

## Mecoptera of Ontario

DAVID K.B. CHEUNG\*, STEPHEN A. MARSHALL\* and DONALD W. WEBB\*\*

\*Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1, Canada [dcheung@uoguelph.ca](mailto:dcheung@uoguelph.ca), [samarsha@uoguelph.ca](mailto:samarsha@uoguelph.ca). \*\*Illinois Natural History Survey, 1816 S. Oak Street Champaign, IL 61820 [dwebb@inhs.uiuc.edu](mailto:dwebb@inhs.uiuc.edu)



**Abstract.** The 19 Mecoptera species occurring in Ontario are reviewed with the provision of extensively illustrated keys in three alternative formats (Lucid ID, HTML non-hierarchical keys, and dichotomous keys). Only male specimens of *Panorpa* are keyed. The keys cover all eastern Canadian Mecoptera and all Canadian Mecoptera other than Boreidae (all known Canadian Mecoptera other than some western Boreidae occur in Ontario). Distributional data are given for Ontario only.

### Introduction

The Mecoptera is an easily recognized order with a small extant fauna of 610 described species worldwide (Penny, 2006). North America is home to less than 100 species of Mecoptera, a fauna dominated in eastern North America by the conspicuously long-snouted and picture-winged common scorpionflies (Panorpidae). The other three families found in Ontario are the earwig scorpionflies (Meropeidae; one species), hanging scorpionflies or hangingflies (Bittacidae, three species), and snow scorpionflies (Boreidae; two species). Snow scorpionflies, now thought to be more closely related to fleas than to other Mecoptera (Whiting, 2002), are small, wingless, rarely encountered winter-active insects. The common scorpionflies and hangingflies, however, are conspicuous and common insects of eastern North American forests and many naturalists are familiar with their abundance, apparent morphological diversity, and interesting behaviour.

The order Mecoptera has been the subject of a number of reviews and regional treatments over the past hundred years. Early treatments of the order include Hine's 1898 and 1901 reviews of common scorpionflies and hangingflies, respectively, and Engelhardt's 1915 treatment of the eastern North American fauna. Carpenter (1931) revised the Nearctic Mecoptera, but three of the Ontario species included here were described later in papers by Byers (1962, 1973). Several papers since then have dealt with regional scorpionfly faunas. The most important of these relative to Ontario Mecoptera are the reviews of the Illinois fauna by

Webb et al. (1975) and the Michigan fauna by Thornhill and Johnson (1974). Both papers provide keys to species and deal with faunas similar to the Ontario fauna both in composition and size (18-20 species), and both use similar line drawings of male terminalia to support their keys. Webb et al. provide maps of the entire distributions of all scorpionfly species found in Illinois, only seven of which were shown as ranging into Ontario. Since the University of Guelph Insect Collection alone includes 17 species of Mecoptera, most of which are also present in Illinois, the Ontario fauna was obviously inadequately documented. The present work is based largely on the University of Guelph collection, supplemented with some records from the Canadian National Collection (Ottawa) and the Royal Ontario Museum (Toronto). Our objective is to document the Ontario fauna while at the same time providing more accessible and user-friendly keys than those available in published papers.

Identification of most Mecoptera is most easily and reliably accomplished by examination of the external male genitalia, which can be difficult to interpret on the basis of descriptions and line drawings. The colour photographs included here should be relatively easy to interpret, and to match to specimens in hand. Distributional data are given for Ontario only, but the keys will work for any eastern Canadian Mecoptera since all known eastern Canadian species occur in Ontario. The Mecoptera have a disjunct distribution in North America, with the eastern North American fauna separated from the relatively small western fauna. In Canada, several species of *Boreus* occur in

British Columbia, Alberta and the Yukon, but Mecoptera are otherwise absent from Canada west of southeastern Manitoba. The keys herein will therefore work for any Canadian Mecoptera other than the western species of Boreidae (North American Boreidae are monographed by Penny, 1977). Ontario is the most Mecoptera-rich province, with 19 species compared with two species (*Bittacus strigosus* and *Panorpa helena*) in Manitoba, and 13 species known from Quebec (Aranguren, 1987). Mecoptera of the Maritime Provinces are inadequately known. We have restricted our *Panorpa* key to male specimens for the simple reason that males of this genus are easiest to identify. Good male specimens, with the genital bulb clearly visible, can usually be identified without special preparation although magnification of about 40X is recommended. Females are often only identifiable with dissection (the abdomen must be removed and cleared in potassium hydroxide), and the reader is referred to the keys in Webb et al. (1975) and Thornhill and Johnson (1974) for identification of females. Some females (such as *P. nebulosa* and *P. acuta*) are apparently indistinguishable morphologically.

#### Biology and behaviour of Mecoptera

Snow scorpionflies are wingless insects that feed on and develop in mosses, and are only active as adults during the colder months. Other Mecoptera are found from spring to fall, usually in shaded, organically rich, moist habitats, where they are often seen standing conspicuously on leaves (Panorpidae), or using their forelegs to hang from foliage of herbaceous plants (Bittacidae). When disturbed, many species will fly a short distance and come to rest on the foliage, but some drop to the ground when alarmed. Bittacidae are predators, often of small Diptera, and Panorpidae usually feed on dead or moribund insects, sometimes taken from spider webs (Thornhill, 1975, Jennings and Sferra, 2002). Both Bittacidae and Panorpidae have complex courtship behaviours involving alternative strategies and nuptial gifts of prey, dead insects, or salivary masses. Several papers deal with sexual selection and nuptial feeding behaviour in scorpionflies (Thornhill, 1976, 1992, Engqvist and Sauer 2001, 2003). Byers and Thornhill (1983) provide a more thorough review of the biology of Mecoptera.

