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# Tabanidae of Canada, east of the Rocky Mountains 1: a photographic key to the species of Chrysopsinae and Pangoniinae (Diptera: Tabanidae)

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*Fredericton, New Brunswick, mothman@nbnet.nb.ca **Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1, Canada, samarsha@uoguelph.ca. Abstract. The family Tabanidae is characterized and interactive photographic keys are provided to the 3 subfamilies of Tabanidae in Canada east of the Rocky Mountains. Keys are also provided for the genera and species of the subfamily Chrysopsinae of this region (including 40 species of *Chrysops* Meigen [deer flies] and one species of *Merycomyia* Hine) and the genera and species of the subfamily Pangoniinae (one species of *Goniops* Aldrich and two species of *Stonemyia* Brennan) occurring in eastern and central Canada. Distribution maps for all species are provided, incorporating significant additional records since the most recently published maps (Teskey, 1990).


*Chrysops sackeni*

Biological Survey of Canada
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## Introduction

Horse flies and deer flies (family Tabanidae) are familiar to most Canadians, both for the persistence and painful bites of the blood-sucking females, and for the distinctive appearance of the large, often colorful adults. Horse flies and deer flies are much better known than most insects in Canada, in no small part because of the excellent account of all Canadian species in Teskey's (1990) "The Horse Flies and Deer Flies of Canada and Alaska". In the introduction to that volume, he describes it as "the first modern attempt to fulfill the requirements for identifying all the currently recognized species of Tabanidae of Canada and Alaska, and to plot collection records of these species, thus giving an indication of their distribution". We feel it is time to re-address the "requirements for identifying … species of Tabanidae", and not just because Teskey's book is out of print and difficult to obtain. More importantly, Tabanidae lend themselves to identification using a range of colour and structural characters that were not practical to include in Teskey (1990) but that are ideal for treatment in a digital key copiously illustrated with colour photographs. We therefore here initiate a series of new guides to tabanid identification taking full advantage of newly available tools for the capture and dissemination of digital images. The present contribution is a key to the Canadian Chrysopsinae and Pangoniinae, east of the Rocky Mountains. A key to the eastern Canadian species of the third subfamily, the Tabaninae, will follow as a separate publication. These keys are to females only, since male Tabanidae are not commonly encountered. Males are keyed in Teskey (1990), however the key to males is considerably less reliable than the key to females.

Distribution maps herein are based on the maps in Teskey (1990), with the addition of post-1990 records from the University of Guelph Insect Collection (Department of Environmental Biology; DEBU), from the senior authors' personal collection (AWT), and from some post-1990 papers including Hurlburt et al. (2008) and Butt et al. (2008).

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# Characteristics of the family Tabanidae

The family Tabanidae, including 3 subfamilies in North America, is characterized by a combination of the following ten characters:

➢Three similar flattened pads (pulvilli) beneath the tarsal claws at the tip of the tarsus (Fig. 1). In most fly families there are 2 lateral pulvilli (one right, one left) and a central bristle-like empodium. In tabanids and a few related families the empodium resembles a lateral pulvillus.

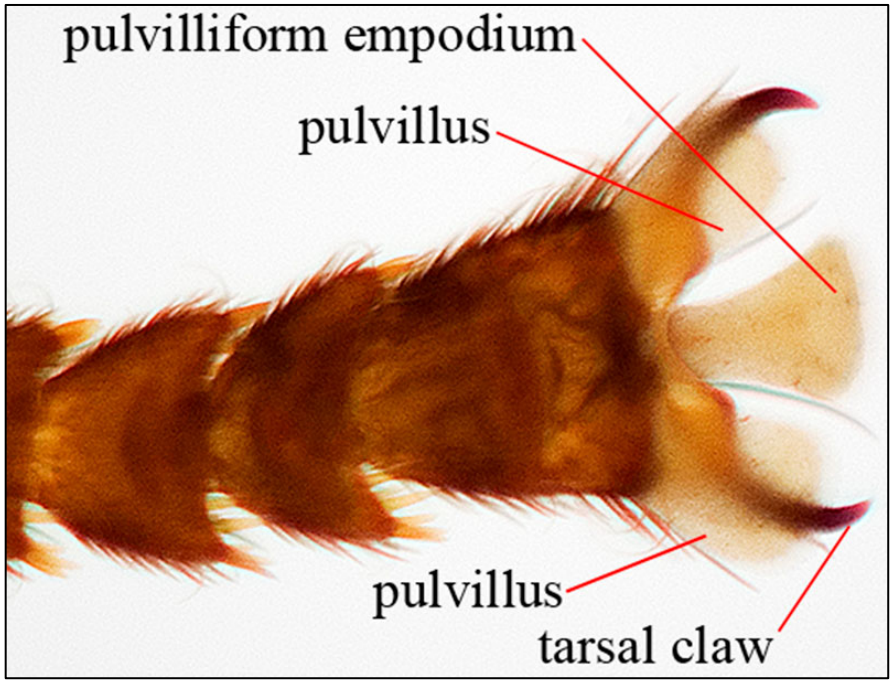


Fig. 1. Ventral view of tarsus of mid leg of female *Hybomitra nuda (*McDunnough) showing the pulvilliform empodium (microscope slide preparation).



Next page.

# Characteristics of the family Tabanidae

➢Antenna with a scape, pedicel and annulated flagellum (Fig. 2a); the basal flagellomeres (segments of the flagellum), may be fused into a plate (Fig. 2b) and the apical flagellomeres may be fused into a stylus (Fig. 2b);

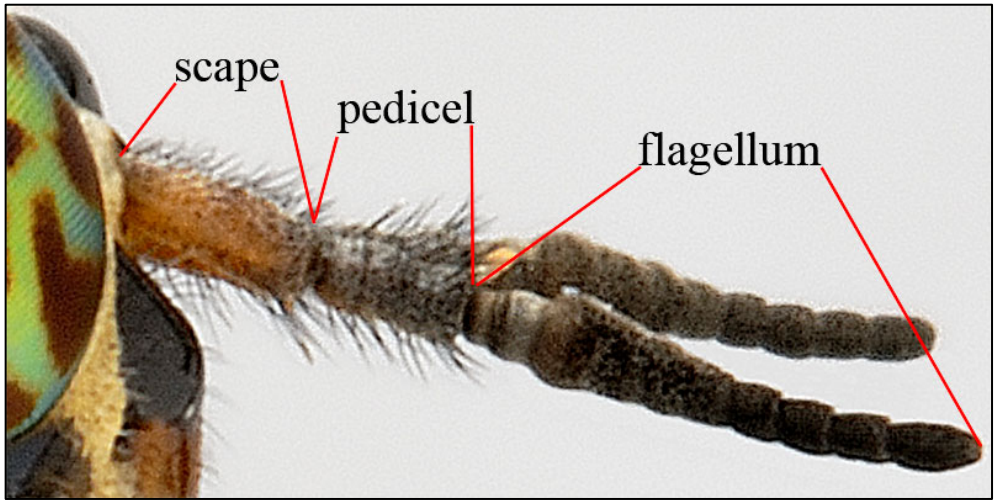


Fig. 2a. Antenna of female *Chrysops niger.*

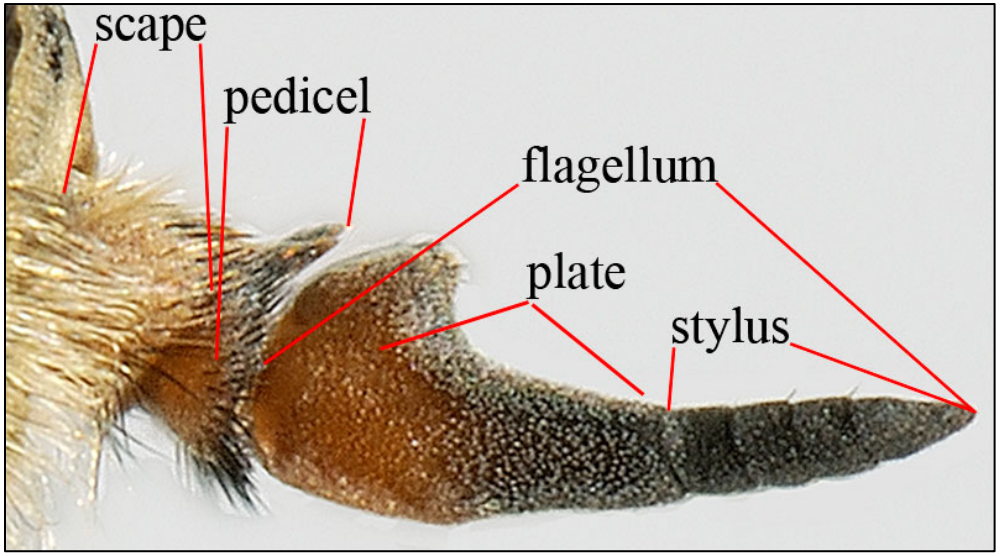


Fig. 2b. Antenna of female *Hybomitra affinis* (Kirby).

# Characteristics of the family Tabanidae

- Costa vein (C) extending beyond the apex of the wing (Fig. 3a)
- Radial cell 1 ($r_1$) in wing open to C (Fig. 3b)
- Fused radial veins 2 and 3 ($R_{2+3}$) meeting C far beyond end of radial vein 1 ($R_1$) (Fig. 3a)
- Discal cell of wing much longer than wide (Fig. 3b)
- Wing venation with a widely divergent fork near apex of wing such that veins R4 and R5 always terminate on either side of wing tip (Figs. 3a, 3b)

