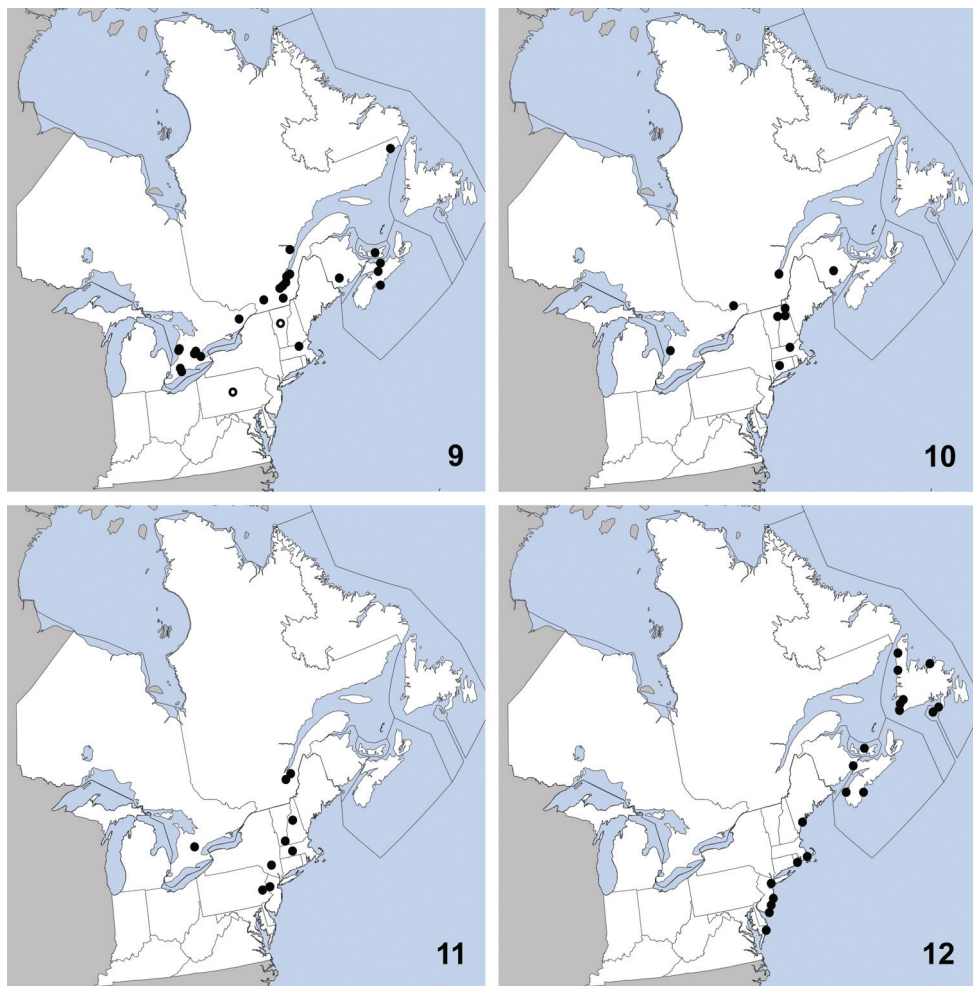
### ***Tachinus corticinus* (Gravenhorst, 1802)**

**Materials. UNITED STATES: MA: Middlesex Co.,** Groton, 22-IV-2010, T. Murray (1).

**Diagnosis.** *Tachinus corticinus* is easily distinguished from congeners in northeastern North America by the combination of: pronotum and elytra lacking microsculpture; pronotum with at least borders paler than head; female tergite eight with all lobes of similar size; male sternite seven without apical lobes; small size (3.00–3.75 mm from clypeus to apex of elytra).

This exotic species was first collected in North America in St. Cyrville, Québec in 1967 and was first recognized in North America by Campbell (1975). Since then it has been detected in Vermont, Pennsylvania (Byers et al. 2000), Nova Scotia (Schülke

2006), New Brunswick, Prince Edward Island (Majka and Klimaszewski 2008a) and Ontario (Brunke et al. 2009). Herein we record it as new for Massachusetts (Map 9). *Tachinus corticinus* is widespread in the Palearctic region (Smetana in Löbl and Smetana 2004) and has been collected in a variety of open and forested habitats. Although most individuals captured in Hannover, Germany were brachypterous (Assing 1992), Levesque and Levesque (1995) found that nearly all individuals captured in Québec raspberry fields were fully winged. All specimens deposited in DEBU were found to be brachypterous but fully winged individuals do exist in Ontario as *T. corticinus* was captured in small numbers in raised pan traps (A. Brunke *unpublished data*).



**Maps 9–12.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **9** *Tachinus corticinus* (Gravenhorst) (Campbell 1975, Levesque and Levesque 1995, Byers et al. 2000 Majka and Klimaszewski 2008a, Brunke et al. 2009) **10** *Tachyporus browni* Campbell (Campbell 1979, Klimaszewski et al. 2005) **11** *Tachyporus ornatus* Campbell (Campbell 1979) **12** *Bledius neglectus* Casey (Herman 1976, Majka et al. 2008).

### *Tachyporus browni* Campbell, 1979

**Materials.** CANADA: ON: Huron Co., Benmiller, Sharpes Creek Line, 43.691–81.608, soybean field, pitfall, 18-IX-2009, A. Brunke (1).

UNITED STATES: NH: Coos Co., Dixville, leaf litter, 6-IV-2010, T. Murray (1); Jefferson, leaf litter, grassy area near stream, 20-IV-2010, T. Murray (1); Dixville, 4-V-2010, T. Murray (4). MA: Middlesex Co., Groton, sifting hay, flood debris in farm field nr. drainage ditch, 30-IV-2010, T. Murray (1). VT: Orange Co., Topsham, sweeping low vegetation, 22-VI-2010, T. Murray (1).

**Diagnosis.** *Tachyporus browni* can be easily recognized amongst other northeastern *Tachyporus* by the combination of a bicolored abdomen and elytra without black discal markings (Fig. 4). Rarely, specimens occur with a small black marking on the scutellum but it does not extend half the length of the elytra as in *T. elegans* Horn. Additionally, *T. elegans* lacks dark markings on the pronotum.

This distinctive species was known from 12 specimens at the time of its description, all collected from September to November in southern Québec and Connecticut (Campbell 1979). Klimaszewski et al. (2005) newly recorded it from red spruce-dominated forest in New Brunswick. Herein we newly report *Tachyporus browni* from Ontario, New Hampshire, Massachusetts, and Vermont (Map 10). Habitat data suggests that *Tachyporus browni* inhabits moist or wet litter/debris near water. Most of the specimens known are from the cooler months of the year and this seasonality is probably responsible for its rarity in collections. This phenomenon is common for many staphylinid groups (e.g., winter-active Omaliinae in Campbell 1978) and suggests that increased sampling during September to April will yield further discoveries.

### *Tachyporus ornatus* Campbell, 1979

**Materials.** CANADA: ON: Wellington Co., Belwood Lake, lake margin, fallen log overhang, 3-VI-2008, S.A. Marshall (1).

**Diagnosis.** *Tachyporus ornatus* can be distinguished from all other large northeastern members of the genus except *T. lecontei*, by the combination of a non-bicolored abdomen and the crisp, dark markings on the elytra. From *T. lecontei* it is most easily identified by the fine microsculpture of the elytra which produces a strong metallic sheen (the former species completely lacks microsculpture).

This species is transcontinental in North America with a disjunct population in the Rocky Mountains of Colorado. It was previously known from the following states and provinces: Alberta, Colorado, Manitoba, Massachusetts, New Hampshire, New Jersey, New York, North Dakota, Pennsylvania, Québec, Saskatchewan, and Vermont. Herein we newly record it from Ontario (Map 11). The only habitat data in Campbell (1979) - “treading under *Alnus*”, and the lakeside habitat of the Ontario specimen recorded here suggest an affinity for decaying organic matter near water, but further collecting is necessary to confirm this.

## Oxytelinae

### *Bledius neglectus* Casey, 1889

**Materials. CANADA: PEI:** Stanhope Beach, National Park, débris vég. sur plage (=beach debris), 23-VII-1979 (2) R. Sexton.

**Diagnosis.** *Bledius neglectus* can be identified to the *B. basalis* group of species by the combination of the complete elytral epipleuron, the undivided labrum and the lack of a suture on the epipleuron (Herman 1976). Within this group in northeastern North America, it is best recognized by the combination of: pronotal pubescence directed toward the midline; dark elytral maculation reaching lateral margin of scutellum; basal angle of pronotum strongly sinuate; pronotum with coarse punctures, separated by their widths.

This species is widely distributed along the coast of eastern North America and was previously known from Georgia, Maine, Maryland, Massachusetts, Newfoundland, New Jersey, New York, North Carolina, Nova Scotia, Rhode Island (Herman 1976), and New Brunswick (Majka et al. 2008). Herein we newly report it from Prince Edward Island (Map 12). It occurs along marine coastline on 'moist, un-vegetated flats', intertidal zones and often away from shore on the leeward sides of islands and peninsulas (Herman 1976). The specimen from vegetative beach debris in Prince Edward Island may have been a dispersing individual seeking refuge from desiccation.

## Steninae

### *Stenus clavicornis* (Scopoli, 1763)

**Materials. UNITED STATES: MA: Middlesex Co.,** Groton, 30-IV-2010, T. Murray, (1).

**CANADA: ON: Halton Reg.,** Milton, Derry Rd. and 4<sup>th</sup> line, grass field, yellow pans, 23 to 24-VI-2001, S. Paiero, (1); **Huron Co.,** Auburn, Hullett-McKillop Rd. nr. Limekiln Line, 43.744 -81.507, soybean field, pitfall, 4-VIII-2010 (1), A. Brunke; Auburn, Limekiln Line, 43.736 -81.506, hedgerow, pitfall, 26-V-2010 (1), A. Brunke; Benmiller, Sharpes Creek Line, 43.691 -81.608, hedgerow nr. creek, canopy trap in buckthorn, 11-V-2009 (2), A. Brunke; Brucefield, London Rd. nr. Centennial Rd., 43.509 -81.516, hedgerow nr. creek, pitfall, 11-V-2009 (1), A. Brunke; **Ottawa,** Carleton Place, 12-IX-1992, W. Bennett, (1); **Peel Reg.,** Cooksville, pond margin, 30-V-1993, C. Krupke, (1); **Waterloo Reg.,** Blair, Whistlebare Rd. and Township Rd.1, 43.372 -80.362, hedgerow, pitfall, 18-V-2010 (1), A. Brunke; **Wellington Co.,** Guelph, 10-IX-1980, Y. Deedat; Guelph, 17-IX-1980, Y. Deedat; Guelph, University Arboretum, 1-X-2005, M. Bergeron, (1); Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, soybean field, canopy trap, 23-VI-2009 (1), A. Brunke; **York Reg.,** Stouffville, V-1982, Brian Brown, (1);

**Diagnosis.** *Stenus clavicornis* is, at present, only reliably distinguished from congeners in North America by its characteristic aedeagus (Fig. 14).

This exotic, Palearctic species was first recognized in North America by Puthz (1975) based on specimens collected in Québec as early as 1968 in Orsainville. Since then it has been detected in New Brunswick (Campbell and Davies 1991), Prince Edward Island (Klimaszewski et al. 2010), New Hampshire, Pennsylvania (Puthz 1994), Maine (Chandler 2001), and Nova Scotia (Majka and Klimaszewski 2008a). Herein we report *S. clavicornis* from Ontario and Massachusetts on the basis of specimens collected as early as 1980 and 2010, respectively (Map 13). Its native range is very broad and includes most of the Palearctic region (Smetana *in* Löbl and Smetana 2004). In North America, this species has been collected from a variety of habitats including open fields, agricultural land, woodlots, and the margins of ponds and salt marshes.

## Paederinae

### *Eustilicus tristis* (Melsheimer, 1844)

**Materials. United States: VA: Giles Co.,** Ripplemead, Rte. 460 at bridge, flood debris, 11 to 25-V-2008 (6) A. Brunke.

**Diagnosis.** *Eustilicus tristis* is the only northeastern member of the genus and its distinct habitus will readily identify it as a *Eustilicus* (Fig. 5).

