

**NEW RECORDS OF NATIVE AND INTRODUCED ACULEATE
HYMENOPTERA FROM ONTARIO, WITH KEYS TO EASTERN
CANADIAN SPECIES OF *CERCERIS* (CRABRONIDAE)
AND EASTERN NEARCTIC SPECIES OF *CHELOSTOMA*
(MEGACHILIDAE)**

MATTHIAS BUCK¹, STEVEN M. PAIERO, STEPHEN A. MARSHALL
Department of Environmental Biology, University of Guelph,
Guelph, Ontario, Canada, N1G 2W1
email: mbuck@uoguelph.ca

Abstract

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The Palaearctic *Ancistrocerus gazella* (Vespidae) and *Spilomena troglodytes* (Crabronidae) are recorded for the first time from the Nearctic region based on material from Ontario (both species) and the northeastern United States (*A. gazella*). Seven species are recorded for the first time from Canada (C), one from eastern Canada (eC) and two from the eastern Nearctic (eN). Sierolomorphidae: *Sierolomorpha nigrescens* (eN); Sphecidae: *Isodontia elegans* (eN), *I. philadelphica* (C); Crabronidae: *Tachysphex punctifrons* (eC), *Ectemnius paucimaculatus* (C), *Cerceris bicornuta* (C); Colletidae: *Hylaeus hyalinatus* (C); Megachilidae: *Chelostoma campanularum* (C), *Ch. rapunculi* (C), *Hoplitis anthocopoides* (C). The recently recorded *Stictia carolina* (Crabronidae) is confirmed as established in southern Ontario. A key to the twenty eastern Canadian species of the genus *Cerceris* (Crabronidae) is provided, separating for the first time males of several species in the *echo*, *clypeata*, and *nigrescens* species groups. The three eastern Nearctic species of *Chelostoma* (Megachilidae) are also keyed.

Introduction

Despite substantial recent faunistic work many Ontario Aculeata families still remain relatively poorly documented. Until recently less than 59% of Ontario spheciform wasps had been recorded (Buck 2004). Unpublished data show similar ratios for other families of aculeate wasps, e.g., Vespidae 64% (Buck et al., in prep.), Pompilidae 60%, Mutillidae 33% (Buck unpubl.). The present paper updates the recently published checklist of Ontario spheciform wasps (Buck 2004) by adding six species of Sphecidae and Crabronidae, which brings the provincial total up to 284 species. Five new records in four other families (Sierolomorphidae, Vespidae, Colletidae, Megachilidae) are also presented.

Species inventories are important because the Ontario Hymenoptera fauna is in

¹ Author to whom all correspondence should be addressed.

a constant state of flux. Faunal change is being effected by various causes such as local extirpations, introductions of exotic species (e.g. Smith 1991; Paiero and Buck 2004; Romankova 2004; Buck 2004, 2005), and natural range extensions. The present paper provides examples for the latter two categories. As documented recently for three groups of solitary wasps (Crabronidae, Pompilidae, Vespidae: Eumeninae; see Buck 2005), the increase in the number of exotic aculeate species is due mostly to introductions of cavity-nesting species (including mud daubers), whereas the ground-nesting fauna has remained largely unaffected. Six introduced species that are newly recorded in this paper, as well as several previously recorded introduced bees (Paiero and Buck 2004; Romankova 2004; Smith 1991) are likewise cavity-nesters or construct free-standing mortar nests. Some of the newly recorded species have been present in Ontario (or North America) for a long period of time without being noticed (either due to misidentification or because old material was identified only recently). Range extensions of native species are also often overlooked or detected with delay due to a lack of consistent sampling and a shortage of taxonomic expertise. The suspected case of a northward range extension into Ontario of one of the largest and most conspicuous spheciform wasps in North America (the 'horse guard', *Stictia carolina*, Crabronidae) was reported earlier (Buck 2004). New data provided in this paper now suggest that the species has in fact become established in Ontario.

Materials and Methods

All specimens, unless noted otherwise, are deposited in the University of Guelph Insect Collection, Department of Environmental Biology, Guelph, Ontario.

Acronyms of depositories: AMNH – American Museum of Natural History, New York, New York; CNCI – Canadian National Collection of Insects, Ottawa, Ontario; GAM – private collection of Parker Gambino, Brewster, New York; GUS – private collection of Josef Gusenleitner, Linz, Austria; ROME – Royal Ontario Museum, Toronto, Ontario.

Abbreviations: MOD – mid ocellar diameter.

Sierolomorphidae

Sierolomorpha nigrescens Evans, 1961

CANADA, Ontario: Thunder Bay Distr., 4♂, ♀, Sleeping Giant Provincial Park, Marie Louise Lake Campground, 48°21'47"N, 88°47'53"W, 9–14 July 2002, forest trail, white pan traps, M. Buck.

Recorded for the first time from the eastern Nearctic. Previously, the species was known from Saskatchewan west to the Yukon and south to California, Arizona, and Colorado (Evans 1961). Evans (l.c.) suspected that *S. nigrescens* might be a western subspecies of *S. canadensis* (Provancher). He mentions a range overlap between the two species, which is incompatible with the hypothesis of subspecies status. The biology of Sierolomorphidae is unknown. Most species appear to be associated with wooded areas and might be parasitoids of wood-boring insects.