#### Panorpidae Stephens 1835

Panorpidae (common scorpionflies) are distinctively patterned and pigmented insects further distinguished from other Mecoptera by the presence of ocelli (ocelli are absent in Meropeidae), paired serrate claws (single in Bittacidae), and an elongated rostrum (the rostrum is short in Panorpididae, which do not occur in Canada). Panorpids are the only Mecoptera routinely seen standing on foliage. One genus (*Panorpa*), two species groups, and a total of 12 species of Panorpidae occur in Ontario.

Body colour and wing patterns vary widely within most *Panorpa* species, and are usually of limited use for species identification although wing characters have some diagnostic value when combined with other characters. Males can be identified using characters of the genital bulb. Diagnostic structures include the anal horn, dististyles, hypovalves, ventral parameres, accessory lobes and ninth tergite (Fig. 3 and 4). Some authors suggest clearing the male genital bulbs with 10% KOH, however we find that most characters are visible on fresh or dried specimens.

#### *Panorpa acuta* Carpenter 1931

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour and margined crossveins. Apical band broken up with small pale spots. Pterostigmal band indistinct. Marginal spots absent. Male terminalia dark yellow. Ninth tergum truncate apically. Basistyle broad. Hypo valve (Fig. 1a) broad, almost reaching base of dististyle, acuminate apically. Ventral paramere elongate, narrow, unbranched, reaching slightly beyond base of dististyle. Dististyle smaller than basistyle.

*Panorpa acuta* was formerly known from the Appalachian Mountains plus a supposedly disjunct population in the northern lower peninsula of Michigan (Thornhill and Johnson 1974; Webb et al. 1975). The Ontario collections (Fig. 5a) reported here represent the first published records of this species between the Appalachians and Michigan, although Aranguren's (1987) unpublished thesis also records it from southern Ontario and Quebec. We have found *P. acuta* at only two localities in Ontario, (Orwell and Wawanosh; see map). Specimens were collected from May to June.