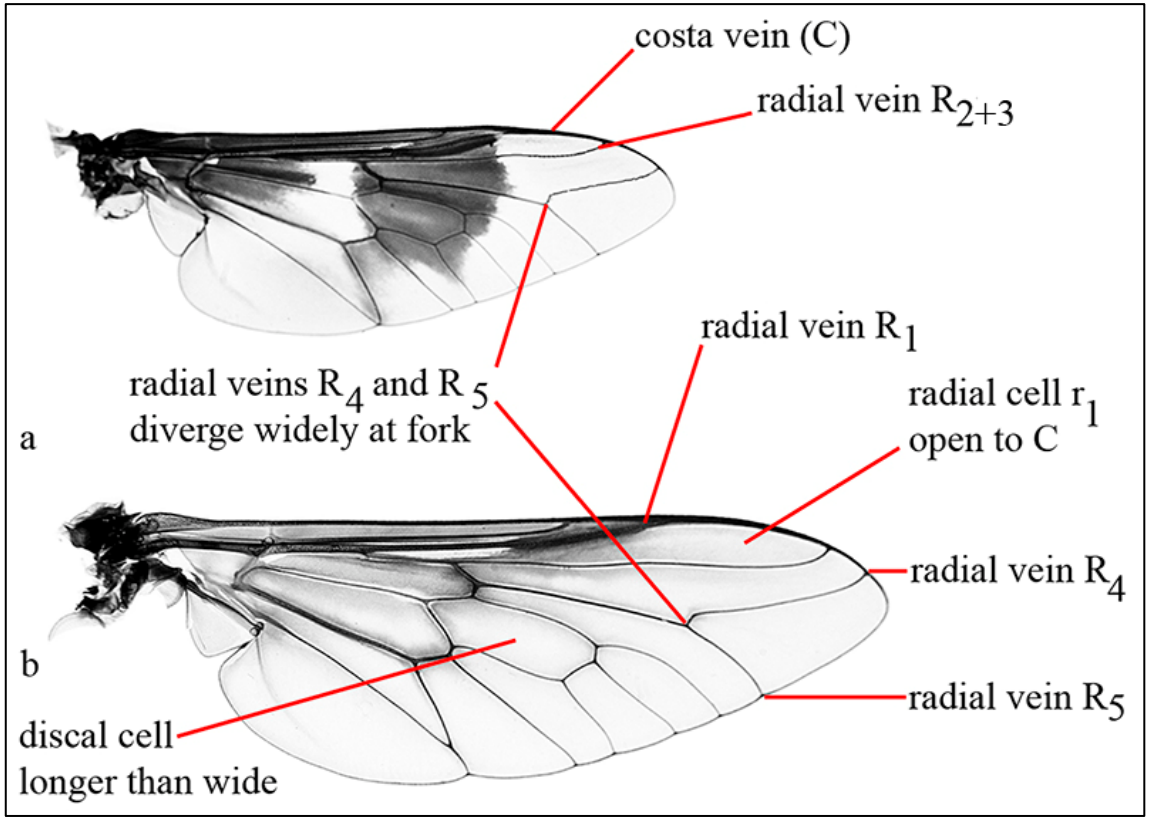


Fig. 3a. Wing of *Chrysops excitans*

Fig. 3b. Wing of *Hybomitra nuda*

# Characteristics of the family Tabanidae

- Subscutellum strongly developed (only slightly enlarged in *Stonemyia)* although usually hidden below the large scutellum (Fig. 4b)
- First abdominal tergite deeply notched at middle of hind margin (Fig. 4b)
- Upper and lower calypteres large and subequal (Fig. 4c)

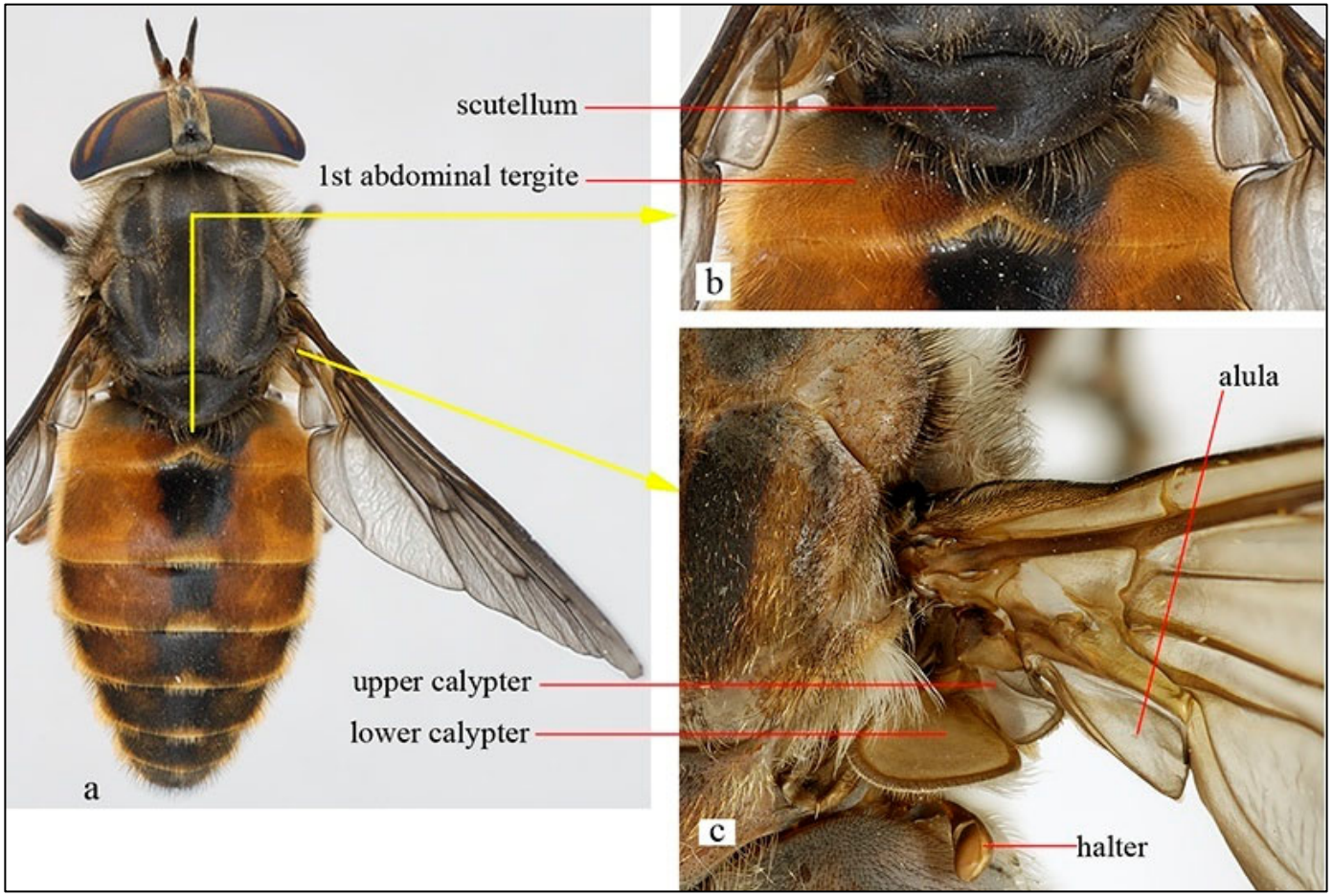


Fig. 4a, b. Dorsal view of *Hybomitra affinis.*
Fig. 4c. Base of right wing of female *Tabanus novaescotiae* Macquart.

# Key to subfamilies and genera of Pangoniinae & Chrysopsinae east of the Rocky Mountains (key reliable for females only)

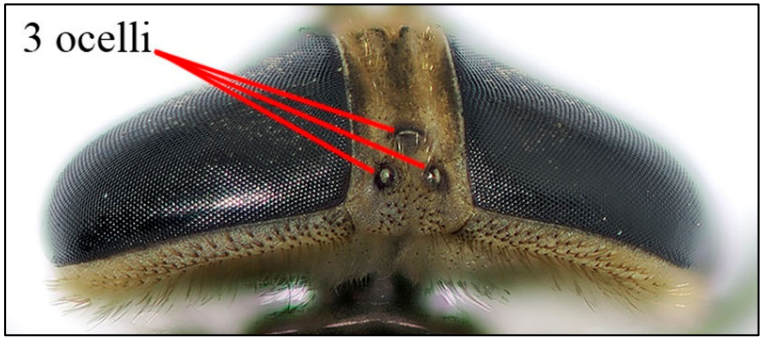


Fig. 5. Vertex of *Stonemyia tranquilla* (Pangoniinae)

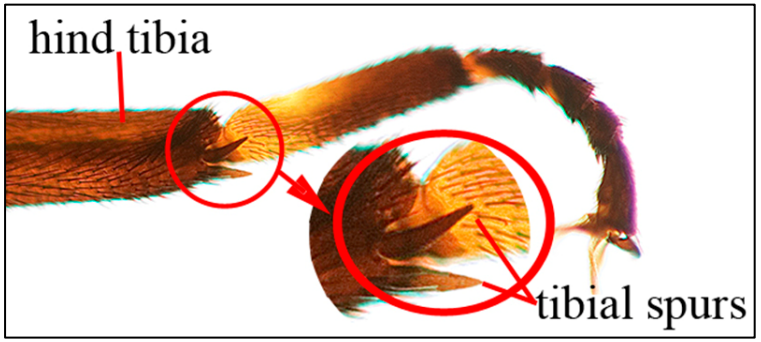


Fig. 6. Hind tibia of *Chrysops excitans* (Chrysopsinae)

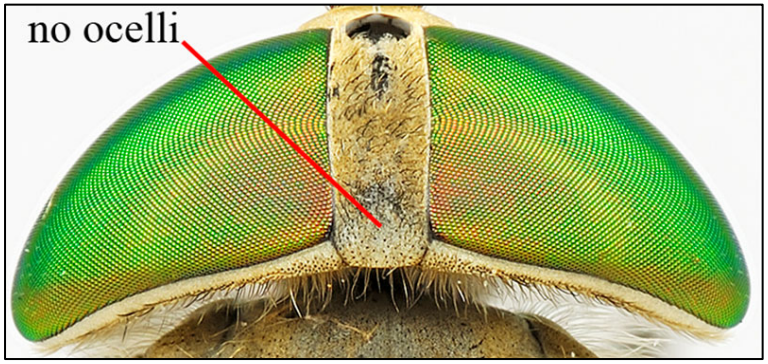


Fig. 7. Vertex of *Tabanus nigrovittatus* (Tabaninae)

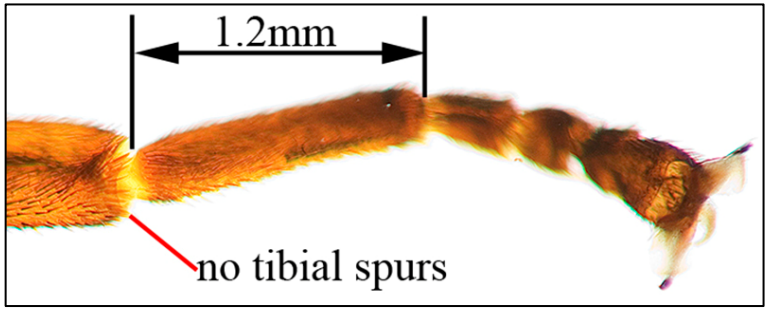


Fig. 8. Hind tibia of *Hybomitra nuda* (Tabaninae)

| | | |
|---|---|---|
| 1 | Three well-developed ocelli on vertex (Fig. 5). Hind tibia with apical spurs (large in *Stonemyia* spp., small but just visible with a x10 hand lens in *Chrysops* spp. (Fig. 6), extremely small in *Merycomyia).* | 2 CHRYSOPSINAE and PANGONIINAE |
| | Ocelli absent (Fig. 7) (but there is a similar-looking single raised ocellar tubercle in *Hybomitra* spp.) Hind tibia without apical spurs (Fig. 8) (but such spurs present on mid tibia). | TABANINAE (not included in this key) |