Vespidae

Ancistrocerus gazella (Panzer, 1798)

CANADA, Ontario: York Reg., ♀, Etobicoke, 16 August 1995, garden, B. Larson. **Peel Reg.**, ♀, Cooksville, 17 June 1993, field vegetation, R. Krupke. **Wellington Co.**, ♀, Guelph, 6 October 1992, field, D. Bennett; ♀, Guelph, Speed River, 7 October 1997, sweep net, R. Vincent; Guelph, University Campus, ♂, 31 August 2001, S. M. Paiero, ♀, 3–5 September, ♀, 6 September 2002, M. Buck, ♂, ♀, 16 August, ♂, 25 August, ♀, 26 August, ♀, 30 August, 2♀, 1 September, 2♀, 3 September 2004, M. Buck. **Halton Reg.**, ♀, Milton, Derry Rd. & 4th Line, 43°31'31"N, 79°50'25"W, 5 August 2002, S. M. Paiero. **Welland Co.**, 2♀, Thorold, 21 August 1983, M. D. Forward. **UNITED STATES, Massachusetts:** ♀, Cape Cod, 13 August 1978, W. A. Attwater. **New York:** ♀, New York, Central Park, 1 October 1961, P. H. Arnaud (AMNH); ♀, Kings Co., Brighton Beach area, 8 August 1962, S. H. Hessel and R. B. Tarsy (AMNH); 1 specimen, Newburgh, Fostertown, 26 June 1967, P. P. Babiy (GUS*). **New Jersey:** ♀, Bergen Co., Closter, 26 June 1962, J. G. Rozen et al. (AMNH). **Delaware:** 1 specimen, Wilmington, 11 June 1974, P. P. Babiy (GUS*). (*data kindly provided by J. Gusenleitner; material not examined by the authors).

The oldest Nearctic specimen of this Palaearctic species examined was collected in New York in 1961. Due to its similarity to another introduced Palaearctic species, *A. parietum* (L.), which has been known from eastern North America for a long time, *A. gazella* was overlooked for almost half a century. For identification Gusenleitner's (1995) key to central and southern European *Ancistrocerus* was used. *Ancistrocerus gazella* differs from *A. parietum* by the following characters: transverse carina of tergum 1 with small median incision only (with deep, V-shaped incision in *parietum*), and metanotum with complete yellow band (in some males divided medially or absent; black or with small, evanescent yellow spots in *parietum*). The Palaearctic range of *A. gazella* includes most of Europe (except northern Scandinavia) east to the Caucasus, North Africa (Morocco), and Madeira (Blüthgen 1961). Like the closely related *A. parietum*, it nests in a great variety of natural and man-made cavities including hollow stems, borings in wood, hollows in brick-and-mortar walls, or metal rails (Blüthgen l.c.). In central Europe the species has two generations (Blüthgen l.c.). The flight period in Ontario is similar, and probably includes two generations as well.

Sphecidae

Isodontia elegans (F. Smith, 1856)

CANADA, Ontario: Essex Co., ♀, La Salle, Brunet Park, 29 July 2005, S. M. Paiero. **UNITED STATES, New York** (data kindly provided by P. Gambino; material not examined by the authors): Bronx Co., Harris Park Annex, 2♀, 19 July 1995, ♂, ♀, 16 July 1996, P. Gambino (GAM); Bronx Co., ♂, East 211th Street at Woodlawn Cemetery, 12 August 1997, P. Gambino (GAM); Bronx Co., Van Cortlandt Park at Gunhill Road, ♀, 6 June 2000, ♂, 27 June 2001, 2♂, ♀, 3 July 2005, P. Gambino (GAM); Westchester Co., ♀, Croton Point Park, 19 August 1999, P. Gambino (GAM).

First published records of *I. elegans* from the eastern Nearctic region. The natural range of this species extends from British Columbia south to California, Texas and northern Mexico (Bohart and Menke 1963). The easternmost previously published records are from western Nebraska and east-central Texas. Besides the material listed above, two eastern Nearctic records of *I. elegans* have been posted on an amateur entomological website on the internet. One record (supplemented by an image of a correctly identified *I. elegans*) is from West Chicago Prairie, DuPage Co., Illinois on 2 July 2005 (Marlin 2005). Another contributor to the website mentions collecting the species “in Cincinnati [Ohio] in the 1990s” (Eaton 2005). *Isodontia elegans* is recognised easily by the brownish colour of the metasoma, and there is therefore no reason to doubt the identity of the mentioned material. The occurrence of this species in the eastern Nearctic is probably due to accidental introduction. Because of their nesting habits (in borings in wood, stems, etc.), species of this genus are prone to be introduced accidentally to other geographic areas. This has also happened to the closely related eastern Nearctic species *I. mexicana* (Saussure), which was accidentally introduced to southern Europe and Hawaii (Bohart and Menke 1963; Bitsch et al. 1997). Examples of western-eastern Nearctic introductions are rare in aculeate wasps. Besides the western *Trypoxylon bidentatum* Fox, which might have become established in Ontario (see Buck 2004), *I. elegans* appears to be the only example for this introduction pattern.