This species is rarely collected and at the time of the most recent revision, it was only known from scattered localities in District of Columbia, Kentucky, New Jersey, Missouri, Oklahoma, Texas (Herman 1970), Arkansas, and South Carolina (Sanderson 1947). *Eustilicus tristis* was described from ‘Pennsylvania’ by Melsheimer (1844) but no locality was given. Sanderson (1947) stated that it had been recorded from Ohio but we could find no mention of this in the literature. We here newly record it from Virginia (Map 14). This species appears to be a specialist in stream and river drift/flood litter, although it is occasionally found in caves (Peck and Thayer 2003). Watrous (2008) recently recommended *Eustilicus tristis* for S3 ranking in Missouri based on its specialized, sensitive habitat and general rarity over its known distribution.

### *Medon fuscus* (Mannerheim, 1830)

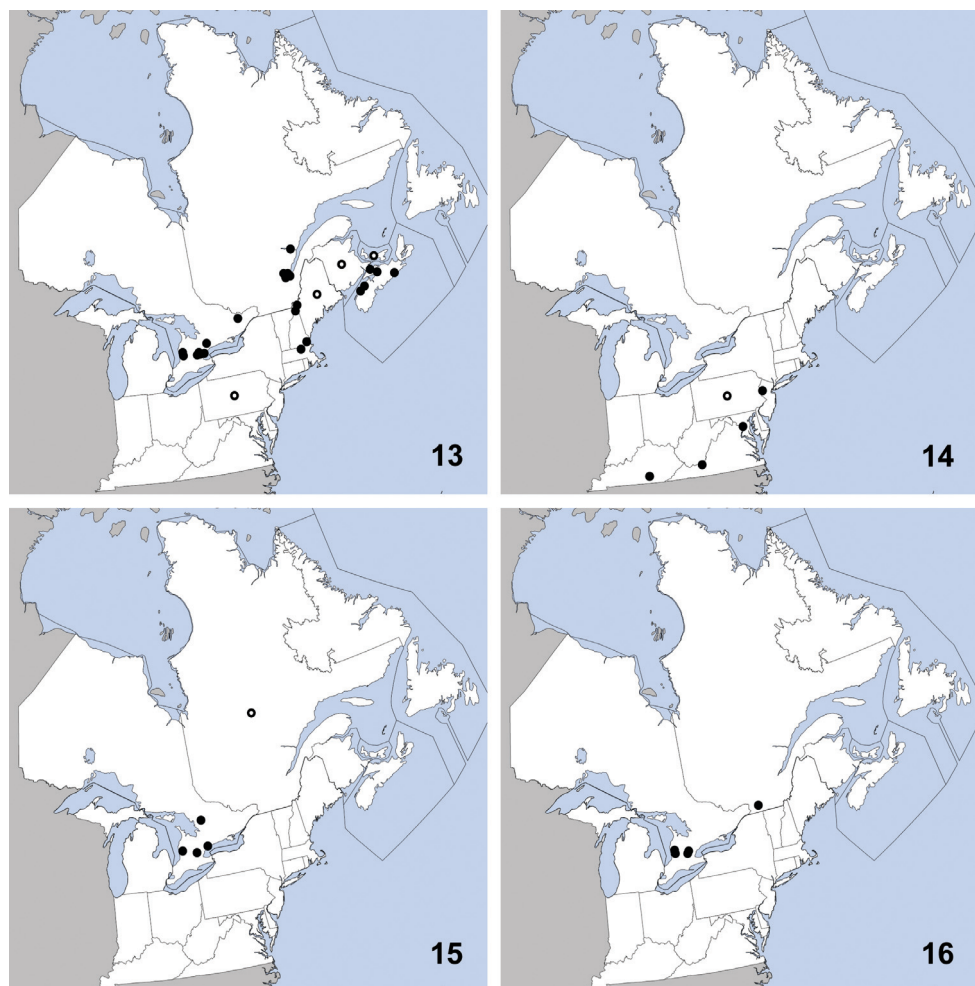
**Materials. CANADA: ON: Huron Co.,** Auburn, Hullett-McKillop Rd. nr. Limekiln Line, 43.742 -81.514, hedgerow, pitfall, 26-V-2010 (1) A. Brunke; Auburn, Limekiln Line, 43.736 -81.506, hedgerow, canopy trap in buckthorn, 26-V-2010 (2) A. Brunke; Benmiller, Sharpes Creek Line, 43.691 -81.608, hedgerow nr. creek, pitfall, 11-V-2009 (1) A. Brunke; **Muskoka Reg.,** S. Waseosa Rd., 8-VII-1996 (1) W. J. Crins; **Wellington Co.,** Guelph, 26-V-1978 (1) Ron O. Kreazer; Guelph, under rock, 16-



III-1983 (1) Brian Brown; Guelph, University Arboretum nature reserve, sifting beech litter, 3-V-2009 (4) A. Brunke and D.K.B. Cheung, sifting litter, 6-VI-2009 (1) A. Brunke; **York Co.**, Toronto, 2-V-1959 (2) R. J. Pilfrey.

**Diagnosis.** The genus *Medon* is in need of revision in North America, and *Medon fuscus* is currently recognizable in North America only from the characteristic modifications of the male seventh sternite and aedeagus (Fig. 15–16).

This exotic, Palearctic species was first recognized in North America by Campbell and Davies (1991) from Québec but specimen data were not given and the Palearctic species had not yet been revised at that time. Herein we confirm its presence in North



**Maps 13–16.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **13** *Stenus clavicornis* (Scopoli) (Puthz 1975, Puthz 1994, Campbell and Davies 1991, Chandler 2001, Majka and Klimaszewski 2008a, Klimaszewski et al. 2010) **14** *Eustilicus tristis* (Melsheimer) (Melsheimer 1884, Sanderson 1947, Herman 1970) **15** *Medon fuscus* (Mannerheim) (Campbell and Davies 1991) **16** *Scopaeus minutus* Erichson (Frisch et al. 2002).

America based on comparisons with illustrations in Assing (2004) and newly report it from Ontario based upon specimens collected across southern Ontario as early as 1959 (Map 15). *Medon fuscus* is widely distributed in the Palaearctic region (Smetana *in* Löbl and Smetana 2004). In North America, specimens have been sifted from deciduous litter in a small fragment of mature forest and found under a rock. *Medon fuscus* is a common species in its native range and typically inhabits leaf litter and compost (Assing 2004).

### ***Scopaeus minutus* Erichson, 1840**

**Materials. CANADA: ON: Huron Co.,** Auburn, Hullett-McKillop Rd. nr. Limekiln Line, 43.742 -81.514, soybean field, pitfall, 23-VI-2010 (6), 7-VII-2010 (6), 21-VII-2010 (4), 1-IX-2010 (1), A. Brunke; Benmiller, Sharpes Creek Line, 43.691 -81.608, hedgerow nr. creek, canopy trap in buckthorn, 22-VI-2009 (1) A. Brunke; Brucefield, London Rd. nr. Centennial Rd., 43.509 -81.516, soybean field, canopy trap, 22-VI-2009 (1) A. Brunke; **Waterloo Reg.,** Blair, Dickie Settlement Rd. nr. WhistleBear golf course, 43.373 -80.400, soybean field, pitfall, 23-VI-2009 (1), 7-VII-2009 (2), 21-VII-2009 (1), A. Brunke; Blair, Fountain St. S. nr Speed River, 43.391 -80.373, soybean field, pitfall, 23-VI-2009 (3), 7-VII-2009 (1) A. Brunke; Blair, Whistlebare Rd. and Township Rd. 1, 43.372 -80.362, soybean field, pitfall, 13-VII-2010 (4), A. Brunke; Blair, Whistlebare Rd. and Township Rd. 1, 43.367 -80.358, soybean field, pitfall trap, 15-VI-2010 (3), 27-VII-2010 (1), A. Brunke. **Wellington Co.,** Eramosa, Wellington County Rds. 124 and 29, 43.615 -80.215, soybean field, pitfall, 13-VII-2010 (2); Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, soybean field, pitfall trap, 23-VI-2009 (23), 7-VII-2009 (4), 21-VII-2009 (11), 4-VIII-2009 (1), 18-VIII-2009 (2), 1-IX-2009 (1), 15-IX-2009 (4); Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, soybean field, vacuum sampled from soybean foliage at 8pm, 16-VII-2009.

**Diagnosis.** The diverse genus *Scopaeus* is greatly in need of revision in North America and thus, *Scopaeus minutus* can only be recognized currently by the form of the aedeagus (Fig. 17).

This exotic Palaearctic species was first reported from North America by Frisch et al. (2002) from Montreal, Québec, Canada; however, no specimen data were provided. Herein we confirm its presence in North America and newly report it from Ontario based on numerous voucher specimens collected from 2009–2010 (Map 16). It is widely distributed in the Palaearctic region (Smetana *in* Löbl and Smetana 2004). The North American material was collected in passive traps in soybean fields and woodlot edges. *Scopaeus minutus* is less hygrophilus than others of the genus (Frisch et al. 2002) and is typically found in habitats undergoing early stages of succession (Boháč 1985).

***Sunius melanocephalus* (Fabricius, 1792)**

**Materials.** CANADA: ON: Huron Co., Auburn, Hullett-McKillop Rd. nr. Limekiln Line, 43.742 -81.514, hedgerow, canopy trap in buckthorn, 26-V-2010 (1); Waterloo Reg., Blair, Whistlebare Rd. and Township Rd. 1, 43.367 -80.358, hedgerow, pitfall, 4-V-2010 (1); Wellington Co., Eramosa, Wellington County Rds. 124 and 29, 43.615 -80.215, hedgerow, pitfall, 4-V-2010 (1).

**Diagnosis.** *Sunius melanocephalus* may be easily recognized among other north-eastern members of the genus by the combination of the non-serrate lateral margins of the pronotum and the bicolored body.

This species was accidentally introduced from the Palaearctic region to North America and was first recognized on the continent by Hoebeke (1991) from specimens collected in New York as early as 1924. Since then, it has been detected in Pennsylvania, Vermont (Byers et al. 2000), and Québec (Campbell and Davies 1991). As specimen data were not provided for the Québec record, this species' presence in Canada was uncertain. Herein we verify its occurrence in Canada and newly record it from Ontario based on collections made in 2010 (Map 17); no earlier collections of this species in Ontario were present in DEBU. In the Palaearctic region *Sunius melanocephalus* is widely distributed (Smetana in Löbl and Smetana 2004) and inhabits a wide variety of habitats including grasslands, swamps, riverbanks, gardens, parks, arable land and mammal burrows (Assing 2008). The Ontario specimens were captured in passive traps at the edges of woodlots.

**Staphylininae*****Acylophorus agilis* Smetana, 1971**

**Materials.** CANADA: ON: Middlesex Co. London, Southern Crop Protection Research Centre, pitfall trap/Masner trap, 21-VI-1995, T. Sawinski (1); Simcoe Co., Noisy River, Prov. Nature Res., beaver lodge, 28-IX-2008, S.A. Marshall (1).

**Diagnosis.** At present, *Acylophorus agilis* is reliably separated from others in the diverse *Acylophorus pronus*-group only by the characteristically shaped paramere of the aedeagus (Fig. 169 in Smetana 1971).