**Key to Male *Panorpa* of Ontario**

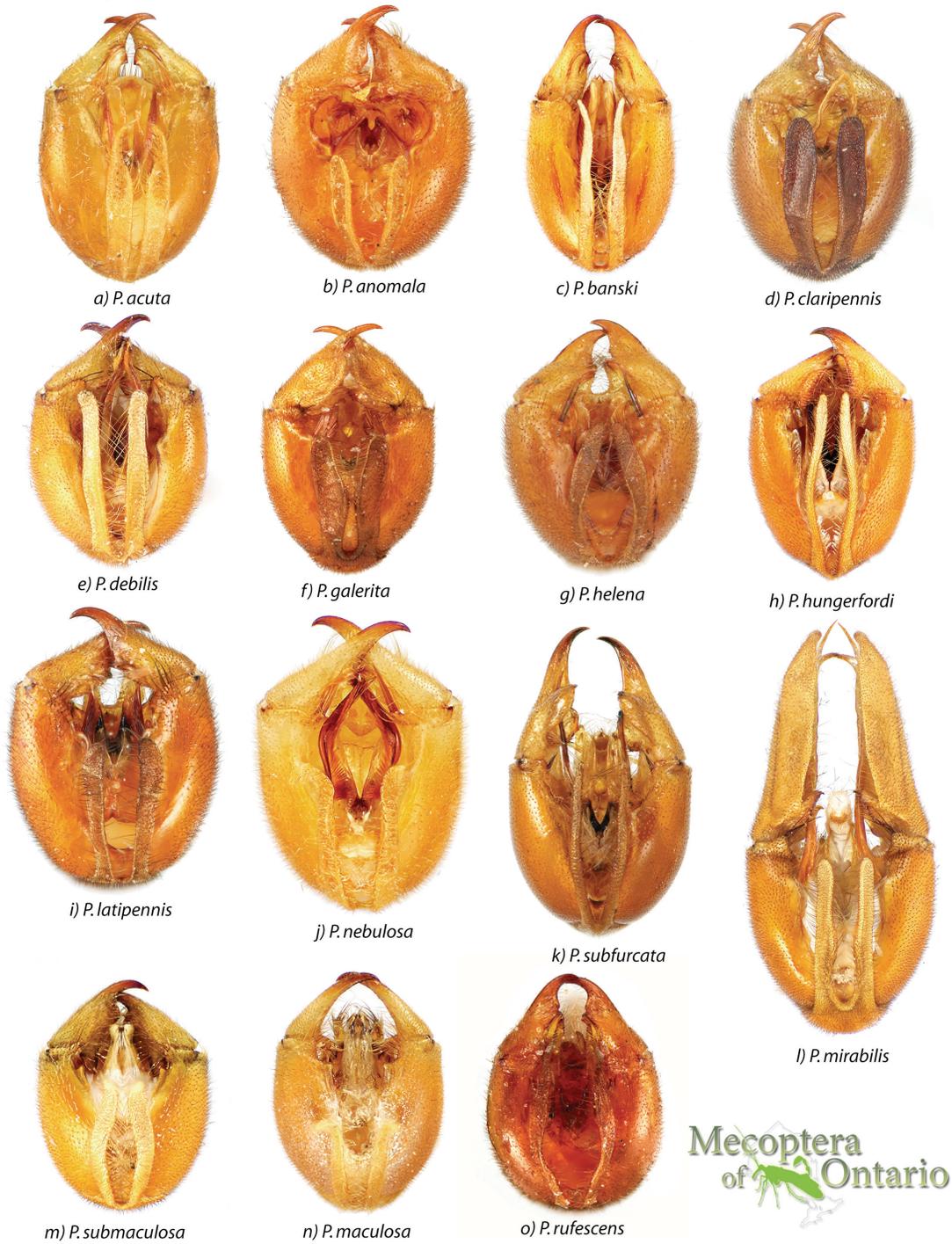
- 1 Anal horn present and pterostigmal band continuous anterior to posterior on fore wing (Fig. 3, 2).....2
- Anal horn absent and pterostigmal band not continuous anterior to posterior on fore wing (Fig. 2)....10
- 2 Dististyles with large accessory lobes (Fig. 1. f, h, k, l).....3
- Dististyles with small accessory lobes (Fig. 1. d, e, g).....6
- 3. Hypovalves thick and divergent (Fig. 1. f, l).....4
- Hypovalves slender and elongate (Fig. 1. h, k).....5
- 4. Accessory lobes large, almost covering entire dististyles (Fig. 1. l)..... *P. mirabilis* Carpenter
- Accessory lobes small, covering only basal half of dististyles (Fig. 1. f).....*P. galerita* Byers
- 5 Background colour of wings clear, ventral parameres without barbs (Fig. 1. k).....
- ..... *P. subfurcata* Westwood
- Background colour of wings yellow, ventral parameres with barbs (Fig. 1. h)..... *P. hungerfordi* Byers
- 6 Ventral parameres branched (Fig. 1. b).....*P. anomala* Carpenter
- Ventral parameres simple, unbranched (Fig. 1. d, e, g).....7
- 7 Basistyle with 1-3 thick setae near the base of each dististyles (Fig. 1. g).....*P. helena* Byers
- Basistyle without thick setae near base of dististyles, or if present coming off of tubercle on the apex of the dististyle (Fig. 1 d, e, o).....8
- 8 Ventral parameres short, concealed within genital bulb (Fig. 1. o).....
- ..... *P. rufescens* Rambur (Potentially occurring in Ontario)
- Ventral parameres long, reaching the base of dististyles (Fig. 1. d, e).....9
- 9 Basistyle with an apical tubercle, ventral parameres long (Fig. 1. e).....*P. debilis* Westwood
- Basistyle without an apical tubercle, ventral parameres short (Fig. 1. d).....*P. claripennis* Hine
- 10 Ventral parameres curved and usually crossing distally (Fig. 1. j).....*P. nebulosa* Westwood
- Ventral parameres straight or slightly curved (Fig. 1. a, c, m).....11
- 11 Dististyles with small finger-like lobes (Fig. 1. i).....*P. latipennis* Hine
- Dististyles without small finger-like lobes (Fig. 1. a, c, m).....12
- 12 Ninth tergum truncate apically, hypovalves tapered (Fig. 1. a).....*P. acuta* Carpenter
- Ninth tergum emarginate apically, hypovalves not tapered (Fig. 1. c, m, n).....13
- 13 Hypovalves long and thin, reaching past the base of dististyles; genital bulb elongate (Fig. 1. c).....
- ..... *P. banksi* Hine
- Hypovalves short and thick, not reaching past the base of dististyles; genital bulb ovate (Fig. 1. m, n)...  
.....14
- 14 Dististyles slender, smoothly curved throughout. (Fig. 1. n).....
- .....*P. maculosa* Hagen (Could potentially occur in Ontario)
- Dististyles broad basally, abruptly curved distally. (Fig 1. m).....*P. submaculosa* Carpenter

*Panorpa anomala* Carpenter 1931

Diagnosis (Webb et al., 1957): Wings with pale yellow background colour, crossveins lightly margined. Apical band brown and usually continuous. Pterostigmal band brown, broad anteriorly, broken posteriorly. Marginal spots small. Male terminalia dark reddish brown. Ninth tergum emarginate. Hypo valve (Fig. 1b) broad apically,

ending before base of dististyle. Ventral paramere elongate, barbed, branched with one branch reaching between dististyle and the other curving dorsally.

*Panorpa anomala* has only been collected once in Canada, in 1936 (Chatham, Ontario). In the United States, *P. anomala* occurs from southeastern

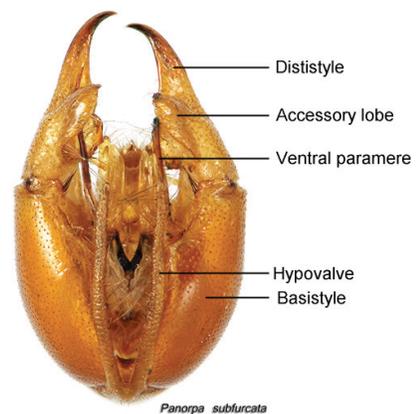


Mecoptera  
of Ontario

Fig. 1 Ventral view of genital bulbs of Male *Panorpa*.