***Isodontia philadelphica* (Lepeletier, 1845)**

CANADA, Ontario: Kent Co., ♂, Rondeau Provincial Park, South Point Trail East, 42°15'35"N, 81°50'53"W, sandy savannah, visiting *Melilotus albus* Medikus flowers, 28 July 2005, M. Buck.

First record for Canada. Harrington (1902) and Walker (1913) erroneously recorded the species from Ontario (Buck 2004). The previously known range extends from Connecticut, New York, and Illinois south to Florida and west to California (Bohart and Menke 1963). *Isodontia philadelphica* is easily distinguished from other species in the genus by the mainly dark pubescence of the body.

Crabronidae

***Spilomena troglodytes* (Vander Linden, 1829)**

CANADA, Ontario: Wellington Co., ♀, Guelph, University of Guelph Campus, 16 August 2004, on *Solidago* flowers, M. Buck. Other material examined: **FINLAND:** ♂, ♀, Tavastia australis, Janakkala, 5 July 2002, swept from *Salix fragilis* L., V. Vikberg.

Spilomena troglodytes is a trans-Palaearctic species (Pulawski 2005) that is recorded here for the first time from North America. The species was identified using Palaearctic keys by Vikberg (2000), Dollfuss (1986), and Lomholdt (1975) and compared to authoritatively identified material from Finland that was kindly provided by V. Vikberg. In Bohart and Smith's (1995) key to Nearctic *Spilomena* species, *S. troglodytes* runs to couplets 15 (females of *S. pusilla* (Say) and *S. hainesi* N. Smith) and 20 (males of *S. barberi* Krombein and *S. pusilla*). The female of *S. troglodytes* is distinguished from *S. pusilla* by the apically compressed tergum 6 which bears a median carina (or double carina) in its apical third (tergum rounded and ecarinate in *S. pusilla* and *S. barberi*, undescribed

for the Californian *S. hainesi*). From *S. hainesi* it can be separated by the short basal flagellomeres (longer than broad in *S. hainesi* according to Bohart and Smith (1995)). The male differs from *S. pusilla* by the less extensive yellow facial markings (not surrounding antennal bases dorsally); both sexes differ from *S. barberi* by the scarcely pubescent apical portions of terga 3–6 (pubescence fairly dense and in a clearly defined band in *S. barberi*). *Spilomena troglodytes* nests in borings in wood, preferably those made by anobiid beetles, and in thatched roofs; it provisions its brood with nymphal Thysanoptera (Lomholdt 1975). The species was probably introduced accidentally to North America with timber or other substrates containing nests.

***Tachysphex punctifrons* Fox, 1891**

CANADA, Ontario: Leeds and Grenville Co., ♂, Lake Opinicon, Perth Road Village, Queens University Biological Station, 44°33'57"N, 76°19'31"W, 1–6 August 2005, L. Best.

Recorded for the first time from eastern Canada. Western Canadian records are from Manitoba to Alberta. In the eastern United States the species occurs along the Atlantic Seaboard from Massachusetts to Florida and west to North Dakota, Idaho, Utah, and New Mexico (Pulawski 1988). The species is rare in the Great Lakes region (F. E. Kurczewski, in litt.), where it has been recorded from Michigan, Illinois, Wisconsin, and Minnesota (Pulawski 1988).

***Ectemnius paucimaculatus* (Packard, 1866)**

CANADA, Ontario: Kent Co., ♂, Rondeau Provincial Park, Marsh Trail North, 11 July 2005, visiting flowers of *Daucus carota* L., M. Buck.

Recorded for the first time from Canada. This species was wrongly recorded from the Ottawa area by Harrington (1902) (see Buck 2004). It is very similar to *E. stirpicola* (Packard) with which it has been confused. However, the shape of the clypeus (illustrated by Bohart and Kimsey 1979) is a very reliable diagnostic character despite the quite subtle difference between the two species. The colouration of tergum 5, another character mentioned by Bohart and Kimsey (i.e., couplet 21: with a pair of yellow spots in *stirpicola*, without spots in *paucimaculatus*) has proven unreliable. The senior author has examined several *E. stirpicola* from Ontario (in CNCI) that lack yellow spots on tergum 5, and in some melanistic specimens the yellow markings of the metasoma are reduced to a single pair of spots on tergum 2. *Ectemnius paucimaculatus* has been recorded previously from Illinois and New York south to Florida (Krombein 1979).

***Stictia carolina* (Fabricius, 1793)**

CANADA, Ontario: Kent Co., ♂, Rondeau Provincial Park, South Point Trail East, 42°15'35"N, 81°50'53"W, dunes, visiting flowers of *Melilotus albus*, 28 July 2005, M. Buck.

This large and conspicuous species was recorded recently for the first time from Canada based on a single male from Point Pelee, Ontario (Buck 2004). At the time it was unclear whether the recorded specimen was just a straggler or whether the species had recently expanded its range into southern Ontario. No further collecting was done at Point Pelee since the first discovery but the new finding of *Stictia carolina* approximately 65 km

ENE of Point Pelee indicates that this species has apparently become established along the western part of Lake Erie in southern Ontario.