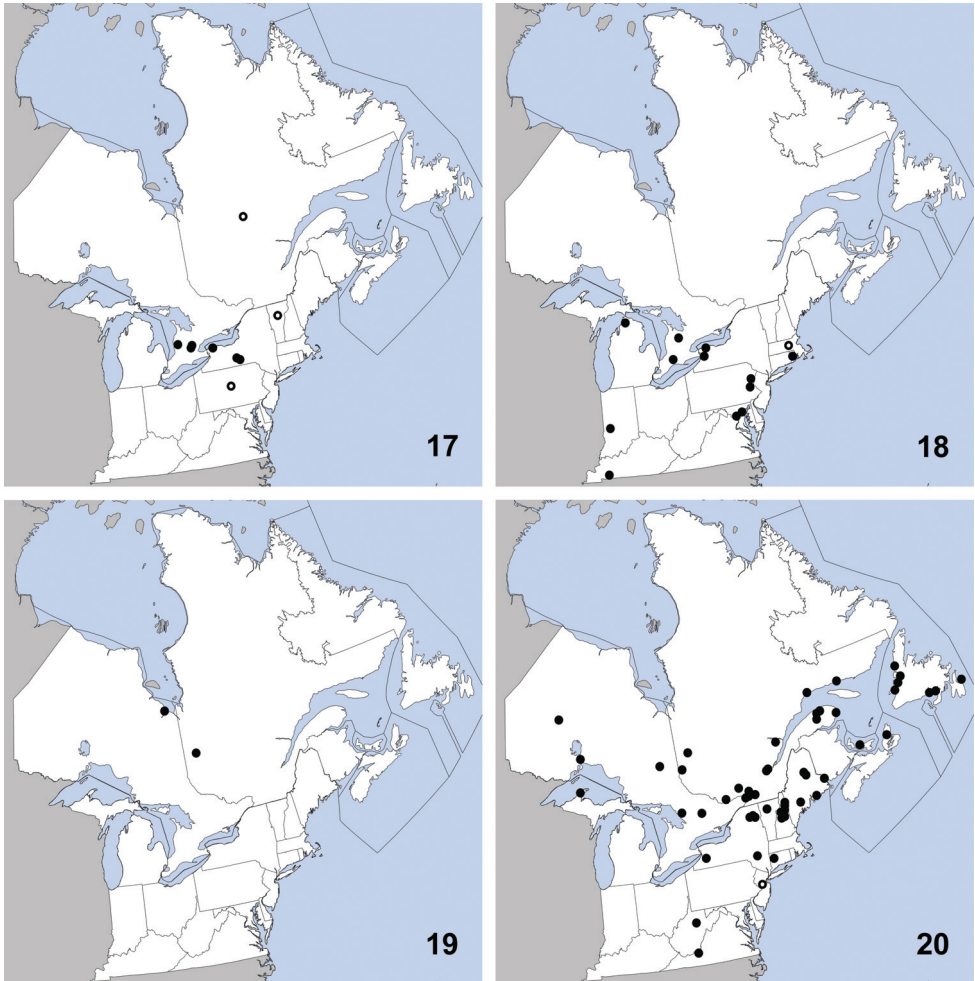
This species is widely distributed in eastern North America, and was previously known from Indiana, Maryland, Massachusetts, Michigan, New York, North Carolina, Pennsylvania, Rhode Island, Missouri, (Smetana 1971), Illinois, and Kentucky (Smetana 1978). Herein we newly record it from Canada (Ontario) (Map 18). *Acylophorus agilis* has been collected in a variety of periaquatic habitats including 'floating grass patches' in a eutrophic pond (Smetana 1971), in sediment-laden debris at the edge of forest creeks (Smetana 1978), at the edge of a sinkhole pond (Watrous 2008), and from debris in a beaver lodge.

***Bisnius cephalicus* (Casey, 1915)**

**Materials.** CANADA: ON: **Cochrane Dist.**, N. Moosonee, sandy beach, ridge along coastal marsh, *Picea*, *Populus*, *Alnus* and herbs, pitfall trap, 23-VI-1990, J. Pilny, (1).

**Diagnosis.** *Bisnius cephalicus* is readily distinguished from others of the genus in the northeast by the combination of: body bicolored with orange elytra; pronotum with five punctures in each dorsal row; eyes small, with the space behind them about three times longer (Fig. 6).

At the time of the most recent revision of the genus, this species was known from only two specimens, from Alberta and Manitoba (Smetana 1995). Later, one specimen



**Maps 17–20.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **17** *Sunius melanocephalus* Fabricius (Campbell and Davies 1991, Hoebeke 1991, Byers et al. 2000) **18** *Acylophorus agilis* Smetana (Smetana 1971, 1978) **19** *Bisnius cephalicus* (Casey) (Smetana 1995, Paquin and Dupérré 2001) **20** *Bisnius siegwaldii* (Mannerheim) (Smetana 1995, Paquin and Dupérré 2001).

was collected in the northern Boreal Forest Region of Québec (Paquin and Duperré 2001). Herein we report the fourth specimen known and newly record *B. cephalicus* from boreal Ontario (Map 19). This species is apparently transboreal in distribution and its poor representation in collections may be due to a cryptic microhabitat. Its relatively small eyes suggest a subterranean existence in the burrows of mammals, similar to that of certain other *Bisnius* species.

***Bisnius siegwaldii* (Mannerheim, 1843)**

**Materials.** UNITED STATES: VA: Giles Co., Mountain Lake, on dead fox squirrel, 11 to 25-V-2008, A. Brunke (3).

CANADA: PEI: Long Pond, National Park, milieu marécageux (=marshy environment), 30-VII-1979, R. Sexton (2); West Covehead, débris sur la plage (=beach debris), 25-VII-1979, R. Sexton, (3).

**Diagnosis.** *Bisnius siegwaldii* is easily recognized among other species of the genus in the northeast by the combination of: body not bicolored; elytra dark; pronotum with at least five punctures in each dorsal row; head with punctures arranged to form a 'V' (Smetana 1995) (Fig. 7).

This species is transcontinental across northern North America with several collections made further south in both the east and west. It is currently known from Alaska, Alberta, British Columbia, California, Connecticut, Maine, Manitoba, Michigan, Montana, Newfoundland, New Brunswick, New Hampshire, New York, North Carolina, Nova Scotia, Northwest Territories, Ontario, Oregon, Québec, Saskatchewan, Tennessee, Vermont, Washington, West Virginia, Wisconsin, and Yukon Territory (Smetana 1995). Herein we newly record it from Prince Edward Island and Virginia (Map 20). *Bisnius siegwaldii* is a common species found in carrion, dung, rotting fungi, decaying plant matter and wood, moss, and in vegetation near water (Smetana 1995).

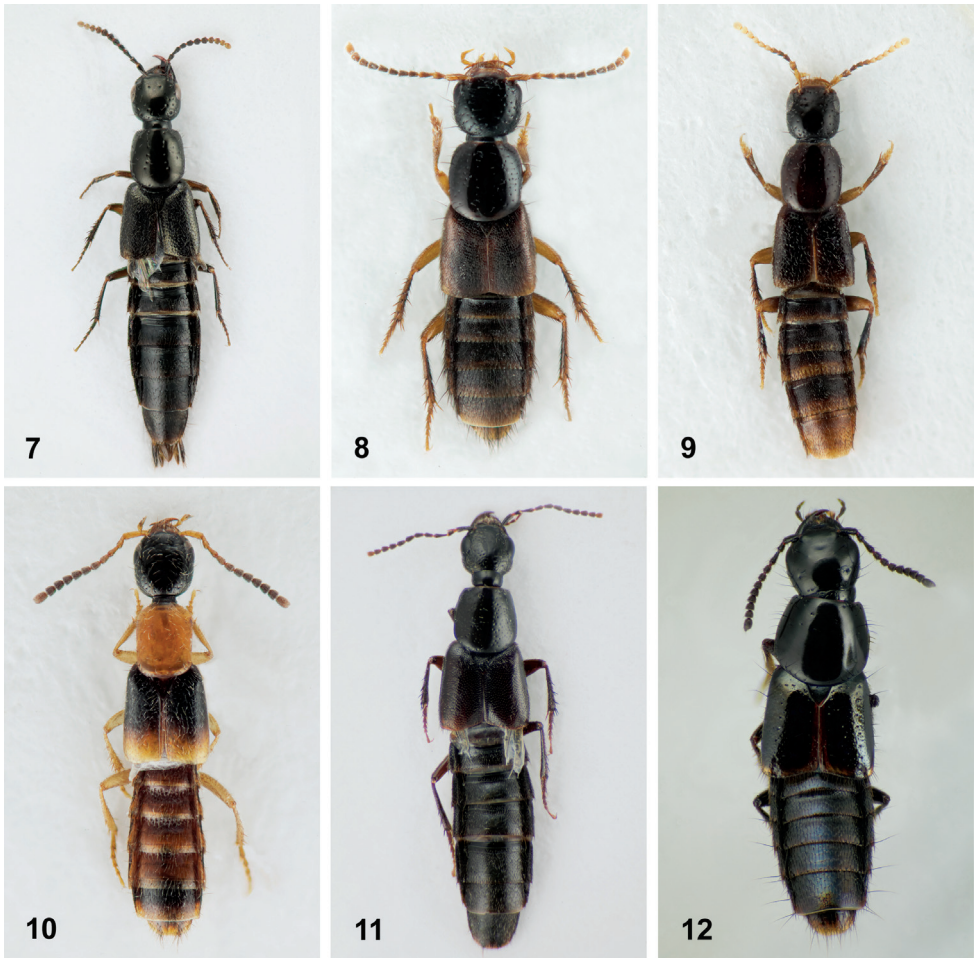
***Erichsonius brachycephalus* Frank, 1975**

**Materials.** CANADA: ON: Huron Co., Brucefield, London Rd. nr. Centennial Rd., 43.509 -81.516, hedgerow nr. creek, canopy trap in buckthorn, 11-V-2009, A. Brunke (1); QC: La Vallée-de-la-Gatinaeu, Martindale, hutte à castor (=beaver lodge), 19-IX-1976, R. Sexton (26).

**Diagnosis.** This species is easily recognized among others of the genus with a sparsely punctate forebody by its large size (>4.7mm from clypeus to abdominal apex) and transverse head with slightly converging temples (Fig.8).

*Erichsonius brachycephalus* was previously known from Illinois, Maine, Massachusetts, New Jersey, Texas (Frank 1975), Virginia (Frank 1981a), and New Hampshire (Chandler 2001). Watrous (2008) reported it from Missouri based on specimens collected in stream drift and leaf litter. Herein we newly record it from Canada (Ontario





**Figures 7–12.** Dorsal habitus. **7** *Bisnius siegwaldii* (Mannerheim) **8** *Erichsonius brachycephalus* Frank **9** *Erichsonius parvus* (Horn) **10** *Neobisnius terminalis* (LeConte) **11** *Philonthus vulgatus* Casey **12** *Quedius cinctus* (Paykull).

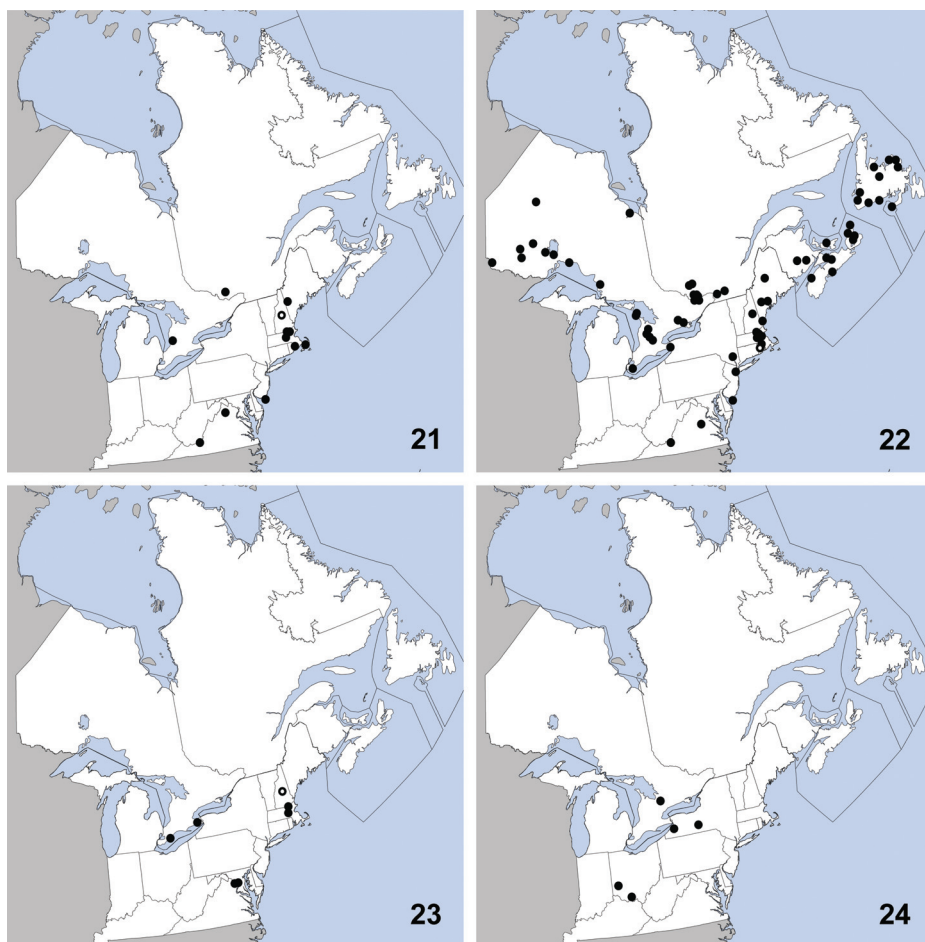
and Québec) and suggest that this species is broadly distributed in northeastern North America, reaching its northern limit in southernmost Canada (Map 21). All available habitat data suggest that this species is strongly associated with decaying vegetative debris along the edges of ponds, lakes, streams, and rivers. Despite the long series from Quebec beaver lodges, we have not found this species during our searches of beaver lodges in Ontario.