**Fig. 2** *Panorpa* forewings.



**Fig. 3** Lateral view of male *P. subfurcata* terminalia. **Fig. 4** Ventral view of male *P. subfurcata* terminalia.

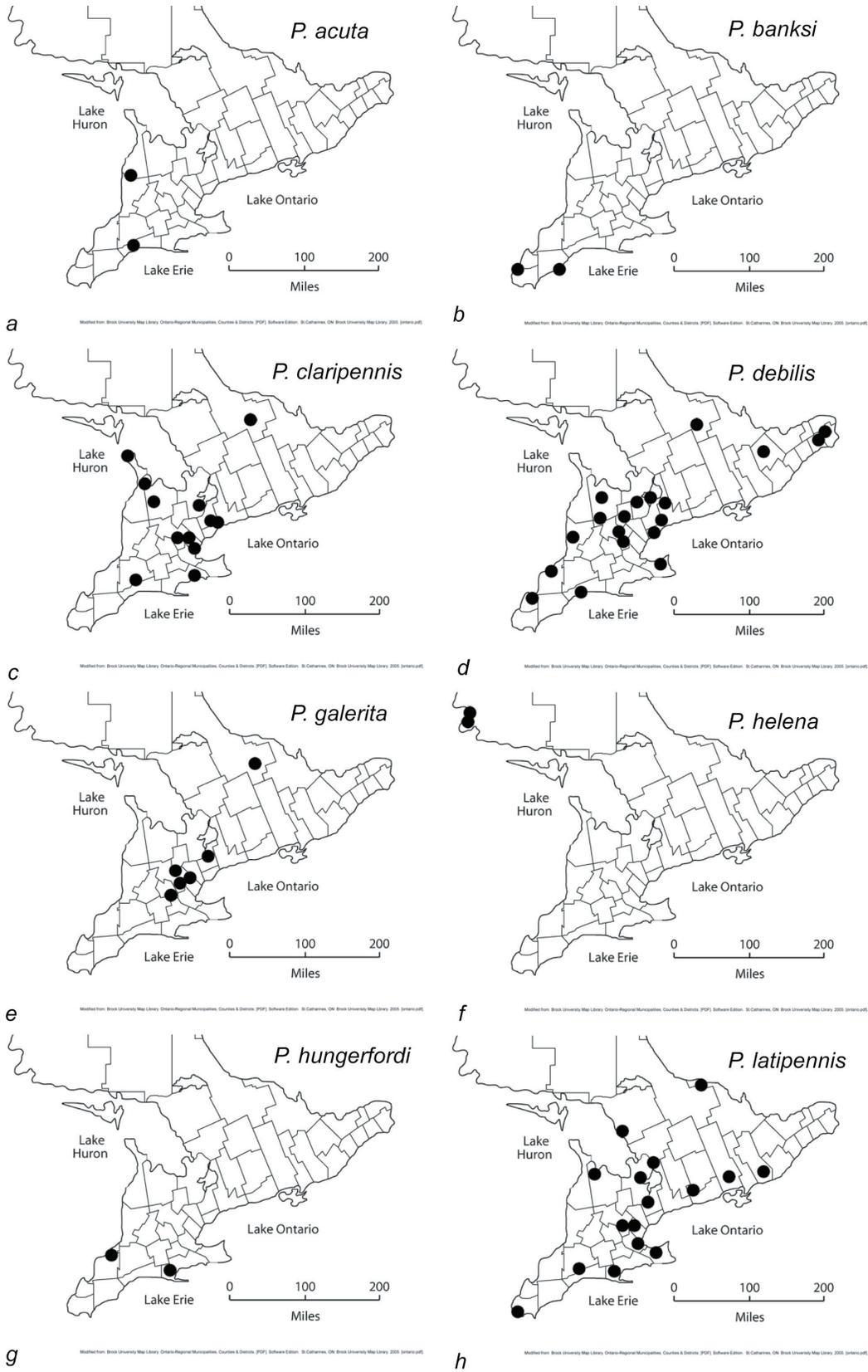
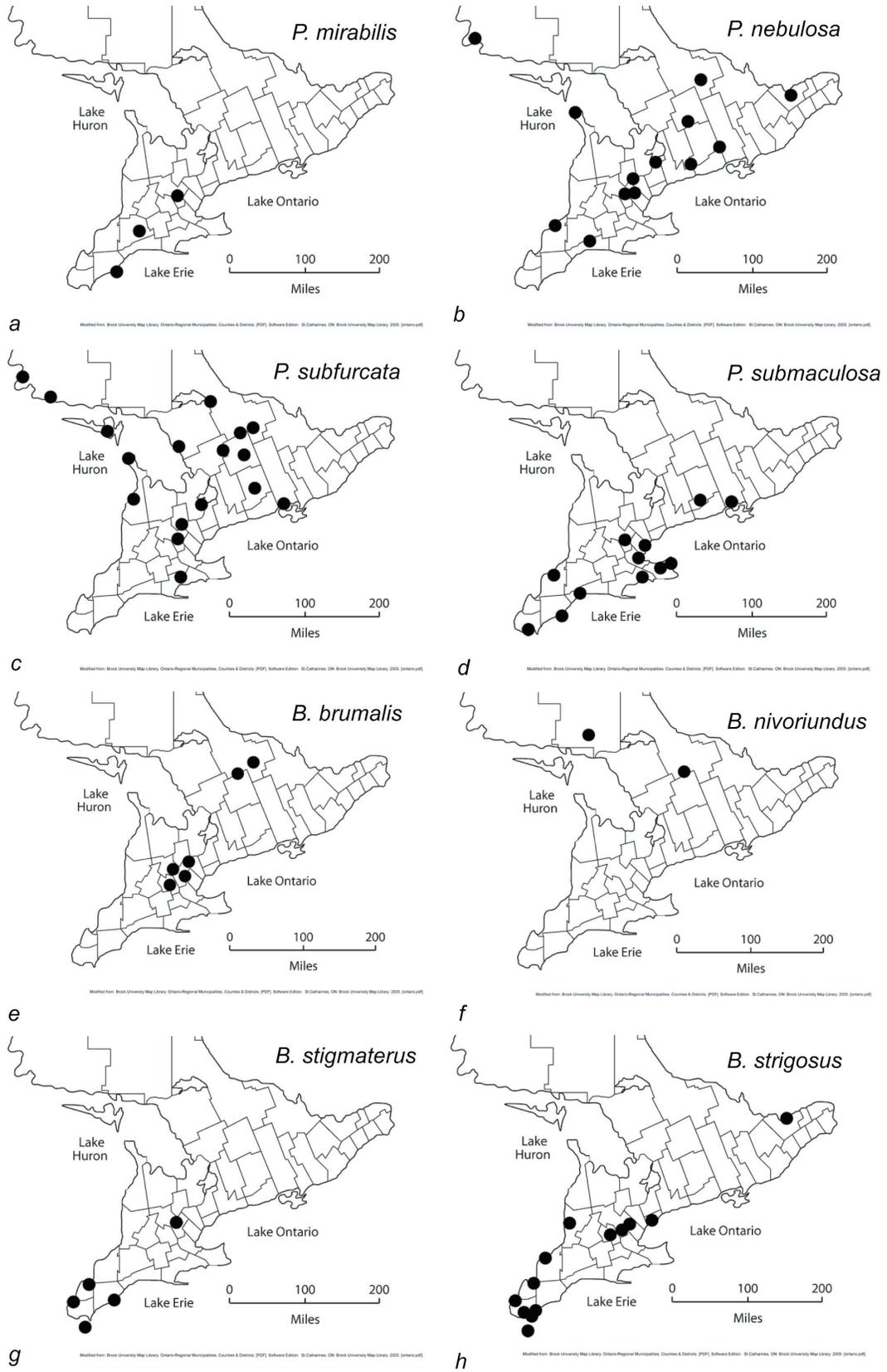