***Cerceris bicornuta* Guérin, 1845** (Fig. 1)

CANADA, Ontario: Lambton Co., ♀, Walpole Island, Chief's Road, sand pits, 42°39'39"N, 82°29'41"W, 8 August 2005, dug out from ground burrow, S. M. Paiero. **Essex Co.**, ♀, Windsor, Broadway Park, 28 July 2005, M. D. Bergeron.

First record from Canada. In the United States the species has a transcontinental distribution from Massachusetts, southern New York, lower Michigan and Illinois south to Florida and west to California and Oregon (Scullen 1965). Because of the unusual colouration of the female and male morphology (see Fig. 1 and key below) this species is easily recognisable. With twenty species, *Cerceris* is the largest genus of spheciform wasps in eastern Canada but most species are difficult to identify with the current literature. Scullen's (1965) revision of the genus provides good illustrations of certain diagnostic features but his key is often misleading and difficult to use for a non-expert. Furthermore, males in several species groups (*arelate-dentifrons*, *atramontensis-clypeata-halone-prominens*, *echo-finitima*) have never been separated. With recent renewed interest in the genus (Marshall et al. 2005) we take the opportunity to provide a novel key to the eastern Canadian species of *Cerceris* that remedies these problems.



FIGURE 1. Female *Cerceris bicornuta* from Windsor, Ontario, July 2005 (photo by S. A. Marshall).

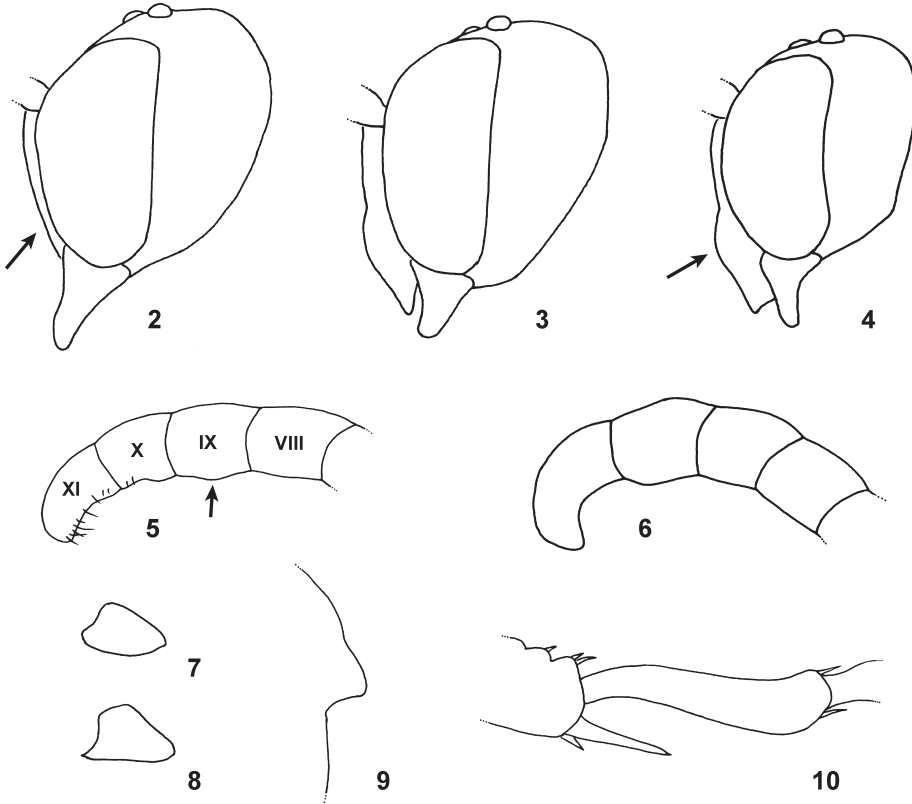
Key to the eastern Canadian species of *Cerceris* Latreille

Notes. Four species from the northeastern United States might be found in Canada in the future but are not included in the key: *C. alaope* Banks (Massachusetts, southern New York), *C. compar* Cresson (distributed widely throughout New England states, Pennsylvania, Ohio, Michigan, Minnesota), *C. jucunda* Cresson (New York), and *C. mandibularis* Patton (southern New York, southern Pennsylvania). The species marked by asterisk (*) are not known from any other Canadian province besides Ontario. It should be noted that colouration shows geographic variation in most species. The present key is designed for eastern Canada and adjacent regions, and some colour characters will not necessarily work for southern or western specimens of the species included here.

Females

(Antenna with ten flagellomeres, metasoma with six apparent segments.)