***Erichsonius nanus* (Horn, 1884)**

**Materials. CANADA: PEI:** Long Pond National Park, milieu marécageux (=marshy environment), 30-VII-1979, R. Sexton (2).

**Diagnosis.** *Erichsonius nanus* can be recognized among the other densely punctate species in northeastern North America by its larger size (>4.4mm, from clypeus to abdominal apex), and the apical portion of the median lobe of the aedeagus, which is distinctly thin and sinuate in lateral view (Fig. 18).

This species is widely distributed and was previously known from Alaska, British Columbia, Illinois, Maine, Massachusetts, New Brunswick, New Hampshire, Newfoundland, New Jersey, New York, Northwest Territories, Nova Scotia, Ontario, Québec, Washington, Wisconsin (Frank 1975), Virginia (Frank 1981a), and Rhode Island (Sikes 2003). Herein we newly report this species from Prince Edward Island (Map 22). *Erichsonius nanus* is found in a variety of habitats near water and can be collected in great numbers by sifting or treading the debris present there.



**Maps 21–24.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **21** *Erichsonius brachycephalus* Frank (Frank 1975, 1981a, Chandler 2001) **22** *Erichsonius nanus* (Horn) (Frank 1975, 1981a, Sikes 2003, Klimaszewski et al. 2005) **23** *Erichsonius parvus* (Horn) (Frank 1975, Chandler 2001) **24** *Gabrius amulius* Smetana (Smetana 1995).

***Erichsonius parvus* (Horn, 1884)**

**Materials.** CANADA: ON: Kent Co., Rondeau Prov. Pk., spicebush trail, Carolinian forest, yellow pans, 25-V-2003, M. Buck and S. Paiero (1); Rondeau Prov. Pk., spicebush trail, Carolinian forest, yellow pans, 16 to 17-VI-2003, Buck and Carscadden (1); Wainfleet bog, 8km S of Welland, DIE pt. 1 –north ditch (control), 10 to 24-V-1988, A. Stirling (1); 7 to 13-VI-1988, all collected by A. Stirling: D2H pt. 2 – ‘1962 zone’(1), D4H pt. 4 – ‘1980 zone’ (1), D5H pt. 5 – ‘1985 zone’(1), D5E pt. 5 – ‘1985 zone’ (1).

**Diagnosis.** *Erichsonius parvus* can be easily distinguished from other northeastern species of the genus with a sparsely punctate forebody, with the exception of *E. pusio*, by its small size (<3.6mm from clypeus to abdominal apex). Frank (1975) stated that *E. parvus* could be separated from *E. pusio* by the paler coloration, the smaller eyes and the head broader behind the eyes. Head shape was found to be highly variable in both males and females of *E. parvus* and this character should not be used to identify this species. However, the length of the pronotum appears to be a reliable character and is subequal to that of the elytra in *E. parvus* (Fig. 9) and clearly shorter in *E. pusio*. It should also be noted that the parameres of the aedeagus in *E. parvus* possess characteristic short, stout setae (Fig. 19) which were not illustrated by Frank (1975) but mentioned later in Frank (1981a). *Erichsonius pusio* lacks these setae on the parameres.

This species was previously known from Florida (Frank 1981), District of Columbia, Massachusetts, Louisiana, Virginia (Frank 1975), and New Hampshire (Chandler 2001). Herein we record it as new from Canada (Ontario) based on eight specimens, all collected in the Carolinian region of southern Ontario (Map 23). *Erichsonius parvus* has previously been collected by ‘sifting’, in ‘drift’ (Frank 1975) and at lights (Frank 1981a); all Canadian specimens were collected in wet habitats with abundant moss (bog, slough forest). In a survey of southern Ontario peatlands, Blades and Marshall (1994) reported *E. pusio* from Wainfleet bog based on a series of specimens found by the first author to be misidentified *E. parvus*. To our knowledge, no true *E. pusio* have been found in southern Ontario peatlands.

***Gabrius amulius* Smetana, 1995**

**Materials.** CANADA: ON: Simcoe Co. Midhurst, forest nr. Neretva St., under bark of large beech trunk, 4-IX-2009, A. Brunke and K. Brunke (1).

**Diagnosis.** *Gabrius amulius* may be recognized by the combination of: large size (at least 5.0mm long from clypeus to abdominal apex); eyes large, with temple that is distinctly less than twice as long as the eye; forebody without a greenish metallic lustre; elytra with sparsely distributed punctures that are separated by two to three times their diameter; area between basal lines on tergites two and three punctate

This apparently rare species was known from only five specimens at the time of its description (Smetana 1995) from localities in New York and Ohio. It was collected

in Missouri by Watrous (2008) in a flight intercept trap. Herein we newly report it from Canada (Ontario) (Map 24). All known specimens with microhabitat data were collected in deciduous forests in litter, or in the proximity of decaying wood. *Gabrius amulius* is almost certainly an uncommon specialist of deciduous or mixed forests.

### ***Gabrius appendiculatus* (Sharp, 1910)**

**Materials.** CANADA: ON: **Huron Co.**, Auburn, Hullett-McKillop Rd. nr. Limekiln Line, 43.744 -81.507, soybean field, pitfall, 23-VI-2010 (1), 7-VII-2010 (2), A. Brunke; Auburn, Limekiln Line, 43.736 -81.506, soybean field, pitfall, 23-VI-2010 (1), 7-VII-2010 (1), 4-VIII-2010 (1), 18-VIII-2010 (1), A. Brunke; **Waterloo Reg.**, Blair, Dickie Settlement Rd. nr. WhistleBear golf course, 43.373 -80.400, soybean field, pitfall, 23-VI-2009 (1), 7-VII-2009 (1), 21-VII-2009 (6), 4-VIII-2009 (1), A. Brunke; Blair, Dickie Settlement Rd. nr. WhistleBear golf course, 43.373 -80.400, hedgerow, canopy trap in buckthorn, 27-X-2009, A. Brunke (1); Blair, Fountain St. S. nr Speed River, 43.391 -80.373, soybean field, canopy trap, 15-IX-2009, A. Brunke (1); Blair, Whistlebare Rd. and Township Rd.1, 43.372 -80.362, hedgerow, pitfall, 4-V-2010, A. Brunke (1); Blair, Whistlebare Rd. and Township Rd.1, 43.372 -80.362, soybean field, pitfall, 29-VI-2010, A. Brunke (1); Blair, Whistlebare Rd. and Township Rd. 1, 43.367 -80.358, soybean field, pitfall trap, 13-VII-2010 (1), 25-VIII-2010 (1), A. Brunke; **Wellington Co.**, Eramosa, Wellington County Rds. 124 and 29, 43.615 -80.215, hedgerow, pitfall, 4-V-2010, A. Brunke (2); Eramosa, Wellington County Rds. 124 and 29, 43.615 -80.215, soybean, pitfall, 15-VI-2010 (3), 29-VI-2010 (3), A. Brunke; Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, soybean field, pitfall, 21-VII-2009 (1), 4-VIII-2009 (6), 1-IX-2009 (4), A. Brunke; Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, soybean field, canopy trap, 4-VIII-2009 (1), 18-VIII-2009 (1), A. Brunke

**Diagnosis.** *Gabrius appendiculatus* can be distinguished from congeners in the northeast by the following combination of characters: area between basal lines on tergites two and three impunctate; basal antennomeres not distinctly paler than rest of antenna; males with sternite eight broadly notched; females with tergite 10 pointed (as opposed to truncate) apically.

This Palearctic species was first recognized in North America by Smetana (1989) (as *G. subnigritulus* (Reitter)) based on specimens collected as early as 1978 in Ormstown, Québec and from other localities in British Columbia and Newfoundland; the earliest records from the west coast of North America were from 1979. Klimaszewski et al. (2005) newly recorded it from red spruce-dominated forests in New Brunswick. Herein we report the dispersal of *Gabrius appendiculatus* into the southern portion of Ontario from specimens collected in 2009–2010 (Map 25). No other specimens before this period are known to have been collected in Ontario. In its native range, *G. appendiculatus* is widespread in distribution (Smetana in Löbl and Smetana 2004). Numerous specimens collected from soybean fields in Ontario further support the

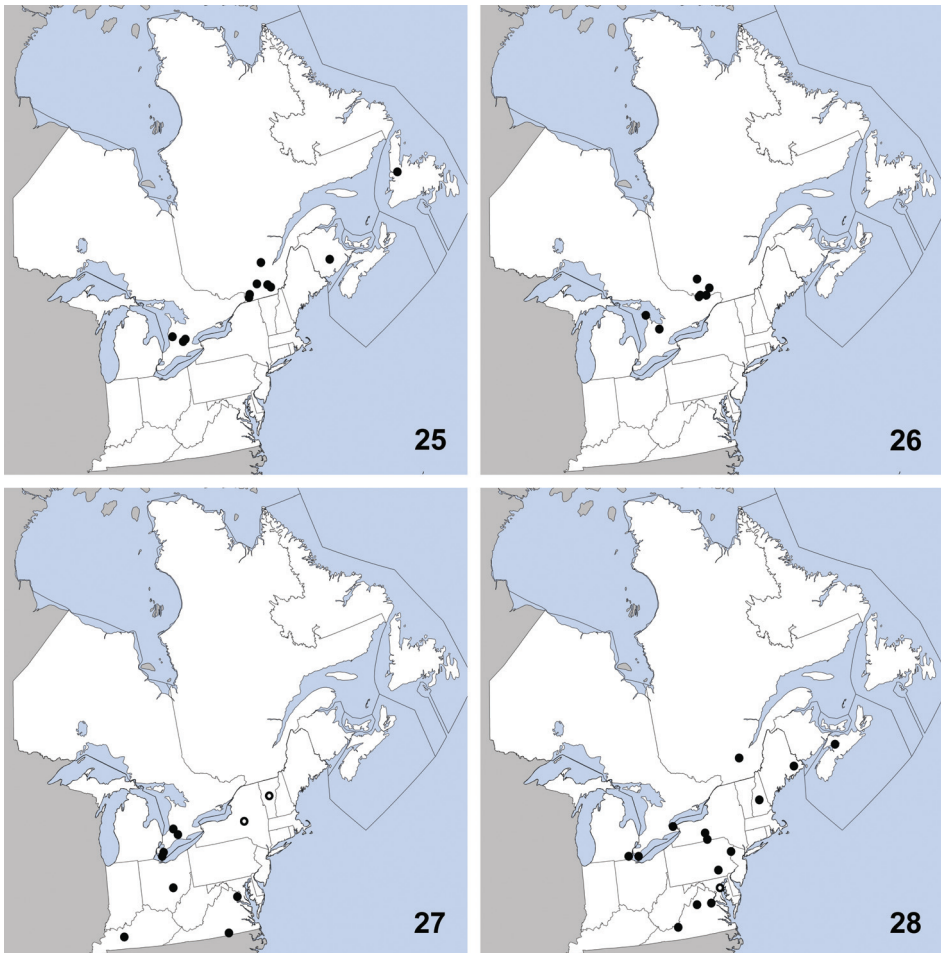


conclusion of Smetana (1989) that this species is well-adapted to agricultural habitat in North America.

### *Gabrius vindex* Smetana, 1995

**Materials.** CANADA: ON: **Bruce Co.**, Bruce Pen. Natl. Pk., Upper Andrew Lake, beaver lodge, 26-VII-2008, S. A. Marshall (1); **Simcoe Co.**, Noisy River Prov. Pk., Res., beaver lodge, 28-IX-2008, S.A. Marshall (1).