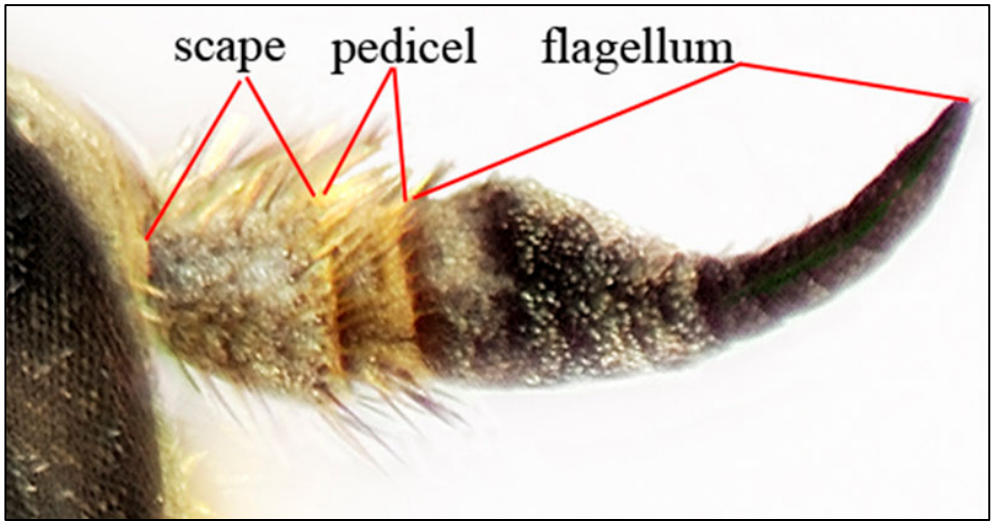


Fig. 9. Antenna of *Stonemyia tranquilla*

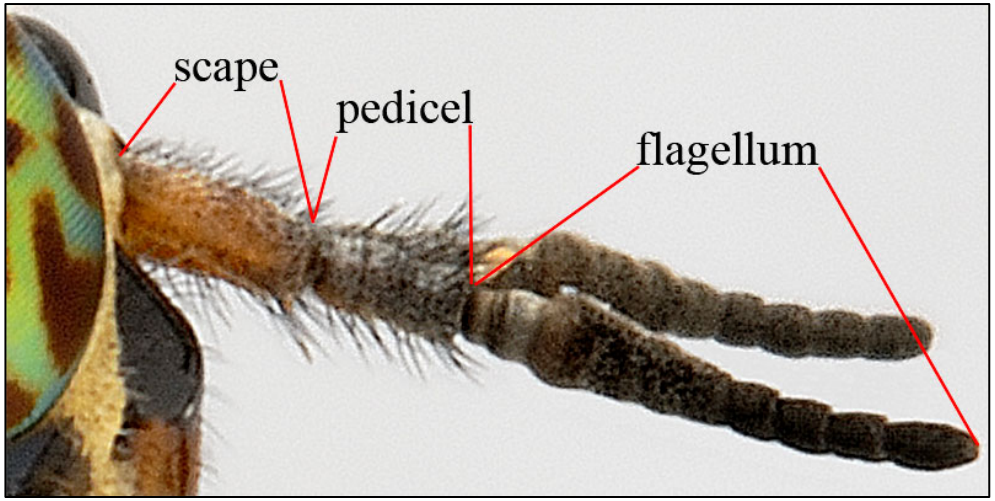


Fig. 10. Antenna of *Chrysops niger*

| | | |
|---|---|---|
| 2 (1) | Antennal scape "square" or slightly longer than wide; pedicel much shorter than wide (Fig. 9). | 3 |
| | Scape and pedicel much longer than wide (Fig. 10). Chrysopsinae (in part). | *Chrysops* |

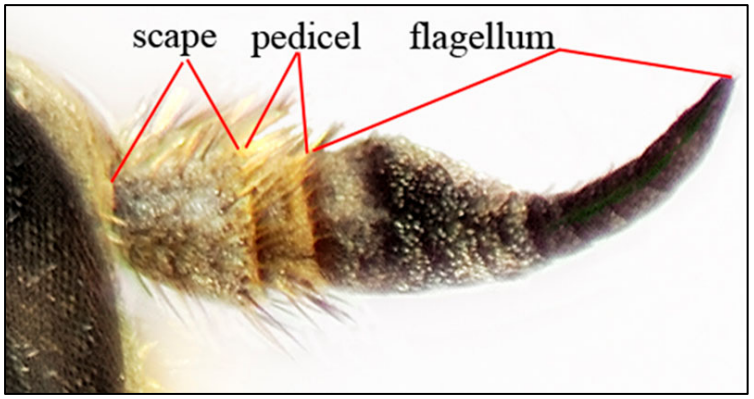


Fig. 11. Antenna of *Stonemyia tranquilla*


Fig. 12.*Merycomyia whitneyi.*

| | | |
|---|---|---|
| 3 (2) | Flagellum with more than 3 flagellomeres (Fig. 11). Small to medium flies, length less than 15 mm. | 4: PANGONIINAE |
| | Flagellum with 3 flagellomeres. Large flies, length greater than 18 mm (Fig. 12). Chrysopsinae (in part). | *Merycomyia* |

Fig. 13. Wing of *Stonemyia tranquilla*

Fig. 14. Vertex of *Stonemyia tranquilla*

Fig.15. Wing of *Goniops chrysocoma*

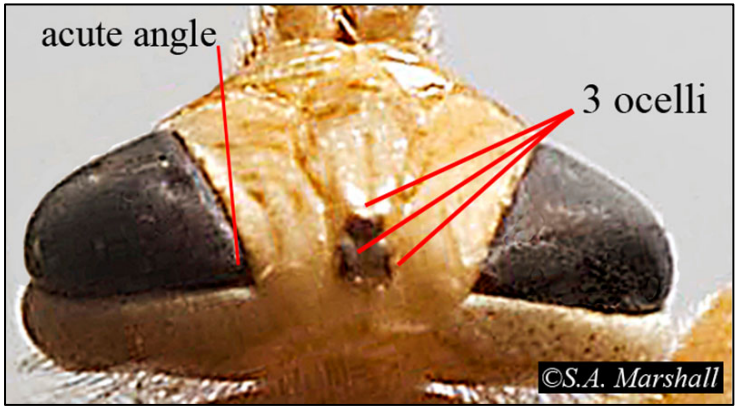


Fig. 16. Vertex of *Goniops chrysocoma*

| | | |
|---|---|---|
| 4 (3) | Wing membrane without dark markings (Fig. 13). Eye with inner upper corner forming a right-angle (Fig. 14). Scutellum with erect bristles underneath. | *Stonemyia* |
| | Wing membrane darkened basally and apically (Fig. 15). Eye with an acute inner upper angle (Fig. 16). Scutellum bare underneath. | *Goniops* |

# Checklist of Pangoniinae & Chrysopsinae species east of the Rocky Mountains

**SF: Pangoniinae:**

*Stonemyia* Brennan

*S. rasa* (Loew)

*S. tranquilla* (Osten Sacken)

*Goniops* Aldrich

*G. chrysocoma* (Osten Sacken)

**SF: Chrysopsinae**:

*Merycomyia* Hine

*M. whitneyi* (Johnson)

*Chrysops* Meigen

*C. aberrans* Philip
*C. aestuans* Van der Wulp
*C. ater* Macquart
*C. brunneus* Hine
*C. callidus* Osten Sacken
*C. calvus* Pechuman & Teskey
*C. carbonarius* Walker
*C. celatus* Pechuman
*C. cincticornis* Walker
*C. cuclux* Whitney
*C. dawsoni* Philip
*C. delicatulus* Osten Sacken
*C. discalis* Williston
*C. excitans* Walker
*C. flavidus* Wiedemann
*C. frigidus* Osten Sacken
*C. fuliginosus* Wiedemann
*C. fulvaster* Osten Sacken
*C. furcatus* Walker
*C. geminatus* Wiedemann
*C. impunctus* Kröber
*C. indus* Osten sacken
*C. lateralis* Wiedemann
*C. luteopennis* Philip
*C. macquarti* Philip
*C. mitis* Osten Sacken
*C. moechus* Osten Sacken
*C. montanus* Osten Sacken
*C. niger* Macquart
*C. nigripes* Zetterstedt
*C. pikei* Whitney
*C. pudicus* Osten Sacken
*C. sackeni* Hine
*C. shermani* Hine
*C. sordidus* Osten Sacken
*C. striatus* Osten Sacken
*C. univittatus* Macquart
*C. venus* Philip
*C. vittatus* Wiedemann
*C. zinzalus* Philip

# Key to the *Stonemyia* females of Canada east of the Rocky Mountains

The two eastern species in this genus are similar and are usually separated on the basis of differences in the colour of the legs and/or colour of the abdomen (Teskey 1990, Pechuman 1981; Pechuman et al. 1961). However, because of within-species variability and wear, it may not always be possible to identify every specimen to species. Pechuman (1981) found that all the Adirondack (New York) records of *S. rasa* (Loew) were misidentified specimens of *S. tranquilla* (Osten Sacken).

*Stonemyia tranquilla* flies from mid July–late August and has a more northern distribution than *S. rasa,* which flies from late July-September. Both are 11-13mm in length.

Key here.

Distribution maps *S. rasa*, *S. tranquilla*.

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return to
start of key
to subfamilies
and genera
of Tabanidae

Fig. 17. *Stonemyia rasa*

Fig. 18. *Stonemyia tranquilla*

| | | |
|---|---|---|
| 1 | Pale posterior margins of abdominal tergites with grayish hairs (sometimes worn off) that may be expanded anteriorly to form median triangles (Fig.17). Costal cell and wing membrane clear (Fig. 17). Sides of anterior tergites sometimes pale but never orange (Fig. 17). Legs reddish brown to dark brown (Fig. 17).<br>Back to Checklist. Distribution map. Back to genus introduction | *rasa* |
| | Pale posterior margins with golden hairs (but hairs absent or pale in worn individuals), pale areas not expanded anteriorly to form pale median triangles (Fig. 18); sides of tergites 2-4 with variable amounts of orange (Fig. 18); costal cell and apices of cell beyond the stigma yellow (Fig. 18); at least femora black.<br>Back to Checklist. Distribution map. Back to genus introduction | *tranquilla* |

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# *Goniops*

There is only one species in this genus: *G. chrysocoma* (Figs. 19, 20).
A medium-sized (length 12-14 mm) pale tabanid not known to feed on blood. The wing pattern (Fig. 15), the wide face, and the acute dorsal angle of the eye (Fig. 16) are characteristic.
Flight dates in Canada: mid July.

Distribution map . Back to Checklist

Male *Goniops chrysocoma* (S.Marshall)



Fig. 19. *Goniops chrysocoma*



Fig. 20 *Goniops chrysocoma*

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and genera
of Tabanidae

## *Merycomyia* female

There is only one species found in Canada: *M. whitneyi* (Fig. 21).
A large tabanid, length 19-23mm, resembling the larger species of *Tabanus* but distinctive for the 3 well-developed ocelli.
In Canada known only from 2 specimens collected on the shores of Lake Ontario (Teskey 1990) and 3 specimens collected in southwest Nova Scotia (Hurlburt et al. 2008).
Flight dates in Ontario: 20 July and 4 August (Teskey 1990).