Fig. 5 Distributions of *Panorpa* species in Ontario



**Fig. 6** Distributions of Mecoptera species in Ontario. a-d *Panorpa*, e-f *Boreus*, g-h *Bittacus*.



Fig. 7 Distribution of *Bittacus pilicornis* in Ontario.

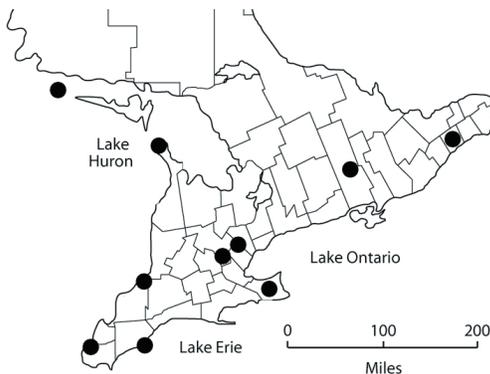


Fig. 8 Distribution of *Merope tuber* in Ontario

Tennessee and northwestern Georgia west to Wisconsin, Kansas, and Arkansas (Webb et al., 1975).

*Panorpa banksi* Hine 1901

Diagnosis (Webb et al., 1957): Wings usually with clear background colour and margined crossveins although some specimens have faint yellow wing membranes. Apical band dark brown. Pterostigmal band broken into small dark brown spots. Marginal spots absent (Fig. 2). Male terminalia yellow. Ninth tergum emarginate. Hypo valve (Fig. 1c) elongate, narrow, reaching near base of dististyle. Ventral paramere elongate, narrow, unbranched, barbed, reaching between dististyle. Dorsal paramere distinct, reaching between dististyle. Dististyle lobed, smaller than basistyle.

Unlike most congeners, *P. banksi* is a characteristic species of relatively dry areas, such as eastern prairies and oak savannahs. It is a widespread species in the northeastern United States, but in Canada it seems to be restricted to southern Ontario (Fig. 5b). Specimens were collected from June to July.

*Panorpa claripennis* Hine 1901

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour, crossveins lightly margined. Apical band dark brown, broken posteriorly. Pterostigmal band brown, continuous. Basal band reduced to two large spots. Marginal spots absent. Male terminalia pale to dark yellow. Ninth tergum deeply emarginate. Hypo valves (Fig. 1d) broad and ending well before base of dististyle. Ventral parameres elongate, narrow, unbranched, barbed and curved; reaching base of dististyle. Dististyle lobed, smaller than basistyle.

*P. claripennis* is one of the more commonly collected scorpionflies, and appears relatively early in the season. Specimens were collected as early as May and as late as August. *P. claripennis* is easily confused with *P. debilis*, as noted below.