1. Clypeal process with broadly lamellate apex. Scutellum with a pair of yellow spots2
 - Clypeal process not lamellate apically, variably developed, in some specimens very small and virtually absent. Scutellum usually black, rarely with complete yellow band or a pair of yellow spots or largely ferruginous.....3
2. Width of lamellate portion of clypeal process less than length of scape; lamella inserted at level of lower eye margin. Metanotum black.....*C. rufopicta* F. Smith
 - Width of lamellate portion of clypeal process ca. 1.5x length of scape; lamella inserted far above level of lower eye margin. Metanotum with complete yellow band.....*C. compacta* Cresson*
3. Tegula conspicuously humped (as in Fig. 7) with coarsely punctate summit *and/or* mesopleuron with distinct, tooth-like ventrolateral tubercle near middle (Fig. 9). Pygidial plate narrowed towards base; basal width at most slightly greater than half maximum width. Scutellum with a pair of yellow spots or complete yellow band.....4
 - Tegula moderately convex and usually smooth, rarely with a few scattered coarse punctures on summit. Mesopleuron rounded ventrolaterally, in some specimens with minute angle. Pygidial plate variable. Scutellum usually black.....7
4. Clypeal process weakly trilobate, middle lobe broad, with slightly convex apex. Tegula evenly convex, not humped, with smooth summit. Metanotum black. Yellow fasciae on terga 2 and 4 complete, broadly interrupted on 3.....*C. kennicottii* Cresson*
 - Clypeal process bilobate or bidentate, its apical margin slightly to conspicuously emarginate between corners. Tegula distinctly humped, with coarsely punctate summit. Metanotum with complete yellow band. Yellow fasciae on terga 2–4 complete.....5
5. Clypeal process narrow (ca. 1.5x MOD), with sharp median incision. Tergum 1 largely ferruginous. Ventrolateral tubercle of mesopleuron poorly developed, apical angle in anterior view much greater than 90°. [Subantennal sclerite and clypeus black.].....*C. crucis* Viereck & Cockerell*



FIGURES 2–10. Diagnostic features of *Cercheris* adults. Male head, lateral view: 2 – *C. halone*, 3 – *C. clypeata*, 4 – *C. occipitamaculata*. Male flagellomeres VIII–XI, dorsal view: 5 – *C. atramontensis* (arrow pointing to posterior swelling of flagellomere), 6 – *C. bicornuta*. Male tegula, posterior view: 7 – *C. echo*, 8 – *C. finitima*. Ventrolateral tubercle of female mesopleuron, anteroventral view: 9 – *C. echo*. Male hind basitarsus, posterodorsal view: 10 – *C. bicornuta*.

- Clypeal process broad (> 2 MOD), very shallowly emarginate. Tergum 1 black, usually marked with yellow. Tubercle of mesopleuron prominent, apical angle in anterior view $\leq 90^\circ$ (Fig. 9).....6
- 6. Subantennal sclerite and clypeus almost completely yellow. Clypeus essentially flat above process; apex of process extending ventrally to level of clypeal margin.....*C. finitima* Cresson*
- Subantennal sclerite and clypeus black, the latter rarely with small median yellow spot. Clypeus with median convexity above process; apex of process ending short of level of ventral clypeal margin.....*C. echo* Mickel*
- 7. Clypeal process virtually absent.....8
- Clypeal process prominent, of variable shape.....9

8. Disc of clypeus evenly convex, with a pair of tiny tubercles just above apical margin. Antennal flagellomeres (VI)–VII–X with linear tyli. Propodeum black. Metasomal terga black except for broad yellow fascia on tergum 2 and in some specimens small lateral spots on tergum 3. Wing strongly infuscated. Large species, body length ca. 15 mm.....*C. fumipennis* Say*
- Clypeus with an indistinct, curved, ridge-like swelling near middle, area below swelling flattened. Antennal flagellomeres without tyli. Propodeum with a pair of yellow spots. Metasoma with subequal yellow fasciae on terga 2–5. Wing weakly infuscated. Smaller, length ca. 10 mm.....*C. deserta* Say
9. Clypeal process developed as low, conical, median tubercle.....10
- Clypeal process not conical, its apex emarginate or truncate (in some specimens only narrowly) in dorsal view.....11
10. Clypeal process somewhat flattened dorsoventrally and slightly deflected downward at apex (lateral view). Inner margin of mandible with low and ill-defined teeth, not notched. Scutellum black, metanotum yellow. Metasomal terga 2–5 with subequal yellow fasciae.....*C. nitidoides* Ferguson
- Clypeal process neither dorsoventrally flattened nor deflected, apex rectangular in lateral view. Second mandibular tooth very enlarged, inner margin of mandible deeply notched just distal of tooth. Scutellum yellow-banded, metanotum black. Tergum 2 black, tergum 3 with broad yellow fascia, terga 4 and 5 with narrow yellow fasciae.....*C. insolita* Cresson*
11. Yellow fascia of tergum 2 distinctly wider than on following terga.....12
- Yellow fasciae of metasomal terga 2–5 subequal.....16
12. Head, pronotum, and propodeum with ferruginous markings; scutellum and metasoma largely ferruginous. Terga 3–5 without yellow fasciae. Pygidial plate about half as wide at base than at middle.....*C. bicornuta* Guérin*
- Body without ferruginous markings. Terga 3–5 with yellow apical fasciae. Pygidial plate as wide at base as at middle.....13
13. Clypeal process (measured from base of clypeus to apex of process along midline) at least as long as scape. Clypeus with yellow spots laterally (exceptionally absent).....*C. clypeata* Dahlbom
- Clypeal process shorter than scape. Clypeus often without yellow spots.....14
14. Clypeal margin with a pair of very prominent and stout paramedian teeth bordering deep median emargination (depth of depression equals diameter of scape). Edge of clypeal process strongly curved (often almost semicircularly) in anteroventral view. Clypeus with yellow markings laterally and medially below process.....*C. halone* Banks
- Paramedian teeth of clypeal margin less robust and less prominent, area between them moderately emarginate (depth of emargination at most half diameter of scape). Edge of clypeal process usually straight to slightly curved in anteroventral view. Clypeus black laterally, rarely with median yellow spot below process.....15
15. Apical corners of clypeal process as far apart as centres of antennal sockets. Process projecting clearly less than diameter of scape beyond level of flattened lower part of clypeus (lateral view). Widespread.....*C. atramontensis* Banks