Distribution map. Back to Checklist


Fig. 21. *Merycomyia whitneyi*

## Genus *Chrysops* Meigen

Tabanids in the genus *Chrysops* are the common deer flies with black, black and yellow, brownish or smoky bodies and dark wing markings. They are relatively small (5-12 mm long) and some species are annoying pests of humans, especially in wooded areas. Thirty-eight of 45 Canadian species are found in Canada east of Manitoba (Teskey 1990), but by including 2 prairie species (*Chrysops discalis* Williston and *Chrysops fulvaster* Osten Sacken) this account will cover all 40 species known from east of the Rocky Mountains.

Sexual dimorphism is large in some species but females can be recognized by their dichoptic eyes (Fig. 22) and males by their holoptic eyes (Fig. 23).

The following key applies only to females as this is the gender most commonly encountered (males are relatively rare). Teskey (1990) provided a key to and descriptions of the males of all the Canadian species but gave no images. Males are relatively difficult to reliably identify.

Features of the head (Fig. 24) and wing infuscation pattern (Fig. 25), as well as body colour and pattern (Figs. 26, 28), are used extensively for the identification of species.

Key here  return to start of key to subfamilies and genera of Tabanidae

Fig. 22. Female *Chrysops lateralis*

Fig. 23. Male *Chrysops lateralis*

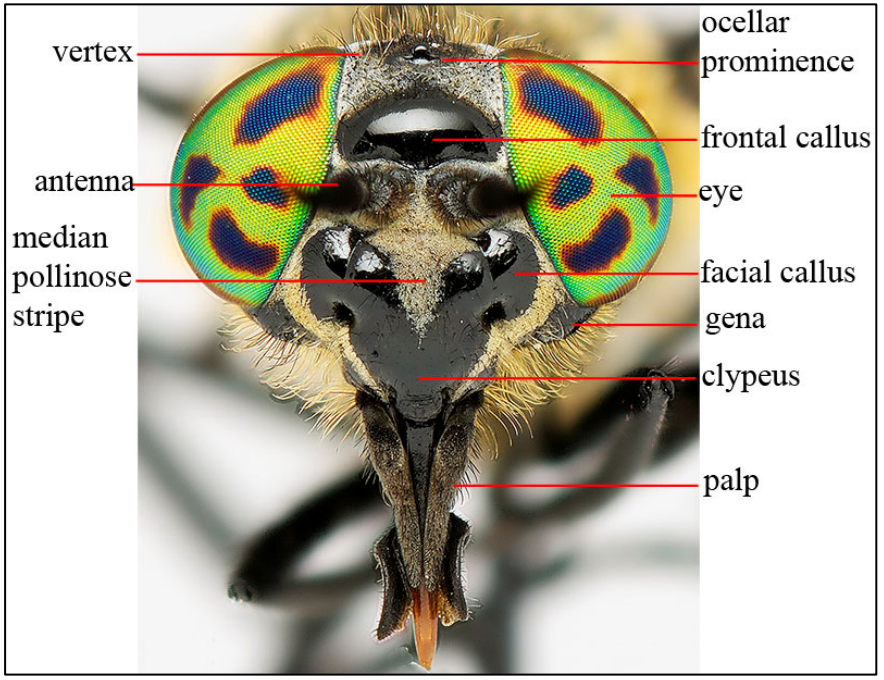


Fig. 24. Features of head, female *Chrysops*

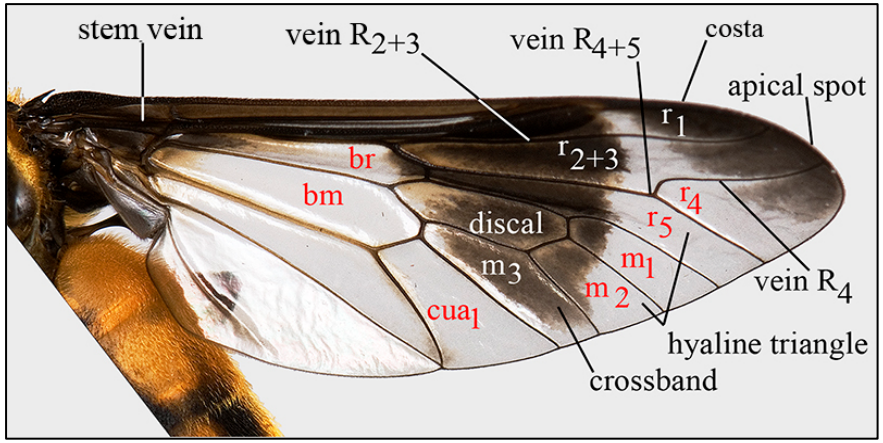


Fig. 25. Wing pattern, female *Chrysops*

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Back to *Chrysops* intro. page

# Key to the *Chrysops* females of Canada east of the Rocky Mountains

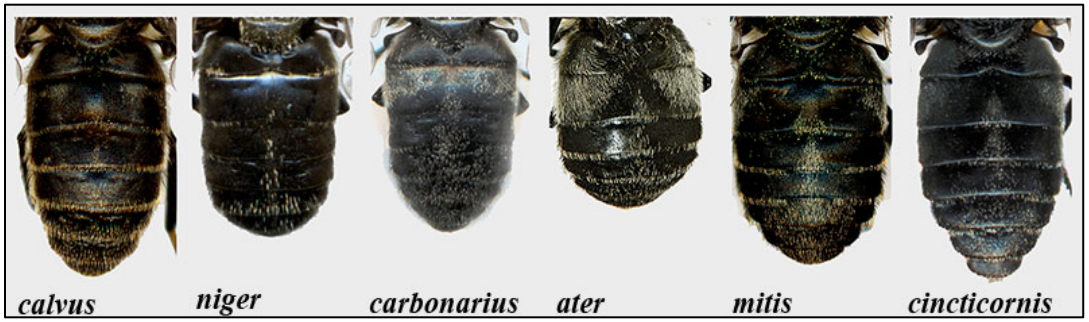


Fig. 26

Fig. 27

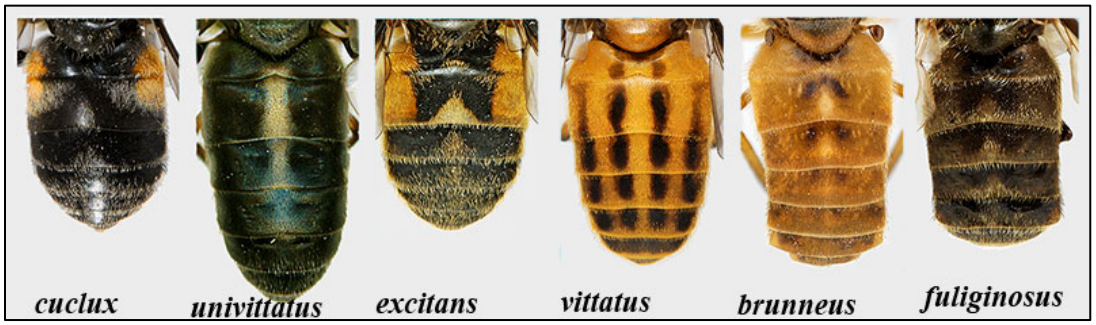


Fig. 28

Fig. 29

| | | |
|---|---|---|
| 1 | Abdominal tergites entirely black (sometimes with an indefinite pattern due to grayish hairs) (Fig. 26); apex of wing beyond crossband clear, at most with an occasional indefinite dark or smoky area along costa in cell r1 (Fig. 27) . 6 spp. | 2 |
| | Abdominal tergites never all black, commonly with yellow/orange areas, rarely mostly yellowish brown or dark smoky brown (Fig. 28); wing with or without dark apical spot beyond crossband (Fig. 29) . 34 spp. | 7 |

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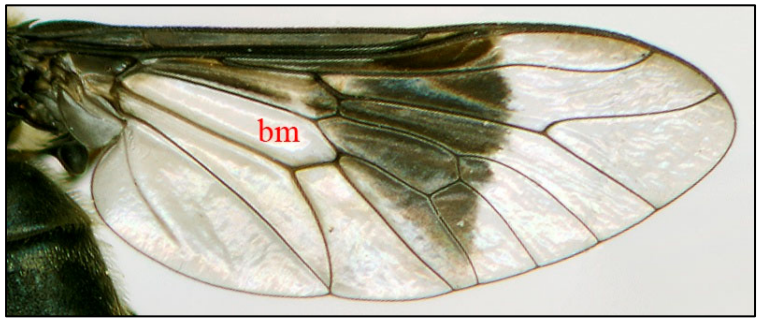


Fig. 30. *C. calvus*

Fig. 32. *C. carbonarius*

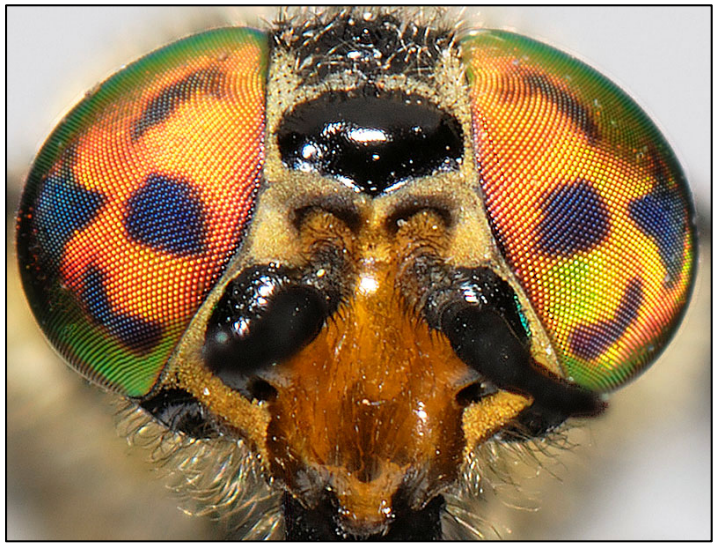

Fig. 31. *C. calvus*

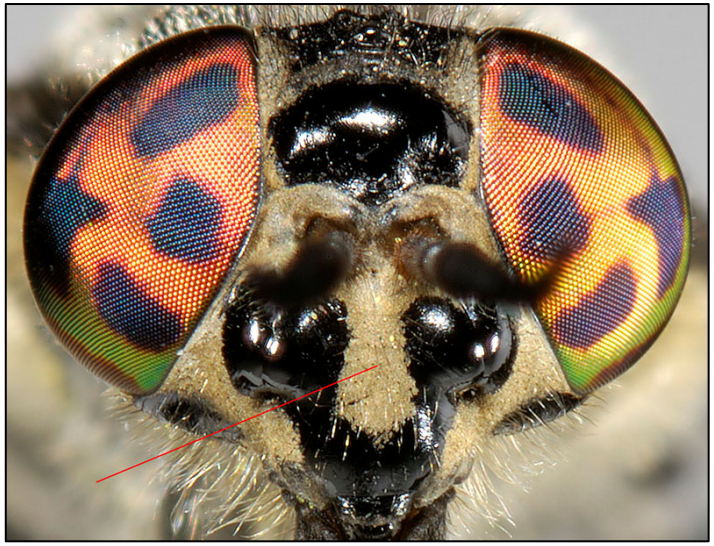

Fig. 33. *C. mitis*

| | | |
|---|---|---|
| 2 (1) | Wing with cell bm completely hyaline (Fig. 30); clypeus yellow without median pruinose stripe (Fig. 31). 2 spp. | 3 |
| | Wing with cell bm at least one-third infuscated (Fig. 32); clypeus black with yellow median pruinose stripe (Fig. 33). 4 spp. | 4 |