**Diagnosis.** *Gabrius vindex* is easily distinguished from all other species of the genus in northeastern North America except *Gabrius astutoides* by the combina-



**Maps 25–28.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **25** *Gabrius appendiculatus* (Sharp) (Smetana 1995, Klimazewski et al. 2005) **26** *Gabrius vindex* Smetana (Smetana 1995) **27** *Neobisnius occidentoides* Frank (Frank 1981b) **28** *Neobisnius terminalis* (LeConte) (Frank 1981b).



tion of: punctures of the elytra dense, separated by their widths or less; size large (at least 6.0mm from clypeus to abdominal apex); the area between the basal lines of tergites two and three punctate. From *G. astutooides* it is most easily separated by the shape of the pronotum which is narrowed anteriorly in *G. vindex* and parallel in *G. astutooides*.

This species is transcontinental in northern North America and was previously known from Alaska, Manitoba, Minnesota, and Québec (Smetana 1995). Herein we newly record *G. vindex* from Ontario (Map 26), representing the only known localities in northeastern North America other than the Gatineau area of Québec. All known specimens of *G. vindex* have been collected in debris adjacent to the water's edge, and Smetana (1995) suggested that beaver lodges provide ideal conditions for this species. The Ontario specimens and the 92 DEBU specimens from beaver lodges in the Gatineau area of Québec strongly support this.

### ***Neobisnius occidentoides* Frank, 1981**

**Materials.** CANADA: ON: **Essex Co.**, East Sister Is. Prov. Nature Res., dry pond bed, yellow pans, 30-VII-2003, S.A. Marshall (1); Leamington, pitfall trap, 17-VIII-1993 (1); **Huron Co.**, Centralia, Dev 1A, pitfall, 16-VIII-1992 (1); **Middlesex Co.**, London, southern crop protection research centre, corn pitfalls 3, 19-VII-1993 (1); London, southern crop protection research centre, pitfall/Masner trap, 2-VIII-1995, T. Sawinski (1).

**Diagnosis.** This species can be distinguished from other orange and black *Neobisnius* in northeastern North America by the combination of head completely lacking microsculpture, elytra with apically paler area limited to a narrow strip, and the maxillary palpi with at least one segment darkened.

*Neobisnius occidentoides* is a widespread species and was previously known from Alberta, Alabama, Arkansas, Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Louisiana, Manitoba, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, and Wyoming (Frank 1981b). This species is also known from Mexico. Herein we newly record it from eastern Canada based on several collections made in the Carolinian region of southern Ontario (Map 27). *Neobisnius occidentoides* is less strongly associated with water margins than are other bicolored species of the genus, and is frequently collected in agricultural fields with moist soil (Frank 1981b).

### ***Neobisnius terminalis* (LeConte, 1863)**

**Materials.** CANADA: ON: **Essex Co.**, Middle Is., shore, yellow pans, 11-VI-2003, S.A. Marshall (1); **Niagara Reg.**, Grimsby, J. Pettit (1).

**Diagnosis.** *Neobisnius terminalis* is easily recognized among other orange and black species of the genus in northeastern North America by the elytra with a broad, pale apical area (Fig. 10). In other northeastern species, this pale area is restricted to a narrow strip.

This species was previously known from Arizona, California, Colorado, Iowa, Maine, Maryland, Michigan, New Hampshire, New Mexico, New York, Nova Scotia, Pennsylvania, Québec, Texas, and Virginia (Frank 1981b). Herein we newly record it from Ontario (Map 28). It is also known from Costa Rica, Guatemala, Mexico, and Panama (unverified record) (Frank 1981b). Unlike *N. occidentoides*, *N. terminalis* is strongly associated with the margins of rivers and lakes and is found in litter or under debris. The specimen recorded here from Ontario's Middle Island (in Lake Erie) was taken in pan traps on a gravel lake shore.

### *Philonthus couleensis* Hatch, 1957

**Materials. CANADA: PEI:** Brackley Beach, National Park, milieu marécageux (=marshy environment), 2-VIII-1979, R. Sexton (1); Long Pond, National Park, milieu marécageux (=marshy environment), 30-VII-1979, R. Sexton (2).

**Diagnosis.** This species is, at present, best identified by the shape of the median lobe of the aedeagus and branches of the paramere (Fig. 499 in Smetana 1995).

*Philonthus couleensis* was previously known from Alberta, British Columbia, Idaho, Illinois, Indiana, Manitoba, Massachusetts, Michigan, New Brunswick, Newfoundland, New Jersey, Northwest Territories, New York, Nova Scotia, Ontario, Saskatchewan, Washington, and Wisconsin (Smetana 1995). Herein we newly report it from Prince Edward Island (Map 29). This species is hygrophilous and has been collected from a variety of wet microhabitats near water (Smetana 1995).

### *Philonthus gavius* Smetana, 1995

**Materials. UNITED STATES: MD: Prince George Co.,** Cedarville St. Pk., at lights, 24 to 29-VII-2008, S. Paiero (1).

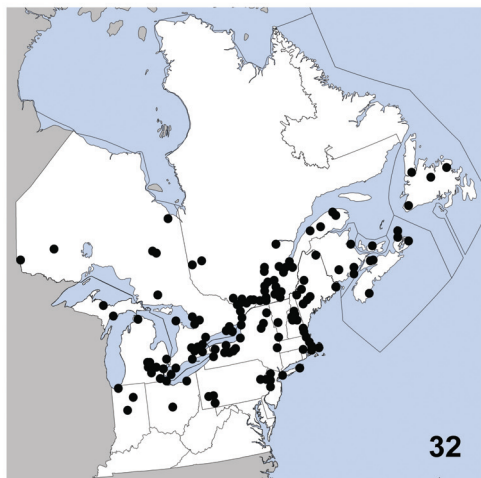
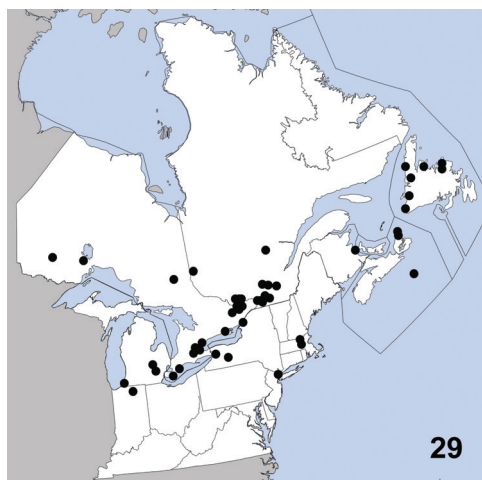
**Diagnosis.** *Philonthus gavius* is recognized among other northeastern *Philonthus* by the combination of: tergite eight distinctly emarginate in both sexes; elytra with most punctures separated by their widths; eyes longer than the temples.

This species was previously known from Arkansas, Illinois, Louisiana, Oklahoma, Tennessee, and Texas (Smetana 1995). It was newly recorded from Missouri by Watrous (2008) based on one specimen at a blacklight. Another specimen collected at a mercury vapour light represents a new record for Maryland (Map 30) and northeastern North America, and extends the known distribution considerably eastward. The habitat preferences of *P. gavius* remain unknown but it is probably a species associated with wet areas similar to most other members of the *Philonthus* 'Quadricollis Group' *sensu* Smetana (1995).

***Philonthus leechensis* Hatch, 1957**

**Materials. CANADA: PEI:** Brackley Beach, National Park, milieu marécageux (=marshy environment), 2-VIII-1979, R. Sexton, (3).

**Diagnosis.** *Philonthus leechensis* may be recognized among other northeastern *Philonthus* except for *P. umbrinoides* Smetana 1995 by the combination of: pronotum with five punctures in the dorsal row on at least one side; temples without a carina; tergite eight not emarginate in either sex; elytra without distinct markings on the disc; hind tarsus with first segment shorter than last segment; legs completely dark. From *P. umbrinoides* it can be differentiated by the distinct, obtuse hind angles of the head.



**Maps 29–32.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **29** *Philonthus couleensis* Hatch (Smetana 1995) **30** *Philonthus gavius* Smetana **31** *Philonthus leechensis* Hatch (Smetana 1995) **32** *Philonthus lindrothi* Smetana (Smetana 1995, Paquin and Dupérré 2001).

This species was previously known from Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Manitoba, Minnesota, Montana, Newfoundland, Northwest Territories, Oregon, Québec, Saskatchewan, Washington, Wisconsin, and Yukon Territory (Smetana 1995). Herein we newly record it from Prince Edward Island, representing only the fifth locality known in northeastern North America (Map 31). *Philonthus leechensis* appears to be a hygrophilous species, occurring mostly in northern or montane wetlands. It remains unrecorded in the eastern United States.

### ***Philonthus lindrothi* Smetana, 1965**

**Materials. CANADA: PEI:** Brackley Beach, National Park, milieu marécageux (=marshy environment), 2-VIII-1979, R. Sexton (6).

**Diagnosis.** *Philonthus lindrothi* can be distinguished from northeastern congeners other than *P. pseudolodes* Smetana 1996 by the combination of: pronotum with five punctures in the dorsal row on at least one side; head with hind angles present but rounded; tergite eight not emarginate in either sex; elytra without distinct markings on the disc; hind tarsus with first segment shorter than last segment; antennae with basal segments not distinctly paler than others and with segments seven and eight elongate. Males can be readily separated from *P. pseudolodes* by the notch in sternite eight not continuing as a groove towards its base (Smetana 1995).

This widespread species was previously known from Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Manitoba, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Brunswick, Newfoundland, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Northwest Territories, Nova Scotia, Ohio, Ontario, Oregon, Pennsylvania, Québec, Rhode Island, Saskatchewan, South Dakota, Vermont, Washington, and Wisconsin (Smetana 1995). Herein we newly record it from Prince Edward Island (Map 32). *Philonthus lindrothi* is an extremely common hygrophilous species that occasionally visits lights (Smetana 1995).

### ***Philonthus neonatus* Smetana, 1965**

**Materials. UNITED STATES: VA: Giles Co.,** Ripplemead, rte 460 at bridge, flood debris, berlese, 11 to 25-V-2008, A. Brunke (4).

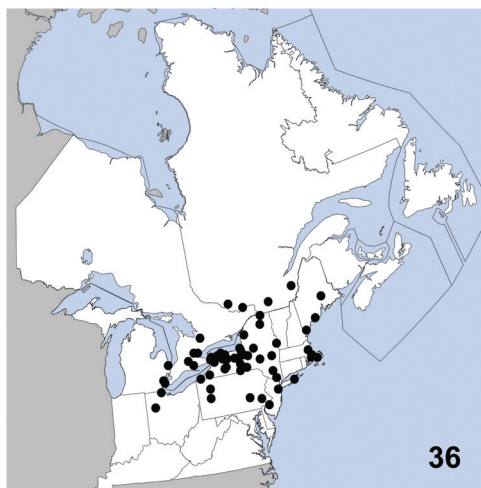
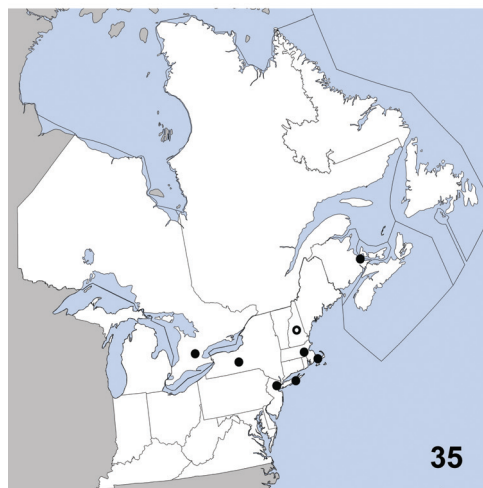
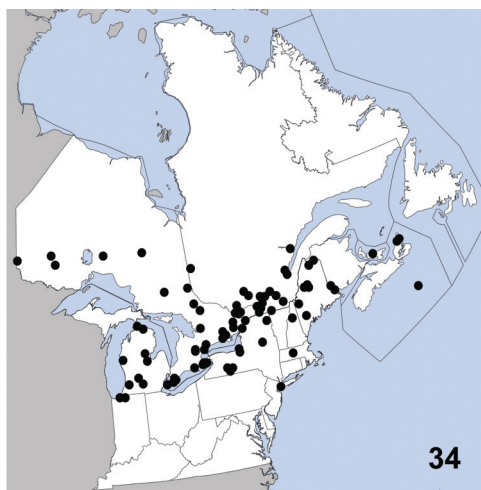
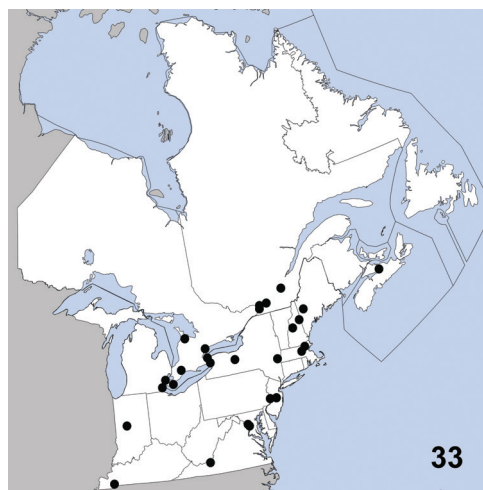
**Diagnosis.** *Philonthus neonatus* is separated from other northeastern *Philonthus* by the combination of: pronotum with six punctures in both dorsal rows; pronotum no more than vaguely narrowed anteriorly; elytra distinctly red and without dark markings; elytra with micropunctures between the regular punctures; abdominal segments paler apically.