Most records (Fig. 5c) are from floodplain or similar poorly drained habitats, where this species can often be seen on Jewelweed (*Impatiens capensis*) foliage. *Panorpa claripennis* is a characteristic northern species occurring in the eastern provinces and adjacent states, although Webb et al. (1975) cite an isolated record from Florida.

*Panorpa debilis* Westwood 1846

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with background colour clear, crossveins margined. Apical band dark brown, broad anteriorly and narrow posteriorly, sometimes interrupted with clear spots. Pterostigmal band brown, continuous. Marginal spots absent. Male terminalia pale to dark yellow. Ninth tergum deeply emarginate. Hypo valve (Fig. 1e) broad and rounded apically, ending before base of dististyle. Ventral paramere elongate, narrow, unbranched and barbed; reaching well between dististyle. Basistyle with a large tubercle near the base of dististyle, with a tuft of setae. Dististyle smaller than basistyle.

*Panorpa debilis* is common and widespread in southern Ontario (Fig. 5d), with adults occurring from June and August but usually emerging in late summer. This species is widespread in the northeast and occurs in a variety of habitats. *Panorpa debilis* can be easily confused with *P. claripennis* because the apical tubercle on the base of the dististyle is not always conspicuous. In addition to the presence of a tubercle, the ventral parameres are long and straight in *P. debilis*, while in *P. claripennis* the ventral parameres are curved and short, not reaching very far beyond the base of the dististyle.

*Panorpa galerita* Byers 1962

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour, crossveins not margined. Apical band dark brown, usually

continuous but sometimes with clear spots on posterior part. Pterostigmal band brown, continuous. Marginal spots absent. Male terminalia dark yellow to brown. Ninth tergum deeply truncate. Hypo valve (Fig. 1f) broad and divergent apically reaching to distal quarter of basistyle. Ventral paramere broad, unbranched, barbed, reaching between dististyles. Dististyle with large broad lobe.

*Panorpa galerita* has been collected from June to July. This species can be confused with *P. subfurcata* because of the large accessory lobes on the dististyle. However, these species can be separated on the basis of the thickness and orientation of the hypo valves. In *P. galerita* they are thick and divergent and in *P. subfurcata* they are thin and elongate.

This northeastern species was previously known from Quebec and Vermont west to Ohio, with an apparently disjunct population in Wisconsin. The Ontario collections (Fig. 5e) reported here narrow that apparent disjunction. Thornhill and Johnson (1974) did not record *P. galerita* from Michigan, nor is it recorded from Michigan on a current web list of Michigan Mecoptera (O'Brian, 2006).

*Panorpa helena* Byers 1962

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with faint yellow background colour, crossveins margined. Apical band dark brown, and continuous. Pterostigmal band dark brown, continuous. Marginal spots absent. Male terminalia dark yellow to brown. Ninth tergum emarginate. Hypo valve (Fig. 1g) broad and rounded apically, ending before base of dististyle. Ventral paramere elongate, narrow, unbranched, barbed, reaching base of dististyle. Basistyle broad with 2 to 3 thick setae near the base of dististyle. Dististyle smaller than basistyle.

Although Webb et al. (1975) describe this species as the most abundant and widely distributed North American *Panorpa*, with a range extending from Georgia and Massachusetts west to Manitoba, it is apparently an uncommon species in Ontario, represented by only 3 specimens in the University of Guelph Insect collection and 9 specimens in Canadian National Collection. All of our records (Fig. 5f) are from northern Ontario (Algoma District, July and August), which is surprising given the wide ecological tolerances of this species and its abundance in Michigan (Thornhill and Johnson, 1974) and Illinois (Webb et al. 1975). This is the only Canadian *Panorpa* species that ranges west to Manitoba, but it does not occur in Quebec (Aranguren 1987).

*Panorpa hungerfordi* Byers 1973

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with pale yellow background colour, crossveins not margined. Apical band brown, usually continuous but sometimes with 1-2 clear spots. Pterostigmal band brown, continuous, sometimes forked. Marginal spots absent. Male terminalia yellow. Ninth tergum emarginate. Hypo valve (Fig. 1h) narrow, elongate, reaching near base of dististyle. Ventral paramere elongate, narrow, unbranched, barbed, reaching between dististyle. Dististyle with two large lobes, shorter than basistyle.

*Panorpa hungerfordi* is rarely collected in Ontario (Fig. 5g) and was previously known only from parts of Wisconsin, Michigan and Ohio. We here record it for the first time in Canada, on the basis of four late summer collections at sites in Carolinian Ontario. It is very similar to, and previously confused with, the southeastern species *P. virginica*. Some individuals of *P. helena* have similarly pigmented wing membrane, but have a broad and undivided wing band.

*Panorpa latipennis* Hine 1901

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour and margined crossveins. Apical band broken, with pale brown and clear spots. Pterostigmal band broad anteriorly but narrow posteriorly and interrupted with clear spots. Marginal spots absent. Male terminalia pale to dark brown. Ninth tergum emarginate. Hypo valve (Fig. 1i) elongate, narrowing at apical fourth, reaching distal quarter of basistyle. Dististyle broad, constricted at apical third. Ventral paramere narrow, elongate, barbed, unbranched and extending slightly beyond basistyle.

*Panorpa latipennis* is widespread in southern Ontario (Fig. 5h), usually flying from May to June with a few records from July and August.