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Fig. 34

Fig. 37

Fig. 35

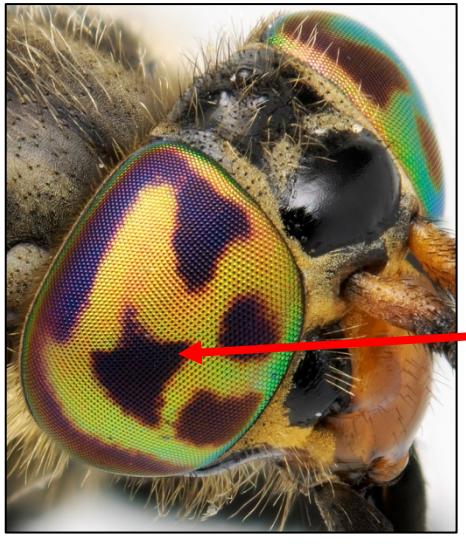

Fig. 39

central spot

Fig. 36

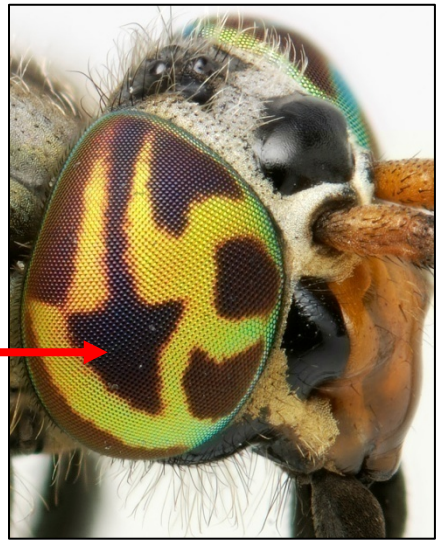

Fig. 38

| | | |
|---|---|---|
| 3 (2) | Pale lateral and sublateral thoracic stripes distinct and bright yellow (Fig. 34). Glossy ocellar prominence large and continuous with glossy vertex and occipital sclerite (Fig. 35); eye pattern (in life) with short dorsal extension of central spot (Fig. 36). | *calvus* |
| | Pale lateral and sublateral thoracic stripes indistinct and dull (Fig. 37). Glossy ocellar prominence small and separated from glossy occiptal sclerite by the pruinose vertex (Fig. 38); eye pattern (in life) with long dorsal extension of central spot (Fig. 39). | *niger* |

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Fig. 40. *C. cincticornis*

Fig. 41. *C. carbonarius*

| | | |
|---|---|---|
| 4 (2) | Hairs on side of thorax intense orange (Fig. 40) | *cincticornis* |
| | Hairs on side of thorax pale yellow/gray (Fig. 41). 3 spp. | 5 |

Return to start of key

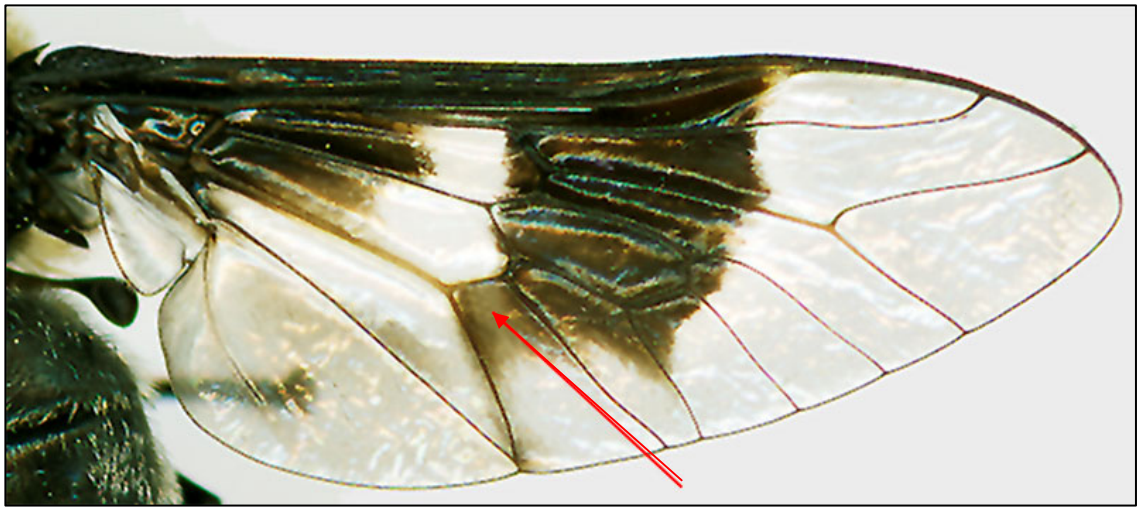

Fig. 42. *C. mitis*

Fig. 43. *C. carbonarius*

| | | |
|---|---|---|
| 5 (4) | Base of wing cell cua1 infuscated (dark) (Fig. 42) | *mitis* |
| | Base of cell cua1 with distinct hyaline (clear) spot (Fig. 43). 2 spp. | 6 |

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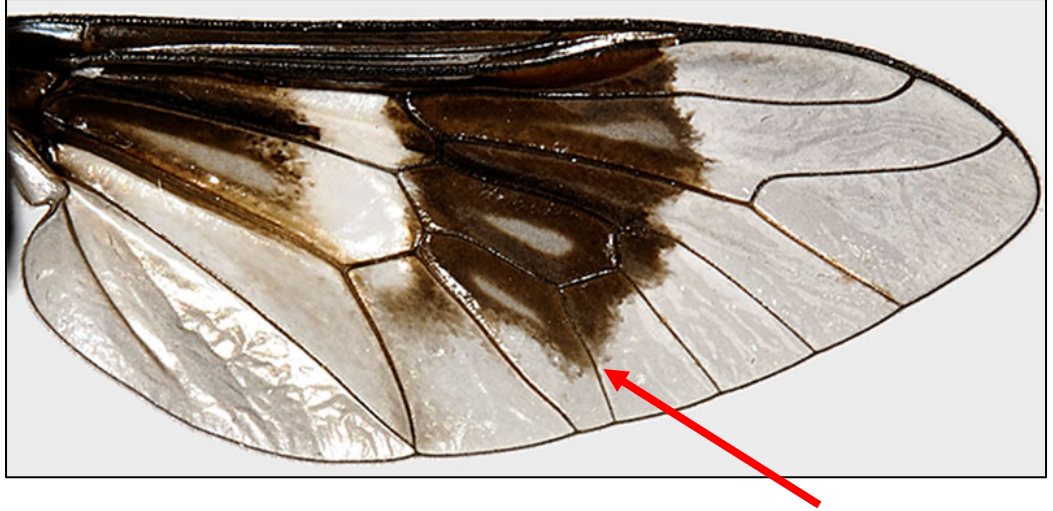

Fig. 44. *C. ater*

Fig. 45. *C. carbonarius*

| | | |
|---|---|---|
| 6 (5) | Crossband of wing not reaching hind margin, its outer margin irregular (Fig. 44) | *ater* |
| | Crossband extends to outer margin, its outer margin straighter (Fig. 45) | *carbonarius* |

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Fig. 46. *C. excitans*.

Fig. 47. *C. vittatus*.

| | | |
|---|---|---|
| 7 (1) | Clypeus with yellow pruinose stripe (Fig. 46); clypeus usually black (yellow in *discalis* and *fulvaster).* 10 spp. | 8 |
| | Clypeus lacking pruinose stripe (Fig. 47); clypeus shiny yellow. 24 spp. | 17 |

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Fig. 48. *C. sordidus*

Fig. 49 *C. sordidus*

Fig. 51. *C. frigidus*

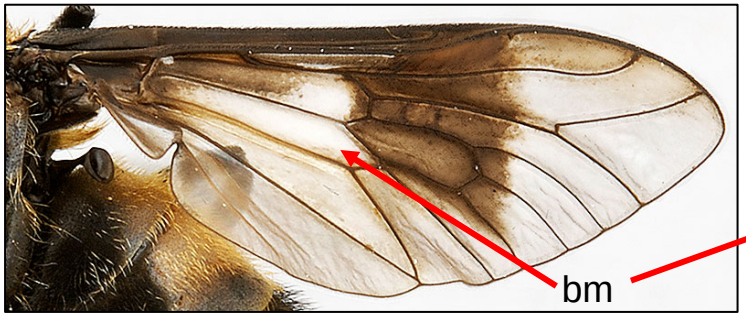


Fig. 50 *C. sordi*dus.