This species was previously known from Arkansas, District of Columbia, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Mississippi,

Missouri, New Hampshire, New Jersey, New York, Ontario, Pennsylvania, and Québec (Smetana 1995). Herein we newly record it from Virginia (Map 33). *Philonthus neonatus* is a hygrophilous species collected from debris along the margins of creeks, rivers and lakes (Smetana 1995).

***Philonthus vulgatus* Casey, 1915**

**Materials. CANADA: PEI:** Brackley Beach, National Park, milieu marécageux (=marshy environment), 2-VIII-1979, R. Sexton (13).



**Maps 33–36.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **33** *Philonthus neonatus* Smetana (Smetana 1995) **34** *Philonthus vulgatus* Casey (Smetana 1995) **35** *Quedius cinctus* (Paykull) (Smetana 1971, 1990, Chandler 2001, Majka et al. 2009) **36** *Quedius cruentus* (Olivier) (Gusarov 2001, Hoebeke 2008).



**Diagnosis.** This species can be easily distinguished from other northeastern *Philonthus* by the combination of: pronotum with punctures widely distributed and not in rows; legs and antennae completely dark; head with hind angles indistinct (Fig. 11).

*Philonthus vulgatus* was previously known from Alaska, Alberta, British Columbia, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Manitoba, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New York, North Dakota, Nova Scotia, Ontario, Québec, Saskatchewan, South Dakota, Utah, Washington, and Wisconsin (Smetana 1995). Herein we newly report this species from Prince Edward Island (Map 34). *Philonthus vulgatus* is a hygrophilous species that has been collected in beaver lodges, at lights, and along water margins in debris or emergent vegetation (Smetana 1995).

### ***Quedius cinctus* (Paykull, 1790)**

**Materials.** CANADA: ON: Wellington Co., Guelph, University Arboretum, rotting *Polyporus squamosus*, 29-VI-2008, A. Brunke (2); Guelph, University campus nr. horse pen, grass sweep, 13-VII-2008, C. Ho (1).

**Diagnosis.** This species may be separated from other northeastern *Quedius* by the combination of: elytra with three rows of coarse punctures on the disc; head without a pair of punctures between the ocular punctures; pronotum with three punctures in each dorsal row (Fig. 12).

This Palearctic species was first detected in North America by Smetana (1971) based on specimens collected in Massachusetts. It was subsequently recorded from New Jersey, New York and Washington by Smetana (1990), and New Hampshire by Chandler (2001). It has been present in North America since at least 1942 based on a collection in New Jersey and was introduced to the west coast (Washington) as early as 1979 (Smetana 1990). Majka et al. (2009) newly recorded it from Canada (New Brunswick) based on specimens collected on carrion. We here newly report *Q. cinctus* from Ontario (Map 35). In its native range, *Q. cinctus* is widespread in the Palearctic region (Smetana in Löbl and Smetana 2004). This species frequents disturbed habitats throughout its range and is typically attracted to decaying organic matter; the Ontario specimens were found in a *Polyporus* fungus in an almost liquid state of decay.

### ***Quedius cruentus* (Olivier, 1795)**

**Materials.** CANADA: ON: Essex Co., Windsor, ~1.5km S Ojibway Prairie, forest-prairie edge, malaise trap, 15-V to 1-VI-2001, S. Paiero (1); Windsor, ~1.5 km S Ojibway Prairie, private prairie, malaise, 5 to 12-VI-2001, S. Paiero (3); Windsor, ~1.5km S Ojibway Prairie, private prairie, malaise, 19 to 30-VI-2001, P. Pratt (2); **Hald.** –Norfolk Reg., Charlotte 2 Rd., ~480m E of Charlotteville, West Quarterline Rd., 'C.C.S.N. -5', purple prism trap, 13 to 19-VI-2009, S.M. Paiero (1); **Halton**

**Reg.**, Milton, Derry Rd. and 4<sup>th</sup> Line, under composter, 16-X-2008, S. M. Paiero (1); **Oxford Co.**, Woodstock, trails nr. river, 14-VI-2008, S.A. Marshall (1). **Simcoe Co.**, Midhurst, forest nr. Neretva St., 28-IX-2008, A. Brunke and K. Brunke (1); **Wellington Co.**, Guelph, University Campus, dairy bush, dry *Polyporus squamosus*, 22-IX-2008, A. Brunke (1).

**Diagnosis.** *Quedius cruentus* may be distinguished from other northeastern *Quedius* by the combination of: elytra evenly punctate; labrum distinctly bilobed; eyes distinctly shorter than temples; antennomeres one to three distinctly paler than others; distal antennomeres strongly transverse; pronotum with sublateral row of punctures longer than dorsal row.

This Palearctic species was first detected by Gusarov (2001) based on a specimen collected in New York. Hoebeke (2008) newly reported *Q. cruentus* from Maine, Massachusetts, New Jersey, Ohio, Pennsylvania, and Québec, and established its presence in North America as early as 1983 in New York. Herein we newly report this species from Ontario (Map 36). In its native range, *Q. cruentus* is widely distributed in the Palearctic region (Smetana in Löbl and Smetana 2004). *Quedius cruentus* has been found in a variety of habitats in Ontario including forests, prairies, urban greenspace under loose bark, under objects and in decayed fungi.

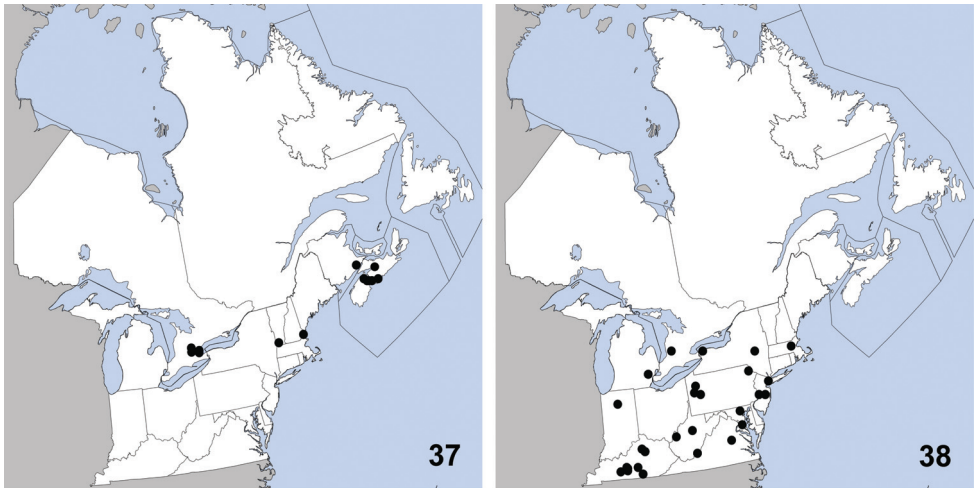
### *Quedius curtippennis* Bernhauer, 1908

**Materials.** UNITED STATES: VT: **Bennington Co.**, Woodford, sifting leaf litter near stream, 1-IV-2010, T. Murray (1).

CANADA: ON: 'Ont.', 30-IX-1982, G. Abayo (1); **Halton Reg.**, Oakville, nr hwy 25 and Burhamthorpe Rd., meadow, yellow pans, 12 to 14-IX-2003, S.M. Paiero (1); **Hamilton Reg.**, Hamilton, 3-VIII-1984, M.T. Kasserra (1); **Waterloo Reg.**, Blair, Fountain St. S. nr Speed River, 43.391 -80.373, hedgerow, pitfall, 28-IX-2009, A. Brunke (1); **Wellington Co.**, Eramosa, Wellington County Rds. 124 and 29, 43.615 -80.215, hedgerow, pitfall, 4-V-2010 (1), 18-V-2010 (1), 2-XI-2010 (1), A. Brunke; Guelph, 17-VIII-1976, David Levin (1); Guelph, 7-VI-1983, C.F. Langlois (1); Guelph, University Arboretum, hand collected, 16-III-1983, L.B. Carlson (1); Guelph, 30-IX-1983, A. Harris (1); Guelph, 5-VII-1984, 'maple', T. Young (1); Guelph, 3-IV-1991, M. Kovacevick (1); Guelph, 14-X-1998, T. Phillips (1); Guelph, Victoria Rd. and Conservation Line, 43.580 -80.275, hedgerow, pitfall, 19-V-2009 (1), 17-XI-2009 (1), A. Brunke.

**Diagnosis.** *Quedius curtippennis* can be distinguished from other northeastern *Quedius* by the combination of: elytra with even punctuation; labrum not bilobed; scutellum impunctate; basal antennomeres not distinctly darker than the other segments (Fig. 13).

This exotic Palearctic species was first correctly reported in North America by Korge (1962) who recognized that *Q. parallelus* Hatch 1957, a species described from western North America, was synonymous with *Q. curtippennis* Bernhauer 1908. *Que-*



**Maps 37–38.** Distribution in northeastern North America, sources of data other than DEBU are quoted in parentheses. **37** *Quedius curtippennis* Bernhauer (Smetana 1990, Majka and Smetana 2007, Majka and Klimaszewski 2008b) **38** *Quedius fulgidus* (Fabricius) (Smetana 1971, Peck and Thayer 2003).

*dius curtippennis* has been present in North America as early as 1934 based on specimens from Washington and also occurs in British Columbia and Oregon (Smetana 1971). A separate introduction to the east was detected first by Smetana (1990) based on a New Hampshire specimen collected in 1983. Since then *Q. curtippennis* has been detected in New Brunswick and Nova Scotia (Majka and Smetana 2007). Herein we newly report it from Ontario and Vermont (Map 37) from specimens collected as early as 1976 and 2010, respectively. The record from Guelph, Ontario represents the earliest known collection in eastern North America. In its native range, *Q. curtippennis* is widely distributed in the Palaearctic region (Smetana in Löbl and Smetana 2004). *Quedius curtippennis* has been collected in Ontario mainly in disturbed habitat such as regenerating woodland, fields and agricultural crops.

### *Quedius fulgidus* (Fabricius, 1793)

**Materials. CANADA: ON: Huron Co.,** Seaforth, 7-VII-1955, D. Keys (1).

**Diagnosis.** *Quedius fulgidus* may be distinguished from other northeastern *Quedius* by the combination of: elytra evenly punctate; labrum distinctly bilobed; eyes distinctly shorter than temples; antennomeres one to three not distinctly paler than others; distal antennomeres only slightly transverse; pronotum with sublateral row of punctures longer than dorsal row.

This Palaearctic species was first correctly recognized in North America by Horn (1878) who synonymised *Q. iracundus* (Say 1834), a species described from North America, with *Q. fulgidus*; this synonymy was later confirmed by Smetana (1971). The first verifiable specimens from North



**Figure 13.** Dorsal habitus of *Quedius curtipennis* Bernhauer.





**Figures 14–19.** **14** *Stenus clavicornis* (Scopoli), aedeagus in parameral view **15** *Medon fuscus* (Mannerheim), 7<sup>th</sup> sternite **16** *M. fuscus*, aedeagus in lateral view **17** *Scopaeus minutus* Erichson, aedeagus in lateral view **18** *Erichsonius nanus* (Horn), aedeagus in lateral view **19** *Erichsonius parvus* (Horn), aedeagus in parameral view.