*Panorpa mirabilis* Carpenter 1931

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour, crossveins not margined. Apical band dark brown and continuous. Pterostigmal band pale to dark brown, continuous. Marginal spots absent. Male terminalia brown. Ninth tergum emarginate. Hypo valve (Fig. 1j) broad and divergent, reaching near base of dististyle. Ventral paramere elongate, narrow, unbranched, barbed; reaching apices of dististyle. Dististyle almost entirely covered by basi-medial lobes. Dististyle larger than basistyle.

*Panorpa mirabilis* has a relatively northern range including New Jersey, New York, Pennsylvania and Michigan, and it is described as a "very common species" throughout Michigan by Thornhill and Johnson (1974). Ontario records (Fig.

6a) of this species are from the southern part of the province, with the northernmost locality in Wellington Co. (Guelph). All Ontario records are from June and July.

*Panorpa nebulosa* Westwood 1846

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour, crossveins lightly margined. Apical band reduced to many small pale spots. Pterostigmal band forked but not continuous, broken posteriorly with pale spots. First and second marginal spots absent. Male terminalia pale yellow with ninth tergum emarginate. Genital bulb ovate with broad basistyle. Dististyle short and lobed. Hypo valve (Fig. 1j) elongate, reaching distal quarter of basistyle. Ventral paramere narrow, unbranched, barbed, sharply curved and usually crossing distally.

*Panorpa nebulosa* is widely distributed in eastern North America including much of Ontario (Fig. 6b). It is common in a wide range of woodland habitats in Ontario from June to July.

*Panorpa subfurcata* Westwood 1842

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with clear background colour, crossveins not margined. Apical band dark brown, broad anteriorly and narrowed posteriorly, sometimes interrupted with clear spots. Pterostigmal band brown, continuous and usually forked. Marginal spots variable. Male terminalia reddish brown. Ninth tergum emarginate. Hypo valve (Fig. 1k) narrow, elongate, reaching near base of dististyle. Ventral paramere elongate, narrow, unbranched, barbed, reaching between dististyles. Dististyle with two large lobes. Dististyle large, similar size to basistyle.

*Panorpa subfurcata* is a widespread northeastern species ranging from North Carolina to north of Lake Superior and much of eastern Canada. It is the most commonly collected and the most widespread scorpionfly in Ontario (Fig. 6c), where it is a characteristic species of mesic forests and floodplains from June until September.

*Panorpa submaculosa* Carpenter 1931

Diagnosis (Webb et al., 1957): Wings (Fig. 2) with background colour clear and crossveins margined. Apical band brown to dark brown, broken up into spots. Pterostigmal band dark brown, not continuous. First marginal spot and second marginal spot absent. Male terminalia yellow with ninth tergum emarginate. Genital bulb ovate with broad basistyle. Dististyle short and lobed. Hypo valve (Fig. 1m) short and narrow, reaching  $\frac{3}{4}$  the length of basistyle. Aedeagus extending posteriorly between dististyles. Ventral

paramere narrow, unbranched, barbed and slightly curved at the apical third.

*Panorpa submaculosa* is a relatively common Carolinian species that has been collected in Ontario (Fig. 6d) from June to August.

### Bittacidae Enderlein 1910

Bittacids can be recognized by their single raptorial tarsal claw and by their long legs and wings that give them a superficial resemblance to crane flies (Tipulidae: Diptera). In Ontario there is only one genus (*Bittacus*) and three species which can be separated without the use of genitalic characters.

The three species of Bittacidae in Ontario are easily distinguished on the basis of wing colour, venation and pattern as shown in the photos here. All three species are predators found hanging from plants (never standing on vegetation like Panorpidae) in a variety of habitats, but especially in moist forests with patches of nettles.

### Key to *Bittacus* of Ontario

- 1 Anal crossvein present (Fig. 9).....  
.....*Bittacus pilicornis* Westwood
- Anal crossvein absent (Fig. 9) .....2
- 2 Wings with crossveins margined (surrounded by pigment) (Fig. 9).....  
.....*Bittacus strigosus* Hagen
- Crossveins not margined (Fig. 9).....  
.....*Bittacus stigmaterus* Say

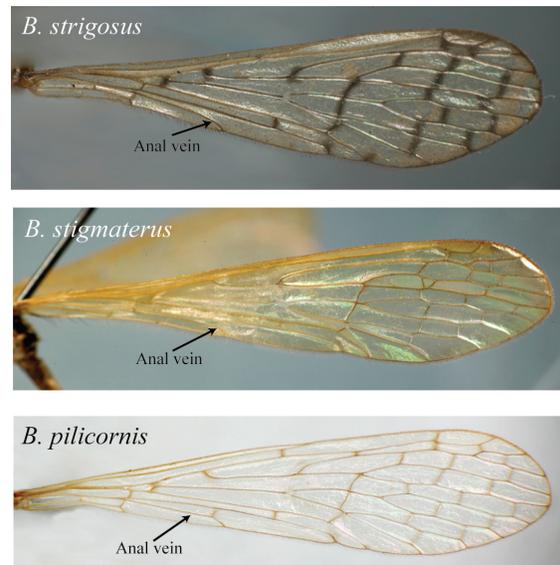


Fig. 9 Forewings of *Bittacus* species.