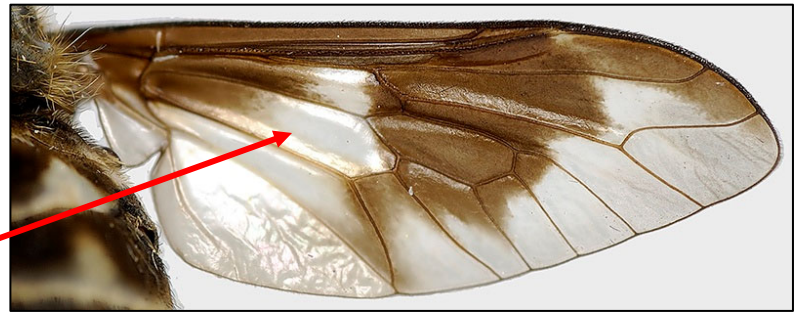

Fig. 52. *C. nigripes*.

| | | |
|---|---|---|
| 8 (7) | Abdominal tergites mostly black but with gray posterior borders that expand anteriorly in midline to form large gray triangles on tergites 2, 3, 4 (Fig. 48); yellow areas restricted to lateral patches on tergites 1 & 2, these patches may be very small (Fig. 49). Wing cell bm hyaline , rarely with small basal infuscation, apical costal margin either hyaline or with smoky tinge that may resemble a weak apical spot (Fig. 50) | *sordidus* |
| | Not with the above combination of characters; tergites with more yellow and distinct apical spot (Fig. 51); if tergites mostly black then cell bm at least 1/3 infuscated (Fig. 52). 9 spp. | 9 |

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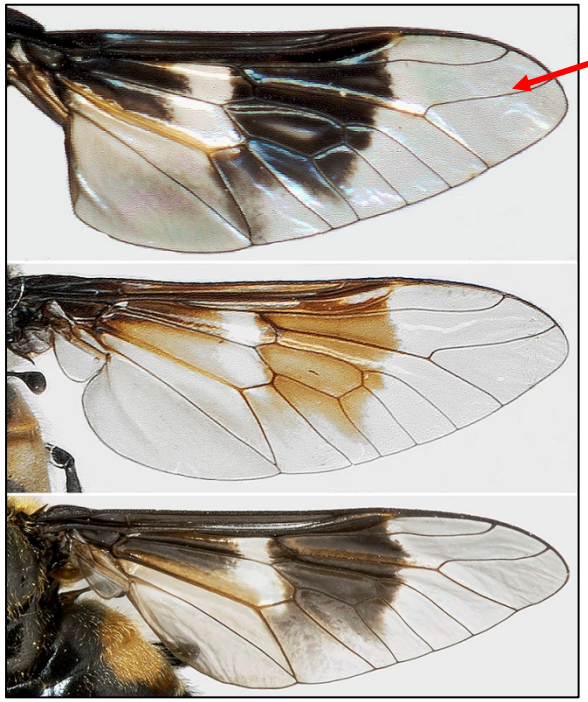

Fig. 53.
*C. excitans*
*C. cuclux*
*C. dawsoni*

Fig. 54.
*C. discalis, C. fulvaster*
*C. venus, C. nigripes*
*C. frigidus, C. zinzalus*

| | | |
|---|---|---|
| 9 (8) | No apical spot beyond crossband but may be some weak infuscation in cell r1 that is not the same density as crossband (Fig. 53). 3 spp. | 10 |
| | Distinct apical spot as dark as crossband (Fig. 54). 6 spp. | 12 |

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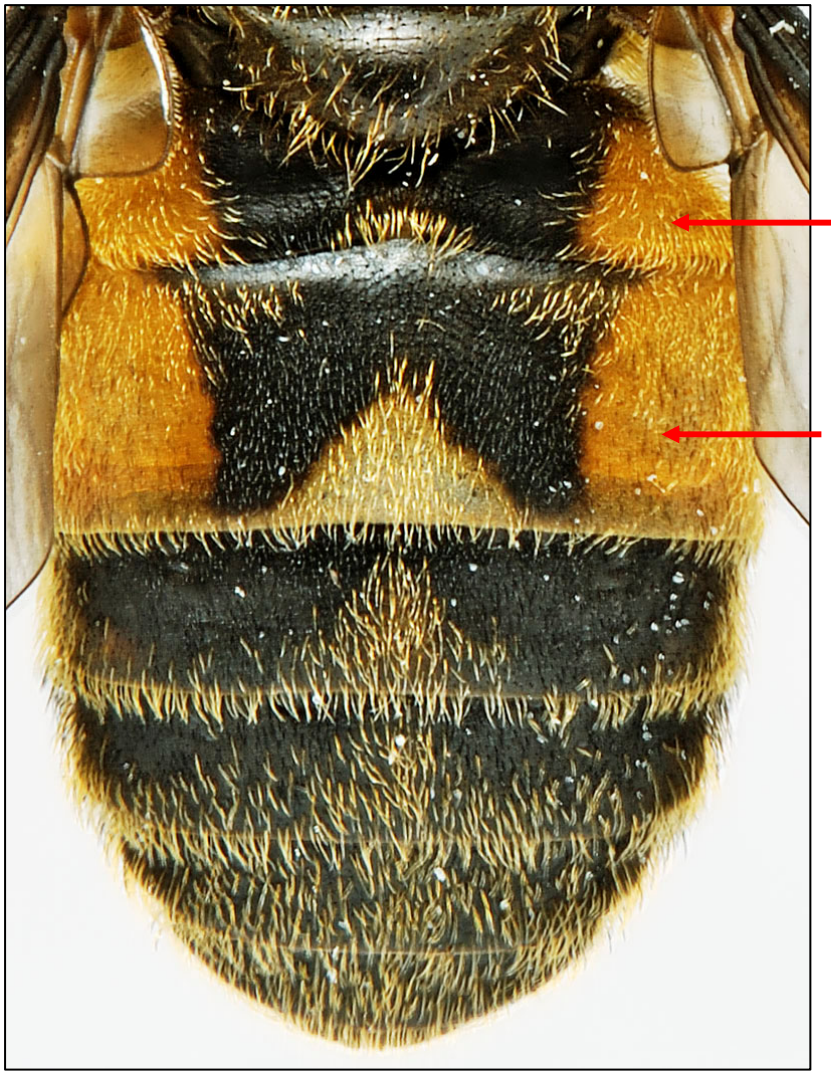

Fig. 55. *C. excitans*


Fig. 56
*C. cuclux*
*C. dawsoni*

| | | |
|---|---|---|
| 10 (9) | Median abdominal triangles present, large on tergite 2, laterally tergites 1 & 2 often extensively yellow/orange (Fig. 55) | *excitans* |
| | Median triangles absent, pale lateral spots on tergites 1 & 2 small (Fig. 56). 2 spp. | 11 |

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Fig. 57. *C. cuclux*

Fig. 58. *C. dawsoni*

| | | |
|---|---|---|
| 11 (10) | Wing pattern pale (Fig. 57) | *cuclux* |
| | Wing pattern saturate (Fig. 58) | *dawsoni* |

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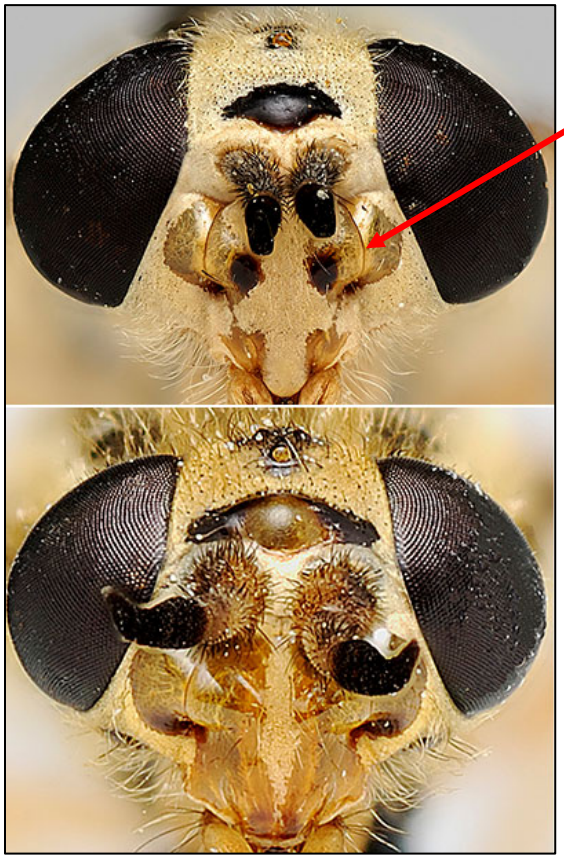

Fig.59.
*C. discalis*
*C. fulvaster*

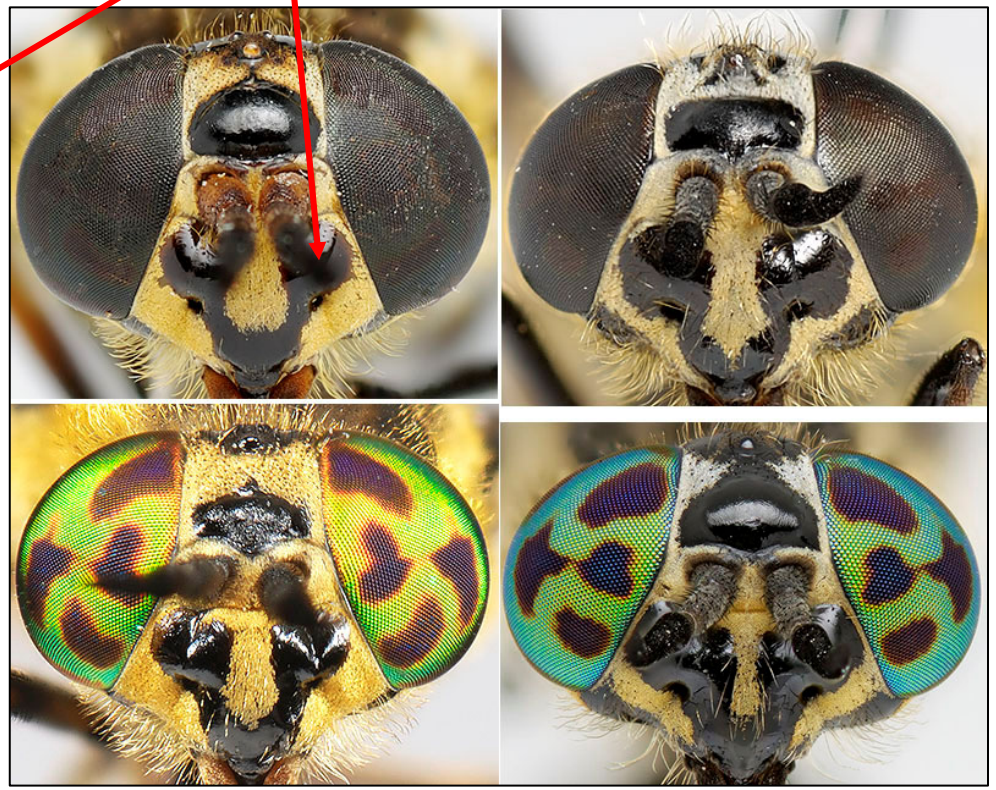


Fig. 60.
*C. venus C. nigripes*
*C. frigidus C. zinzalus*

| | | |
|---|---|---|
| 12 (9) | Facial callus yellow, (Fig. 59). Manitoba west. 2 spp. | 13 |
| | Facial callus black (Fig. 60). Eastern, west to Alberta. 4 spp. | 14 |

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Fig. 61. *C. discalis*

Fig. 62. *C. fulvaster*

| | | |
|---|---|---|
| 13 (12) | Frontal callus black, half width of frons (Fig. 59). Bifurcation at wing vein R4+5 with isolated spot, cell bm hyaline, wing cell below stem vein hyaline (Fig. 61) | *discalis* |
| | Frontal callus wider than high, suboval yellow to marginally black (Fig. 59). No spot at bifurcation of R4+5, cell bm about one-third infuscated , wing cell below stem vein infuscated (Fig. 62) | *fulvaster* |