- Apical corners of clypeal process as far apart as lateral margins of antennal sockets. Process projecting by at least diameter of scape beyond level of flattened lower part of clypeus (Ottawa area, one record only).....*C. prominens* Banks*
- 16. Clypeal margin without median tooth. Rarely collected species.....17
- Clypeal margin with low, often rectangular, median tooth.....18
- 17. Clypeal margin with one pair of teeth that are twice as far apart as antennal sockets; margin between teeth straight. Clypeal process parallel-sided and broad, its apical corners further apart than lateral margins of antennal sockets. Scutum dull between punctures.....*C. occipitomaculata* Packard*
- Clypeal margin with two pairs of teeth, inner pair larger and about as far apart as antennal sockets; margin between inner teeth emarginate. Sides of clypeal process distinctly convergent towards apex; apical corners closer to each other than centres of antennal sockets. Scutum shiny between punctures.....*C. astarte* Banks*
- 18. Clypeal process with deep triangular emargination, its apical edge almost straight in anteroventral view, rounded over medially. [Median tooth of clypeal margin broad, rectangular. Markings of body bright yellow.].....*C. dentifrons* Cresson
- Clypeal process less deeply and more evenly emarginate; its apical edge acute medially and usually strongly curved in anteroventral view.....19
- 19. Median tooth of clypeal margin broad, rectangular. Body markings pale yellow to ivory.....*C. nigrescens* F. Smith
- Median tooth of clypeal margin narrow, triangular. Body markings bright yellow....
.....*C. arelate* Banks

Males

(Antenna with eleven flagellomeres, metasoma with seven apparent segments.)

- 1. Sternum 2 with median subbasal swelling.....2
- Sternum 2 flat.....6
- 2. Clypeus extensively black, especially laterally.....3
- Clypeus yellow except apical margin.....4
- 3. Tegula with coarsely punctate summit. Metanotum yellow (yellow spot evanescent in some specimens). Tergum 1 usually marked with ferruginous; tergum 3 with complete yellow apical fascia.....*C. crucis* Viereck & Cockerell*
- Tegula with impunctate summit. Metanotum black. Tergum 1 black, without ferruginous markings; tergum 3 with pair of broadly separated yellow lateral spots...
.....*C. kennicottii* Cresson*
- 4. Tegula moderately and evenly convex, with indistinct punctures. Scutellum black. Propodeal enclosure smooth with weakly impressed median groove.....
.....*C. nitidoides* Ferguson
- Tegula distinctly humped (Fig. 7, 8) and coarsely punctured. Scutellum with pair of yellow lateral spots (spots evanescent in some specimens). Propodeal enclosure with distinct transverse ridges.....5
- 5. Metanotum with coarse, contiguous punctures, with no interspaces except along posterior margin. Tegula moderately convex (Fig. 7), convexity subequal to greatest

- diameter of flagellomere III. Apical fascia of tergum 2 with slightly convex or straight anterior margin. Erect setae of sterna 3–6 shorter (length < 1 MOD).....
*C. echo* Mickel*
- Metanotum with extensive shiny interspaces between small punctures. Tegula extremely convex (Fig. 8), convexity subequal to 1.5x greatest diameter of flagellomere III. Apical fascia of tergum 2 emarginate anteriorly. Erect setae of sterna 3–6 long (length > 1 MOD).....*C. finitima* Cresson*
6. Setal brushes of clypeal margin very broad, separated by distinctly less than their own width. Scutellum with yellow band. Tergum 2 black, lacking apical fascia; terga 1 and 3 with broad apical fasciae; fasciae narrow on terga 4 and 5.....
*C. insolita* Cresson*
- Setal brushes of clypeal margin separated by at least their own width, not extending onto median lobe. Scutellum black or with pair of yellow spots, exceptionally with yellow band. Tergum 2 with well developed apical fascia, other terga variable.....7
7. Apical fascia of tergum 2 broader than those of following terga.....8
- Apical fasciae of terga 2–4 subequal.....14
8. Flagellomere XI without outstanding setulae on posterior surface.....9
- Flagellomere XI with a few outstanding setulae on posterior surface (e.g., Fig. 5).....
12
9. Scape and clypeus black, the latter in some cases with small ivory spot(s). Pale markings of body ivory.....*C. fumipennis* Say*
- Anterior surface of scape yellow. Clypeus yellow except apical margin. Pale markings of body yellow.....10
10. Tergum 7 with pair of basolateral setal tufts. Sterna 3–5 with conspicuous, dense erect hair. Hind basitarsus somewhat swollen apically and slightly curved outward (Fig. 10). Flagellomere XI conspicuously curved (Fig. 6).....*C. bicornuta* Guérin*
- Tergum 7 with scattered setae laterally. Sterna 3–5 with moderately dense, inclined hair. Hind basitarsus simple. Flagellomere XI nearly straight.....11
11. Flagellomeres (VIII)–IX–XI with bare posterior patches (devoid of microtrichia). Yellow area of median clypeal lobe more rounded ventrally. Metanotum black.....
*C. rufopicta* F. Smith
- Apical flagellomeres without bare posterior patches, evenly covered with microtrichia. Yellow area of median clypeal lobe more or less triangular and pointed ventrally. Metanotum with yellow band.....*C. compacta* Cresson*
12. Clypeus conspicuously flattened (Fig. 2). [Flagellomere IX with low posterior swelling, visible as slight convexity in profile; as in Fig. 5.].....*C. halone* Banks
- Clypeus with the usual slight convexity (Fig. 3).....13
13. Flagellomere IX without posterior swelling (straight in profile but with the usual bare patch). Lower surface of flagellum orange.....*C. clypeata* Dahlbom
- Flagellomere IX with low posterior swelling visible in profile (Fig. 5). At least median portion of flagellum black ventrally.....
*C. atramontensis* Banks and *C. prominens* Banks*