America were collected in 1874 from Iowa (Smetana) but as *Q. iracundus* (= *Q. fulgidus*) was described in 1834 from Indiana, *Q. fulgidus* has surely been present long before 1874. Currently, *Quedius fulgidus* is known from Arizona, British Columbia, California, Colorado, District of Columbia, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Texas, Virginia, Washington, West Virginia, Wisconsin (Smetana 1971), and Tennessee (Smetana 1978). Herein we newly record this species from eastern Canada (Ontario) (Map 38). This species is strongly synanthropic in North America (Smetana 1971) but occurs regularly in caves in the more southern portion of its range (Peck and Thayer



2003). In its native range *Q. fulgidus* is widely distributed in the Palaearctic region (Smetana in Löbl and Smetana 2004). *Quedius fulgidus* appears to be uncommon in the northeastern extreme of its range compared to its close relative *Q. cruentus*, another exotic species that was recently established on the continent (see above) and has since become extremely common.

## General discussion

Curation of over 32,000 staphylinids deposited in the University of Guelph Insect Collection resulted in the discovery of thirty-five new provincial or state records, six new Canadian records, one new record for the United States and two new records for eastern Canada. Many of these specimens were aleocharines and a future publication is planned to report on the discoveries made while curating this subfamily. The majority of the records presented herein involved species of which were included in recent revisions (after 1970), suggesting that even of 'well-known' groups, our knowledge of staphylinid distributions remains incomplete. Two boreal beetles, *Porrhodites fenestralis* and *B. cephalicus* were newly recorded in Ontario, joining previous records from adjacent provinces to suggest a transcontinental distribution. Six staphylinid species were newly discovered in Canada at the northern extreme of their range, two of which are apparently entirely restricted in Canada to the Carolinian ecoregion (*S. versicolor* and *E. parvus*). This relatively small area of southernmost Ontario is the most biodiverse region in Canada (Ontario Ministry of Natural Resources 2010) and has yielded a multitude of new records for Canada in other insect groups (e.g., Orthoptera: Marshall et al. 2004; Hemiptera: Paiero et al. 2003; and aculeate Hymenoptera: Buck 2003, Buck et al. 2005); however it is heavily impacted by agriculture and development (Ontario Ministry of Natural Resources 2010). The distributions of four rare or infrequently collected species (*S. campbelli*, *T. browni*, *E. tristis*, and *B. cephalicus*) in northeastern North America were previously fragmentary and were augmented by new data presented herein. Ten exotic species for which we give new state, or provincial, or national records are apparently appear to be expanding their range in northeastern North America, and have the potential to become widespread across the continent. One of these species, *T. corticinus*, was first collected in North America in 1967 but now dominates autumn leaf litter staphylinid assemblages in Ontario woodland fragments where it can comprise up to 47% of all individuals (A. Brunke, *unpublished data*). Levesque and Levesque (1995) found that this species made up as much as 18% of all staphylinid individuals in Québec raspberry plantations. The impact of this abundance on native North American biodiversity is unknown but may be substantial. New collection data for *Q. curtippennis* establishes its presence in eastern North America as early as 1976, seven years earlier than previously known.

The results of this paper demonstrate the key role of curated insect collections in understanding biodiversity in the boreal region, the imperilled 'Carolinian' region in Canada, and northeastern North America in general. An improved understanding of

rare or or potentially rare insect species, and the effective detection of exotic species, depends on the routine identification of specimens in collections and the regular implementation of regional insect surveys. We recommend increased support for these activities to develop and maintain a clear picture of biodiversity, and biodiversity change, in northeastern North America.

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# Description of two new *Lophocampa* Harris from the Dominican Republic (Arctiidae, Arctiinae)

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## Abstract

Two new species of *Lophocampa* Harris are described from the Dominican Republic, *Lophocampa lineata* **sp. n.** based on two males, and *Lophocampa albitegula* **sp. n.** based on three females. The habitus and genitalia are illustrated. The following nomenclatural changes are also proposed: *Lophocampa albiguttata* Boisduval, 1870, **stat. rev.** and *Lophocampa brunnea* Vincent, **nom. n.**

## Keywords

Phaegopterini, Arctiidae, Neotropics, new species, Dominican Republic, *Lophocampa*

## Introduction

The genus *Lophocampa* Harris includes 66 species and 10 subspecies in the most recent catalogue (Watson and Goodger 1986), with an additional 10 species subsequently described (Beutelspacher 1986, 1992; Vincent 2005a, 2005b, 2009), one raised from synonymy, and one omitted by Watson and Goodger (Vincent 2009). Two species-level names have also been synonymised (Vincent and Laguerre 2010). Six of the 10 new species were captured during a private entomological project in the Dominican

Republic carried out by the author in 2004. This material was complemented by a mission carried out by Jean Haxaire and Odile Paquit in the mountains of this country in 2007, when two new *Lophocampa* were discovered. The purpose of this paper is to describe these two new species, and to compare them with closely related species. Two taxa are raised from synonymy as *bona* species, resulting in one junior homonym for which a replacement name is proposed.

## Methods and materials

Specimens were collected in the Dominican Republic by attraction to a mercury vapour light bulb, powered by a portable generator. Trapping was done throughout the night from 6:30 pm to 6:30 am. Specimens were injected with ammonia and stored in labelled paper envelopes. Dried specimens were subsequently relaxed in a humid container, mounted and spread. Genitalia were prepared using a hot KOH solution (10%). Illustrations were made using a camera attached to a Leica MZ16 stereomicroscope. The genitalia were stained with chlorazol-black to enhance membrane contrast with the cuticle, and were mounted on slides using Euparal. Terminology for the genital characters follows Klots (1970).

The treatment of the Arctiidae at the family level follows that of Mitchell et al. (2006) established on protein-coding nuclear genes. The tribal classification follows that of Jacobson and Weller (2002).

The “barcode” fragment of the mitochondrial cytochrome *c* oxidase subunit 1 (CO1) gene was used to compare molecular variation among taxa. Dried specimen legs, from the collection of the author, were sent to the University of Guelph (Ontario, Canada) and sequenced in the “All Leps Barcodes of Life Campaign” (BOLD). Extraction, amplification and sequencing protocols are described in Vaglia et al. (2008).

Repository abbreviations are as follows:

- AMNH** American Museum of Natural History, New York, New York, USA
- ANSP** Academy of Natural Sciences, Philadelphia, Pennsylvania, USA
- BMNH** The Natural History Museum (formerly British Museum [Natural History]), London, UK
- CMNH** Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA
- MNHN** Muséum National d'Histoire Naturelle, Paris, France
- USNM** National Museum of Natural History (formerly United States National Museum), Washington, DC, USA
- ZMHB** Museum für Naturkunde (formerly Zoologisches Museum, Humboldt Universität), Berlin, Germany
- BVC** Personal collection of Benoit Vincent, Saint-Denis, France

## Systematics

### *Lophocampa lineata* Vincent, sp. n.

urn:lsid:zoobank.org:act:B379F5E6-D5BF-4897-816A-4561CEB03FA9

Figs 1, 7, 9

**Type material.** *Holotype* – ♂, Dominican Republic, Monseñor Nouel, Road El Blanco to Constanza pK [kilometer post] 10, Ebano Verde Scientific Reserve, 1360 m, 15-VIII-2007, 19°01,729'N 70°30,988'W, J. Haxaire and O. Paquit *leg.* prep gen BV 355, Barcode ID ARCTB 641–08, Sample ID BEVI0551, Genbank # HQ682628. Deposited in MNHN. *Paratype*. 1 ♂, same data as holotype, Barcode ID ARCTB 873–09, Sample ID BEVI0768, Genbank # HQ682627 ; in [BVC].

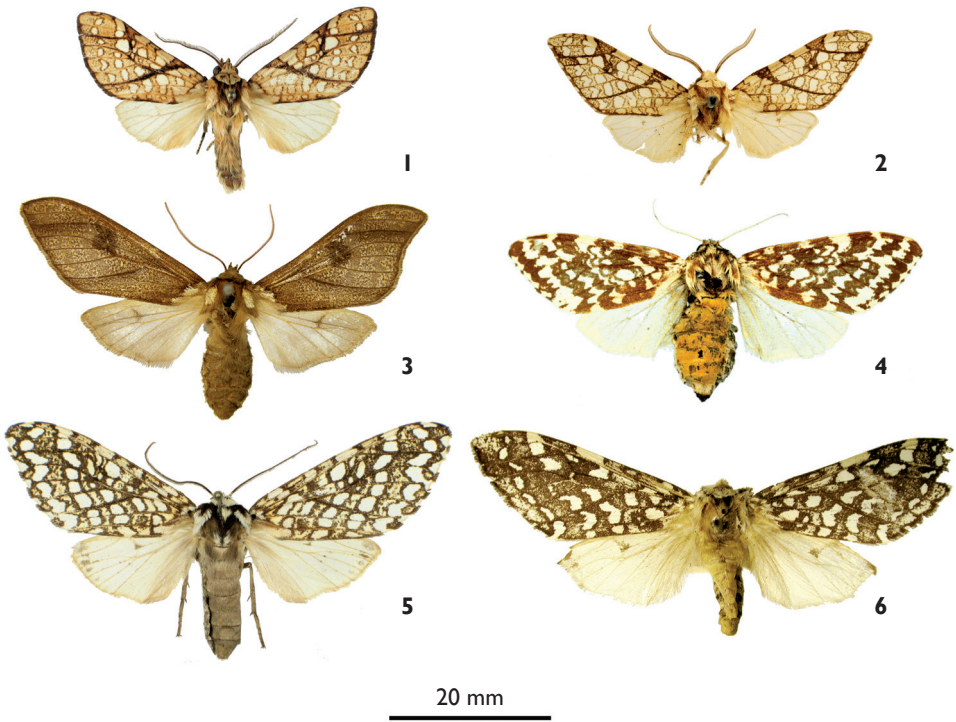
**Etymology.** The name refers to the two brown transverse lines crossing the forewing.

**Diagnosis.** *Lophocampa lineata* Vincent, sp. n. is externally similar to *Lophocampa propinqua* Edwards 1884 (Fig. 2), but the two taxa can be separated by the forewing apex more rounded compared to *L. propinqua*, and the fringe not checkered at the vein terminals as in *L. propinqua*. The ratio of forewing length / width is 2.25 in *L. lineata* sp. n. ( $n = 2$ ) and 2.48 in *L. propinqua* ( $n = 13$ ). The male genitalia of *L. lineata* sp. n., compared to *L. propinqua* has a larger uncus without a spatulate apex and shorter valvae without strong spines on the basal protuberances (Figs 8 and 10). The CO1 barcode sequences of *L. lineata* sp. nov and *L. propinqua* differ by 7,62% - 7,79%.

**Description.** *Head.* Labial palpi curved upward, the third segment shorter than the first two. Yellow ventrally, brown dorsally. Frons yellow with a transverse large brown band. Vertex and scape yellow. Male antenna yellow with dark pectinations, longest rami 3.0 x longer than segment length.

*Thorax.* Collar light yellow marked with two brown transverse lines located on each side of the median axis. Tegulae light yellow with the internal side brown and with a light brownish spot centrally. Dorsal surface brown, with light yellow triangle centrally and the outer margins posteriorly light yellow. Ventral surface light yellow, very hairy. Prothorax brown. Meso- and metathorax yellow. Legs yellow ringed with brown.

*Forewing.* Length: 18 mm. Ground yellow with white spot bands as follows: basal band with one white spot highlighted with brown. Postbasal, antemedian, median, postmedian and subterminal bands formed by rounded white spots intercalating between veins. Postbasal band broken The postmedian band contains a large spot between veins M1 and M2 which is out of alignment with the rest. Subterminal band does not reach the anal angle, with the last spot reduced and triangular. The wing is crossed by two narrow brown transverse lines, the longest one is wide at the costa then narrows following vein CuA2. The shorter line follows vein M1. Fringe brown.