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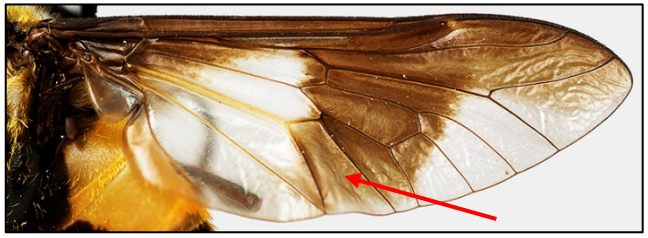

Fig. 63. *C. venus*

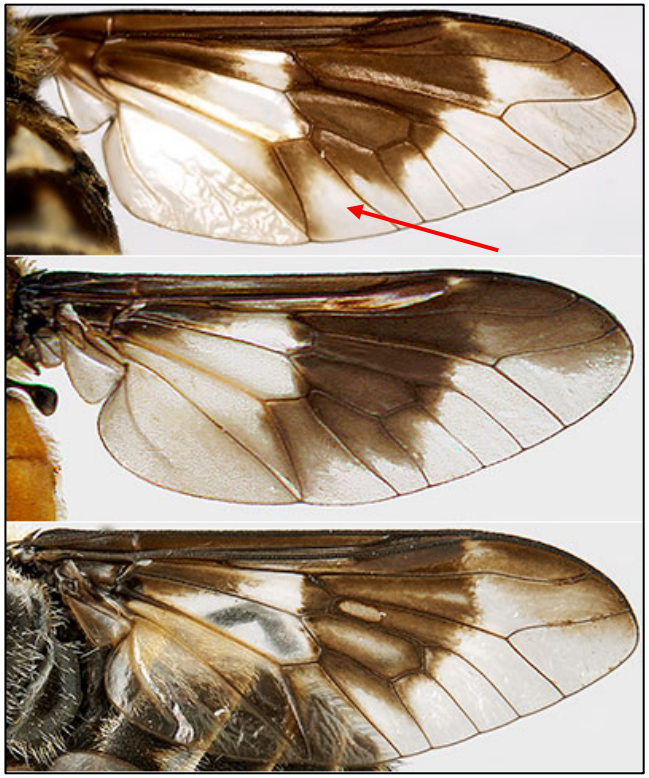

Fig. 65.
*C. nigripes*
*C. frigidus*
*C. zinzalus*

Fig. 64. *C. venus*

Fig. 66.
*C. nigripes, C.frigidus*
*C. zinzalus*

| | | |
|---|---|---|
| 14 (12) | Crossband broadly reaching hind margin of wing, completely filling cell cua1 (Fig. 63). Large brightly coloured black and yellow species (Fig. 64) | *venus* |
| | Crossband never completely reaching hind margin of wing, cell cua1 at least one-third hyaline (Fig. 65). Dull black and yellow/orange species (Fig. 66). 3 spp. | 15 |

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Fig. 67. *C. nigripes*

Fig. 68.
*C.frigidus*
*C. zinzalus*

.

| | | |
|---|---|---|
| 15 (14) | Apical spot not widened beyond crossband and crossing no more than apical half of vein R4 (Fig. 67). Hind tibia entirely black and vertex (top of head) pruinose. | *nigripes* |
| | Apical spot widened beyond crossband and crossing more than apical half of vein R4 (Fig. 68). If hind tibia entirely black then vertex glossy black. 2 spp. | 16 |

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Fig. 69.
*C. frigidus*

Fig. 71.
*C. zinzalus*

Fig. 70.
*C. frigidus*

Fig. 72.
*C. zinzalus*

.

| | | |
|---|---|---|
| 16 (15) | Frontal callus dull and rough, separated from ocellar prominence by pruinose vertex (Fig. 69); palpi yellowish brown (Fig. 69) and hind tibia at least partly reddish; abdominal tergites often with extensive dark yellow/orange areas laterally on tergites 1-4 (Fig. 70) | *frigidus* |
| | Frontal callus glossy and smooth and connected or almost connected to glossy ocellar prominence (Fig. 71); palpi and hind tibia black (Fig. 71); lateral yellow on abdominal tergites restricted to tergites 1& 2 (Fig. 72) | *zinzalus* |

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Fig. 73. *C*. *shermani*

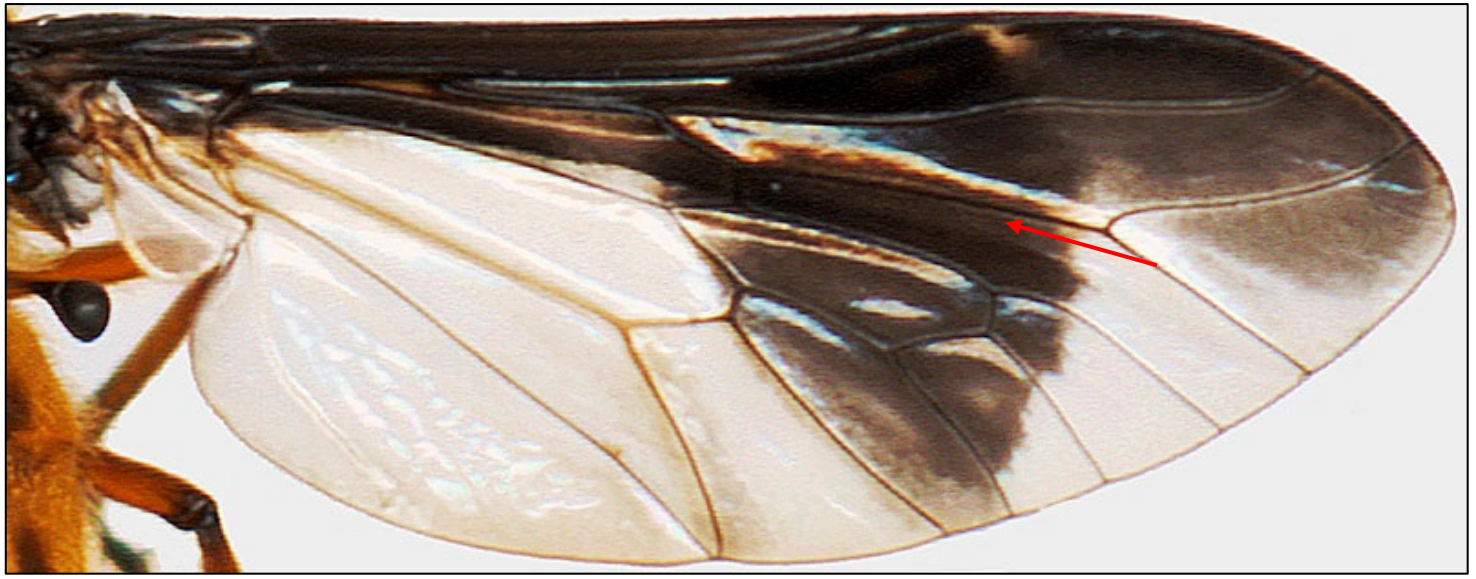

Fig. 74. *C*. *aberrans*

| | | |
|---|---|---|
| 17 (7) | Fenestrate wing pattern, i.e., crossband and apical spot broken by pale areas along veins, pattern unique (Fig. 73) | *shermani* |
| | Dark markings of wing not broken by paler areas along veins (Fig. 74). 23 spp. | 18 |

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Fig. 75. *C. fuliginosus*

Fig. 77

Fig. 76. *C. fuliginosus*

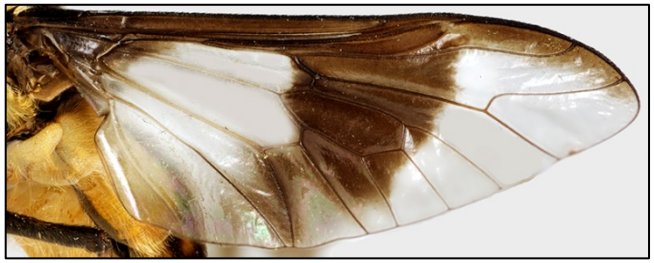

Fig. 78

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| | | |
|---|---|---|
| 18 (17) | General appearance dark smoky gray/brown (Fig.75); wing markings pale (Fig. 76). Restricted to Atlantic coastal salt marshes | *fuliginosus* |
| | General appearance black and yellow or warm brown, not smoky (Fig. 77); wing markings darker to saturate (Fig. 78). Not restricted to salt marshes. 22 spp. | 19 |

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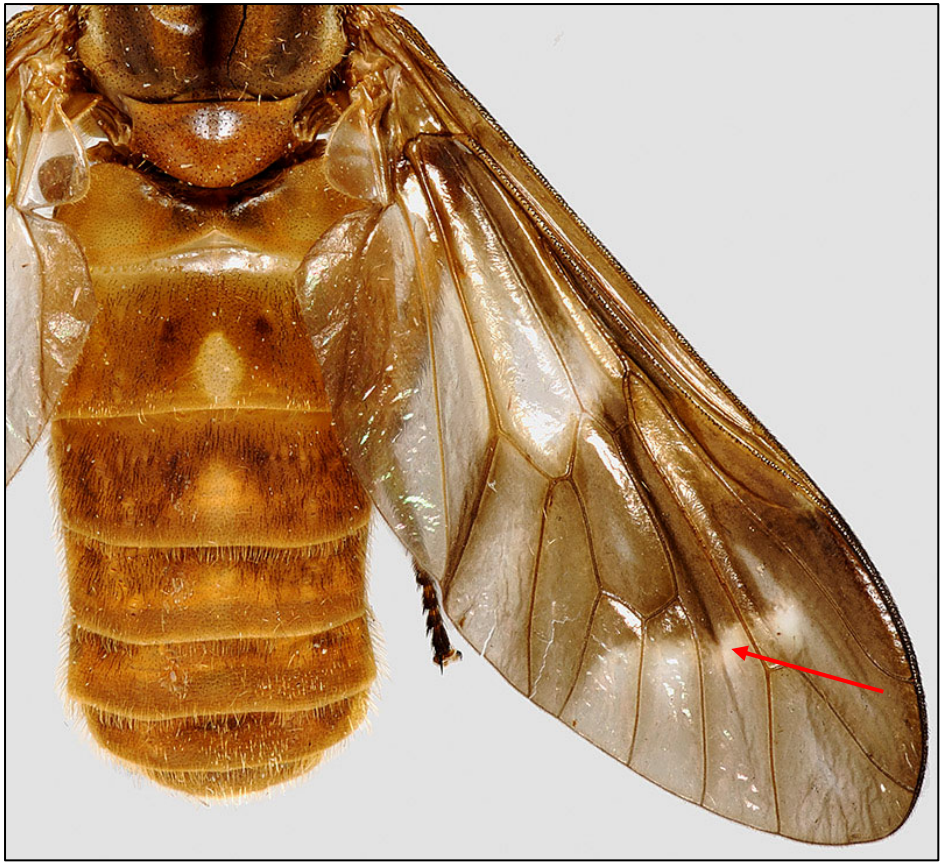