Note: Males of *C. atramontensis* and *C. prominens* cannot be separated based on morphological characters. While the former is one of the most common species of the genus in Ontario (distribution: southern Ontario north to Killarney Provincial

- Park) the latter is known only from a few specimens collected around 1900 in the Ottawa area (Buck 2004).
14. Median clypeal lobe with lateral teeth only, median tooth absent. Posterior fringe of erect setulae present on whole length of flagellomeres XI and X, fairly dense at base of flagellomere XI. Propodeal enclosure smooth except for weakly impressed median groove.....*C. astarte* Banks*
 - Median clypeal lobe with median tooth (indistinct in atypical specimens). Posterior fringe of erect setulae interrupted or sparse near base of flagellomere XI, setulae on flagellomere X restricted to apical half or less. Propodeal enclosure with more or less distinct longitudinal ridges.....15
 15. Clypeus flattened, with welt-like transverse swelling above margin of median lobe. Width of median clypeal lobe > 1/3 clypeal width, with distinct emarginations between teeth.....*C. deserta* Say
 - Clypeus convex, without transverse swelling above margin of median clypeal lobe. Width of median clypeal lobe < 1/3 clypeal width; emarginations between teeth indistinct.....16
 16. Clypeus more strongly convex (Fig. 4). [Body markings yellow] (Ontario, one record only).....*C. occipitomaculata* Packard*
 - Clypeus weakly convex (as in Fig. 3). Mostly commonly collected species.....17
 17. Body markings ivory to pale yellow. [Apical flagellomeres as in *C. arelate*] (see below).....*C. nigrescens* F. Smith
 - Body markings bright yellow or slightly paler.....18
 18. Flagellomeres (V–)VI–XI each with bare patch (devoid of microtrichia) posteriorly (patches becoming smaller on more basal flagellomeres).....*C. dentifrons* Cresson
 - Only flagellomeres (IX–)X–XI with bare patch ventrally (small on flagellomere IX if present).....*C. arelate* Banks
- Note: This character requires careful examination under critical lighting.

Colletidae

Hylaeus (Spatulariella) hyalinatus F. Smith, 1843

CANADA, Ontario: Halton Reg., Oakville, 16 Mile Creek nr. Hwy 407, ♂, ♀, 21 August 2004, ♂, 25 June 2005, M. Buck. **Essex Co.,** ♂, W of Harrow, 28 June 1993, edge of farmer's field, pheromone trap, J. Doherty.

Newly recorded from Canada. This Palearctic species was first recorded from the Nearctic region by Ascher (2001) based on material collected in New York in 1997 and later. All New York state records are from the Ithaca area (Tompkins Co.) and the New York City area (Bronx Co., New York Co., Westchester Co.) (Ascher et al. 2006). The earliest specimen from Ontario was collected in 1993 (see above), and now represents the oldest known record from North America. *Hylaeus hyalinatus* is distinguished easily from other northeastern *Hylaeus* by the well-developed omaulus and the protruding spatulate process of male sternum 8. The male terminalia and facial markings were illustrated by Ascher (2001). This species nests in a great variety of cavities in and above the ground, including abandoned solitary wasp or bee nests, hollow twigs, and borings in wood, etc. (Ascher l.c.).

Megachilidae

Chelostoma (Chelostoma) campanularum (Kirby, 1802)

CANADA, Ontario: York Reg., ♂, Etobicoke, 29 June 1997, backyard, C. S. Onodera; 2♂, 10♀, Toronto, Humber River nr. old mill, 11 July 1999, T. Romankova (ROME). **Wellington Co.**, 3♀, Guelph, 22 July 2004, on *Campanula*, S. M. Paiero; ♀, Guelph, Wellington St. & Fife Rd., 4 September 2004, at roots of uprooted tree, M. Buck. **Halton Reg.**, ♂, Oakville, 21 July 1976, W. A. Attwater. **Welland Co.**, ♀, Welland, 27 June 1977, R. G. Bennett.