*Bittacus pilicornis* Westwood 1846

Diagnosis: Wings (Fig. 9) yellow without margined crossveins. Anal crossvein present. Pterostigma yellow. Legs and abdomen yellow to light red. Antenna plumose.

*B. pilicornis* is the least common of the three Ontario *Bittacus* species. It has only been collected from southern Ontario (Fig. 7) in Essex Co., and Haldimand Co., though it is also known from several localities in Quebec.

*Bittacus stigmaterus* Say 1823

Diagnosis: Wings (Fig. 9) yellow without margining of the crossveins. Pterostigma yellow. Legs and abdomen pale yellow to dark yellow. This species is not often collected (Fig. 6g), and is only known from Lambton Co., Essex Co., Kent Co., and Wellington Co.

*Bittacus strigosus* Hagen 1861

Diagnosis: Wings (Fig. 9) clear with heavily margined crossveins. Pterostigma yellow. Legs and abdomen dark yellow to light brown. *B. strigosus* is the more common and widespread of the three Ontario *Bittacus* species (Fig. 6h).

**Boreidae Stephens 1829**

Only two of the 15 North American *Boreus* species occur in Ontario, and they are easily distinguished from one another on the basis of colour, as illustrated here. Adults emerge late in the year, and are active on mild winter days when they are often seen on or near the moss in which they develop. As the common name “snow scorpionflies” suggests, they are often seen on the snow surface. Boreids are easily identified by their minute size, rudimentary wings, and females with an ovipositor.

**Key to *Boreus* of Ontario**

- 1 Body colour light to dark reddish brown (Fig. 11) .....*Boreus nivoriundus* Fitch
- Body colour dark brown to black (Fig. 11) .....*Boreus brumalis* Fitch

*Boreus brumalis* Fitch 1847

Diagnosis: Body colour dark brown to black, metallic, often with a green highlight (Fig. 11). Apex of ninth sternum deeply notched.

*Boreus brumalis* is more commonly collected than *B. nivoriundus* (Fig. 6e). Records indicate that they are active from November to February.

*Boreus nivoriundus* Fitch 1847

Diagnosis: Body colour light brown (Fig. 11). Apex of ninth sternum rounded or truncate.

Within Canada, *B. nivoriundus* is known from southern Ontario and Quebec (Fig. 6f). It is less frequently collected than *B. brumalis*.

**Meropeidae Esben-Petersen 1921**

Meropeidae is the most primitive family of Mecoptera, characterized by broad wings with many crossveins, and by the absence of ocelli. Two species are known worldwide; one (*Merope tuber*) occurs in the North America including Ontario, and the other species occurs in western Australia. Males have large claspers, resembling the cerci of an earwig.

*Merope tuber* Newman 1838

Diagnosis: Wings (Fig. 10) broad with many crossveins. Ocelli absent. Body colour pale yellow to light brown.

In Ontario, *M. tuber* seems to be restricted to the southern part of the province, with the most northern record being Hilton Beach, near Sault Ste. Marie (Fig. 8). *Merope tuber* is rare in collections, although we have specimens from almost every Ontario site at which we have run malaise traps in hardwood forests.



**Fig. 10** Male *Merope tuber*.

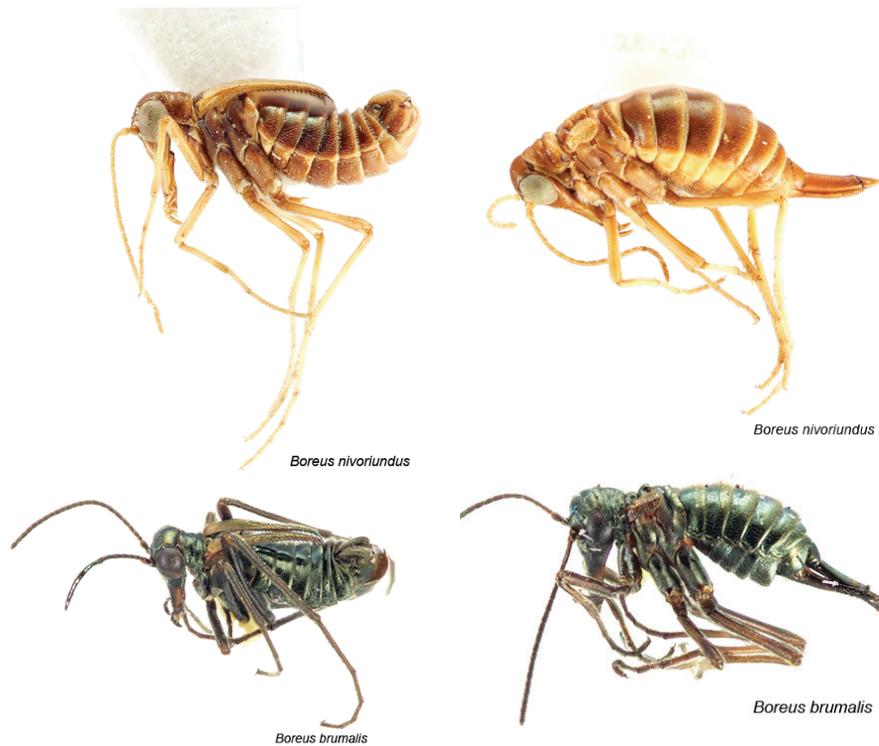


Fig. 11 Habitus of *Boreus* species.

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