**Figures 1–6.** 1 *Lophocampa lineata* male holotype 2 *Lophocampa propinqua* male holotype 3 *Lophocampa brunnea* female holotype 4 *Lophocampa alternata* female holotype 5 *Lophocampa albitegula* female holotype 6 *Lophocampa albiguttata* female syntype potential.

*Hindwing.* White, semi-translucent; anal margin more densely scaled with yellow.

*Abdomen.* Light yellow both dorsally and ventrally.

*Male genitalia.* Tegumen triangular, large basally. Uncus elongated and rectilinear, slightly enlarged basally, bearing lateral setae except on the apical third; apex truncated. Valvae symmetrical, elongated, reaching the middle of the uncus, bearing a small, rounded protuberance near the apex. Basally, on the dorsal face, presence of two elongated, thin and symmetrical protuberances reaching the base of the uncus. Juxta reduced, trapezoidal with a small median notch. Vinculum slender. Penis straight, caecum penis reduced. Vesica large consisting of three smaller elongated lobes, lacking spines.

*Female genitalia.* Unknown.

**Biology and distribution.** It is reasonable to think that *Lophocampa lineata* sp. n. is a species restricted to middle elevations of the central cordillera in the Dominican Republic. Previous exploration in this area in April and May of 2004 failed to find this taxon. The habitat is montane cloud forest. Early stages and foodplants are unknown.

**Remarks.** Based on a single male from Mexico, Edwards described *Lophocampa propinqua* as a variation of *Lophocampa caryae* Harris, 1841. While examining the holo-



type in the AMNH collection, the specimen labelled *propinqua* from Jalapa, Mexico was examined. It has a white label with an unjustified lectotype designation by Allan Watson dated from 1967. The taxon *propinqua* was placed by Watson and Goodger (1986: 23) as a *bona* species in the genus *Lophocampa* Harris. The different forewing pattern, in particular the interrupted medial band, the narrower uncus and the longer valvae of the male genitalia justify this placement as a species distinct from the North American *L. caryae*.

*Lophocampa caryae* form *montana* Gaede, 1928 (Fig. 3) was described from Guatemala. In the catalogue of Watson and Goodger (1986 : 23), this form is associated with *L. propinqua*. After consultation of the ZMHB collection where the type of *montana* Gaede is housed, it is evident that the habitus of *montana* is totally different from *L. caryae*, *L. propinqua* and in fact all *Lophocampa* species. Thus the taxon *montana* must be raised to species rank. However, *Lophocampa montana* (Gaede, 1928), stat. n. then becomes a junior secondary homonym of *Lophocampa montana* (Schaus, 1911), described from volcan Poás in Costa Rica. Consequently, I propose the replacement name *Lophocampa brunnea* Vincent, nom. n.

The nomenclatural changes proposed here are summarized as follows:

***Lophocampa brunnea* Vincent, nom. n.**

= *Lophocampa montana* (Gaede, 1928), stat. n., junior secondary homonym of *Lophocampa montana* (Schaus, 1911)

***Lophocampa albitegula* Vincent, sp. n.**

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Figs 5, 11

**Type material. Holotype** – ♀, Dominican Republic, Pedernales, track from los Arroyos to El Aguacate pK 5,2, 1990m, 11-VIII-2007, 18°16,269'N 71°43,496'W, J. Haxaire and O. Paquit leg. prep gen BV 386, Barcode ID ARCTB 638–08, Sample ID BEVI0548, HQ682631. Deposited in [MNHN]. Paratypes. 2 ♀, same data as holotype, Barcode ID ARCTB 648–08, Sample ID BEVI0558, HQ682630, prep gen BV 369, Barcode ID ARCTB 639–08, Sample ID BEVI0549, HQ682629 ; in [BVC].

**Etymology.** The name reflects the white tegulae of the species.

**Diagnosis.** This species is superficially most similar to *Lophocampa albiguttata* (Boisduval, 1870) (Fig. 6). It has a dark ground colour on the forewings, a subterminal band formed by irregular and flattened spots, a postmedian band formed by spots rounded at the costa then similar to those of the subterminal band. The legs are ringed brown and white. Female genitalia have posterior apophysis shorter than the anterior (longer than the anterior apophysis in *L. albiguttata*) and a smaller bursa (Figs 11 and 12).

**Description.** *Head.* Labial palpi dark, the third segment largely shorter than the two first. Frons dark, vertex white. Scape whitish. Antenna bipectinate, dark except the two first articles which are ochre.

*Thorax.* Collar white except a wide median dark spot on the anterior side. Tegulae white, hairy, with the internal side dark and the center marked with a wide dark spot. Dorsal side dark with a central white spot and the median axis whitish on the posterior side. Legs dark with some whitish spots.

*Forewing.* Length: 25 mm Ground colour light beige, largely speckled with brown and ornamented with bands of white rounded spots underlined with brown. Basal band formed by an unique spot on the costa. Postbasal, antemedian, median, postmedian and subterminal bands formed by an alignment of white spots underlined with brown and intercalating between veins. Postbasal band broken. Antemedian formed by two white spots and two brown spots. Median band formed by two spots on the reniform spot. Postmedian almost straight and complete. Terminal band formed by irregular white spots sometimes fused with the sinuous subterminal spots.

*Hindwing.* White, semi-translucent; anal margin more densely scaled with brown scales. The fringe is checkered white and brownish from apex to vein CuA<sub>2</sub>.

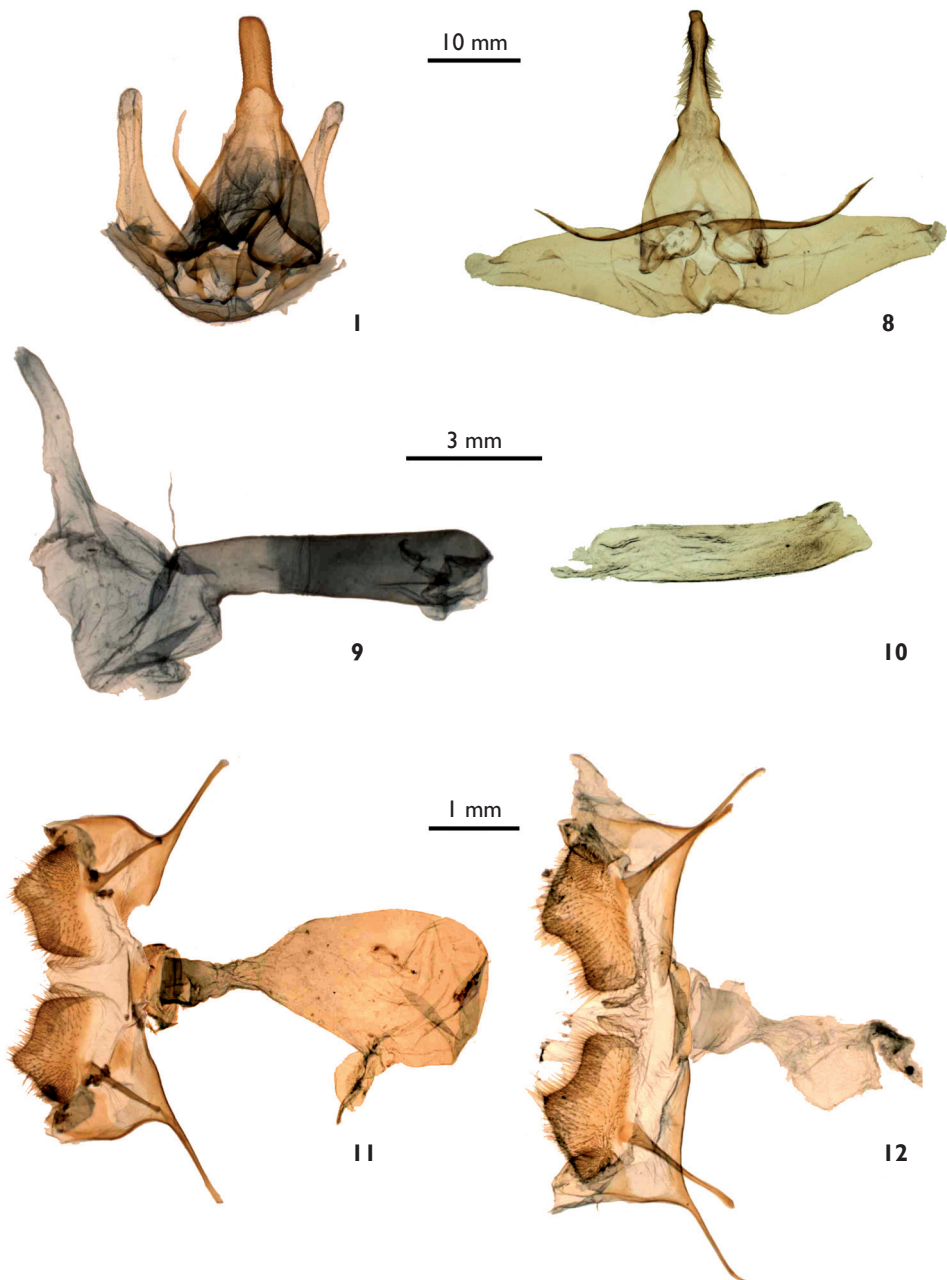
*Abdomen.* Abdomen greyish.

*Female genitalia.* Pseudopapillae anales wholly fused. Papillae anales trapezoid and strongly setose. Anterior apophysis straight, 1 mm in length. Posterior apophysis with a long basis, 1,2 mm. Ductus bursae narrow, non-sclerotized, reduced and wrinkled at the insertion with the corpus bursae. Corpus bursae large, ovoid, smooth without sigma. In its median area, insertion of a large ductus seminalis.

*Male genitalia.* Unknown.

**Biology and distribution.** It is reasonable to think that *Lophocampa albitegula* sp. n. is a species restricted to high elevations of the Sierra de Bahoruco in the Dominican Republic. It is probable that the new taxon could be present in the Sierra de Neiba. Previous exploration in this two area in April and May 2004 failed to find this taxon. The habitat is montane cloud forest. Early stages and foodplants are unknown.

**Remarks.** *Lophocampa albiguttata* (Boisduval, 1870) is treated as a synonym of *Lophocampa alternata* (Grote, 1867) by Watson and Goodger (1986: 23). A comparison of the type material shows a clear difference in these two taxa, in particular the forewing pattern (fig. 4 and 6). *Lophocampa albiguttata* (Boisduval, 1870) stat. rev. is therefore raised from synonymy. In the original description, Boisduval does not indicate the number of syntypes, based on specimens from Honduras. A female specimen from the Boisduval collection, conserved in the BMNH, bears a label “Oaxaca”, [Mexico] and a red “TYPE” label. This specimen from Oaxaca may be a syntype of *L. albiguttata*, although the species was described from Honduras. A locality error in the original description or labelling error could explain this contradiction. As there is some doubt about the status of this supposed type, the designation of a lectotype or neotype is currently not possible. It is also possible that a syntype is stored in another collection. Finally, no specimens from Honduras have been located to serve as potential neotype. Unfortunately, it was not possible to sequence CO1 on a recent specimen of this rare taxon and to compare it with *L. albitegula* sp. n.



**Figures 7–12.** 7–8. Dorsal view of male genitalia. 7 *Lophocampa lineata* male holotype (dissection # BV 355) 8 *Lophocampa propinqua* male holotype (A. Watson dissection # 1246). 9–10. Lateral view of penis. 9 *Lophocampa lineata* male holotype 10 *Lophocampa propinqua* male holotype. 11–12. Female genitalia, ventral view. 11 *Lophocampa albitegula* female holotype (dissection # BV 386) 12 *Lophocampa albigutata* female (dissection # BV 388), (Mexico).

*Lophocampa alternata* was described and illustrated based on a single female specimen (“Number 743, Gundlach’s MS. Catalogue” Grote 1867: 319) from Cuba, and the holotype was in the ANSP. Jason Weintraub, collection manager of this Institution, provided pictures of a female specimen labelled “TYPE n° 7695 by A.R. Grote” and “HOLOTYPE ♀ by A[llan] W[atson] 1967”. This specimen not currently in the ANSP. It may have been transferred to CMNH by mistake, during a major exchange of specimens between ANSP and CMNH in the mid-1960s (J. Weintraub, pers. comm.). The presence of this specimen, and other type specimens described by Grote from Cuba, is not yet confirmed by the CMNH’s curator.

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