Newly recorded from Canada. This is another Palaearctic species that has apparently been introduced accidentally to North America. Previously, the species was known only from New York, where it was first collected in 1973 (Eickwort 1980). *Chelostoma campanularum* nests in borings in wood or hollow twigs, and was probably introduced with shipments of wood (e.g., wooden pallets) containing nests. The species is oligolectic on *Campanula* (Eickwort l.c.).

Chelostoma (Gyrodromella) rapunculi (Lepeletier, 1841)

CANADA, Ontario: Halton Reg., ♂, ♀, Oakville, 16 Mile Creek nr. Hwy 407, 25 June 2005, visiting flowers of *Echium vulgare* L., M. Buck.

As the previous species, *Ch. rapunculi* is native to the Palaearctic region, and is recorded for the first time from Canada. It was first discovered in the Nearctic region by Eickwort (1980) based on specimens collected in New York as early as 1962. The biology is similar to *Ch. campanularum*, with females being oligolectic on *Campanula*, though our specimens were visiting flowers of viper's bugloss (*Echium vulgare*). The differences between the two introduced and the single native eastern Nearctic species of *Chelostoma* are summarized in the key below.

Key to the eastern Nearctic species of *Chelostoma* Latreille

1. Female (ten flagellomeres; metasomal sterna with scopa).....2
- Male (eleven flagellomeres; scopa absent).....4
2. Terga 1–4 with apical fasciae of white appressed pubescence. Body length 8–11 mm.....*Ch. rapunculi* (Lepeletier)
- Terga 1–4 without fasciae of appressed pubescence. Body length 5–8 mm.....3
3. Length of mandible approximately 2/3 eye height (Eickwort 1980: Fig. 3). Flagellomeres VIII and IX at least as long as wide. Setae of mid basitarsus simple.....*Ch. philadelphia* Robertson
- Length of mandible approximately half eye height (Eickwort 1980: Fig. 2). Flagellomeres VIII and IX wider than long. Setae of mid basitarsus conspicuously plumose.....*Ch. campanularum* (Kirby)
4. Apical tergum trilobate, median lobe below paired lateral lobes; lobes truncate apically (Eickwort 1980: Fig. 6). Clypeus truncate apically. Sternum 2 with prominent, nearly semicircular protuberance (posterior view). Body length 8–11 mm.....*Ch. rapunculi* (Lepeletier)

- Apical tergum with paired lobes only, lacking median lobe. Sternum 2 with low, transverse, welt-like swelling. Body length 5–8 mm.....5
- 5. Apical tergum quadridentate, lateral pair of teeth about half the size of paramedian pair (Eickwort 1980: Fig. 4). Flagellomere II longer than wide and longer than flagellomere I.....*Ch. philadelphia* Robertson
- Apical tergum bidentate, only paramedian pair of teeth present, elongate (Eickwort 1980: Fig. 5). Flagellomere II wider than long, at most as long as flagellomere I.....*Ch. campanularum* (Kirby)

***Hoplitis (Hoplitis) anthocopoides* (Schenk, 1853)**

CANADA, Ontario: Peel Reg., ♀, Forks of the Credit, gravel pit NW of Provincial Park, 43°49'24"N, 80°0'57"W, 5 August 2002, white pan traps, M. Buck. **Wellington Co.**, ♂, Rockwood, Valley Rd., 43°46'56"N, 80°8'28"W, 21 July 2004, on rock and mortar walls of ruin of house, M. Buck; 6♂, 4♀, Guelph, Niska Rd., Guelph Bird Sanctuary, 11 June 2005, abandoned gravel pit, M. Buck; 3♂, 2♀, Guelph, Wellington & Fife Rds., 12 June 2005, abandoned lot, M. Buck; 3♂, ♀, same locality, reared from mortar nests on rocks collected on 1 June 2005 (emergence dates in lab: ♂, 14 June, ♂, 15 June, ♂, ♀, 30 June 2005), M. Buck. **Halton Reg.**, Milton, Woodland Trails camp, 6th Line Nassagaweya, 43°32'51"N, 79°59'35"W, ♂, 27 June 2005, ♂, 2♀, 8 July 2005, S. M. Paiero.

This species is also native to Europe and is newly recorded from Canada. It was known previously from New York, where it was first collected in 1969 (Eickwort 1970). According to S. Droege (in litt.) the species now also occurs in West Virginia (Hampshire Co., 2004). The biology of *H. anthocopoides* was studied thoroughly by Eickwort (1973). Unlike native *Hoplitis* (which belong to different subgenera) this species is a true mason bee, i.e. it builds “mortar and pebble” nests. The nests are constructed on exposed areas of rocks (large or small), rubble, stone walls, etc. The females are oligolectic on viper’s bugloss, an introduced European weed that is widespread in disturbed areas with poor soil. This species can be separated from other species of *Hoplitis* using Mitchell (1962) in conjunction with the supplementary couplets provided by Eickwort (1970).

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