Fig. 79. *C. brunneus*

Fig. 80

Fig. 81

| | | |
|---|---|---|
| 19 (18) | Apical spot continuing around apex of wing to join crossband, thus enclosing a linear hyaline area (Fig. 79); tergites pale brown (Fig. 79). Range in Canada restricted to the Great Lakes marshes in extreme southern Ontario. | *brunneus* |
| | Apical spot sometimes extending around wing apex but never joining crossband at hind margin (Fig. 81); pale areas of tergites usually orange/yellow, or white (Fig.80) but tergites brownish in *C. flavidus* and *C. celatus*. 21 spp. | 20 |

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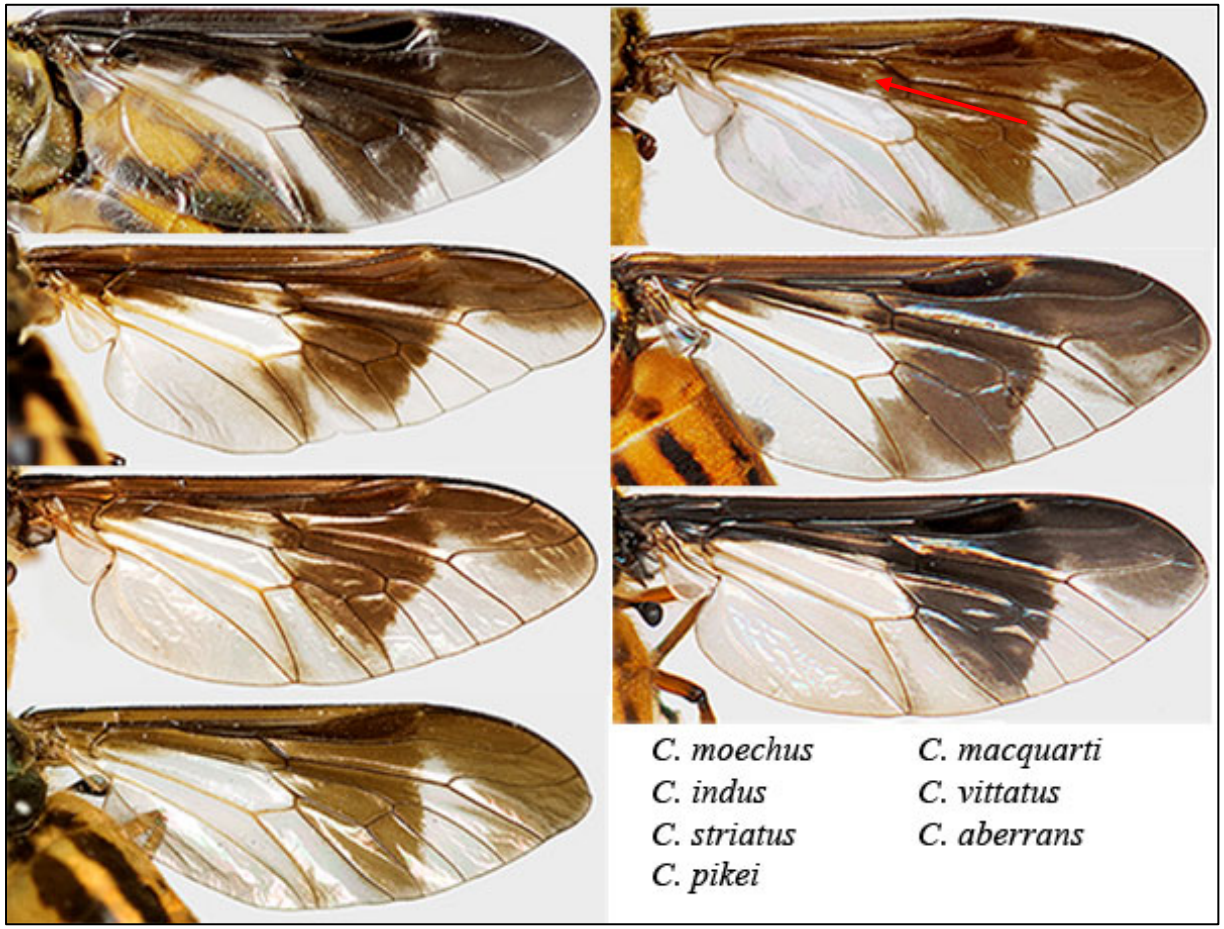


Fig. 82

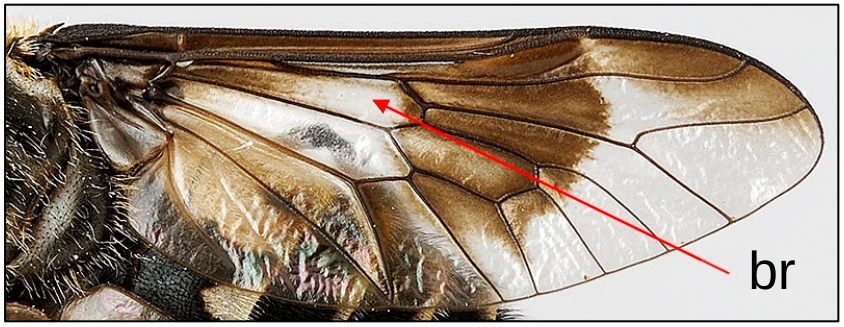


Fig. 83. *C. furcatus*

| | | |
|---|---|---|
| 20 (19) | Wing cell br more than three-quarters infuscated. 7 spp. (Fig. 82) | 21 |
| | Wing cell br always at least one-third hyaline (Fig. 83). 15 spp. | 27 |

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Fig. 84. *C. moechus*

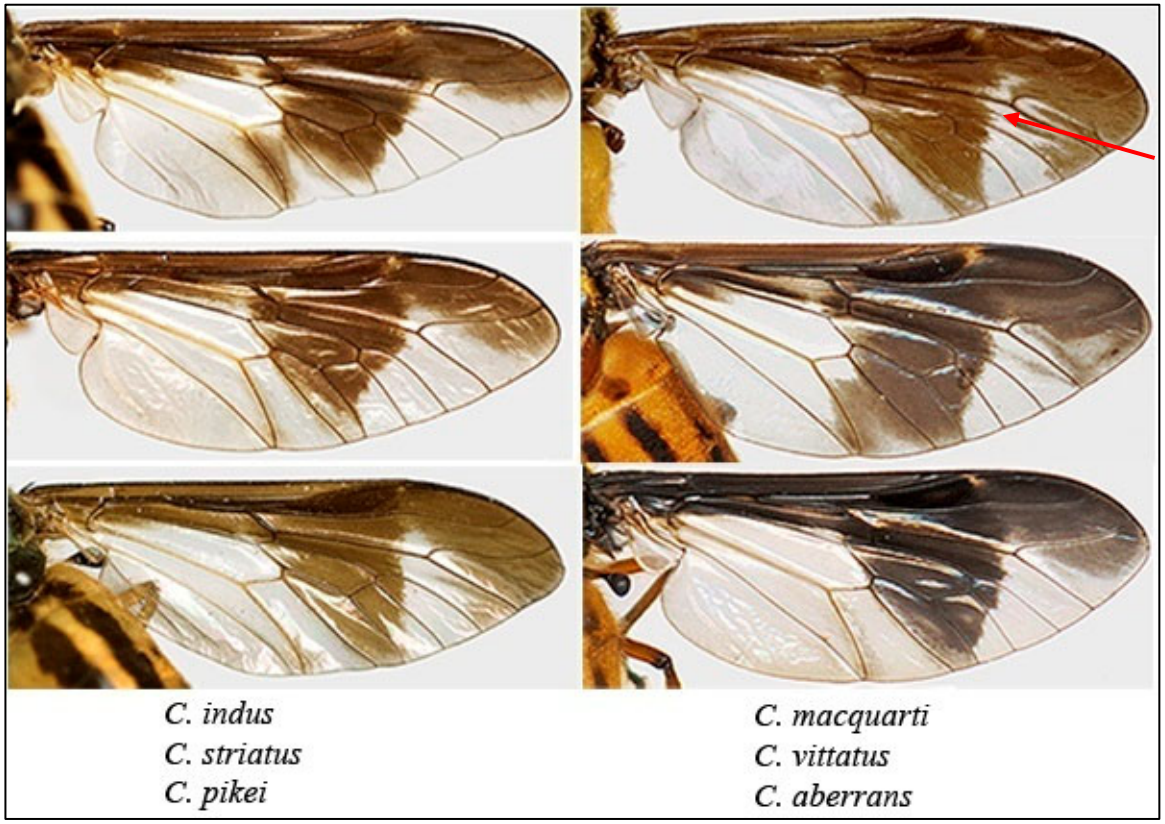


Fig. 85

| | | |
|---|---|---|
| 21 (20) | Hyaline triangle very small, restricted to apices of cells m1 and m2 (Fig. 84) | *moechus* |
| | Hyaline triangle larger, always extending beyond cell m1. 6 spp. (Fig. 85) | 22 |

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Fig. 86
*C. Indus*
*C. striatus*

.

Fig. 87
*C. pikei*
*C. macquarti*
*C. vittatus*
*C. aberrans*

| | | |
|---|---|---|
| 22 (21) | Apical spot filling half or less of cell r4. 2 spp. (Fig. 86) | 23 |
| | Apical spot filling more than one-half of cell r4, and usually extending into r5. 4 spp. (Fig. 87) | 24 |

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.

Fig. 88. *C. indus*

Fig. 89. *C. striatus*

| | | |
|---|---|---|
| 23 (22) | Black markings on tergites 3, 4, 5 much wider than the black inverted U-shaped figure on tergite 2 (Fig. 88) | *indus* |
| | Black markings on tergites 3, 4, 5 approximately same width as those on tergite 2 (Fig. 89) | *striatus* |

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.

Fig. 90. *C. pikei*

Fig. 91.
*C. macquarti*
*C. vittatus*
*C. aberrans*

| | | |
|---|---|---|
| 24 (22) | Apex of hyaline triangle usually reaches vein R2+3 (Fig. 90) | *pikei* |
| | Apex of hyaline triangle just gets beyond furcation of vein R4+5 . 3 spp. (Fig. 91) | 25 |

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Fig. 92. *C. macquarti*

Fig. 94
*C. vitatus, C. aberrans*

Fig. 93. *C. macquarti*

Fig. 95
*C. vittatus*
*C. aberrans*

.

| | | |
|---|---|---|
| 25 (24) | Abdomen with wide median yellow stripe between 2 dark submedian stripes (Fig. 92); apical spot filling wing cell r4 and filling outer edge of cell r5. (Fig. 93) | *macquarti* |
| | Abdomen with a narrower median yellow stripe, 2 submedian stripes and a further 2 dark lateral stripes (Fig. 94); apical spot does not fill outer edge of wing cell r5. 2spp. (Fig. 95) | 26 |

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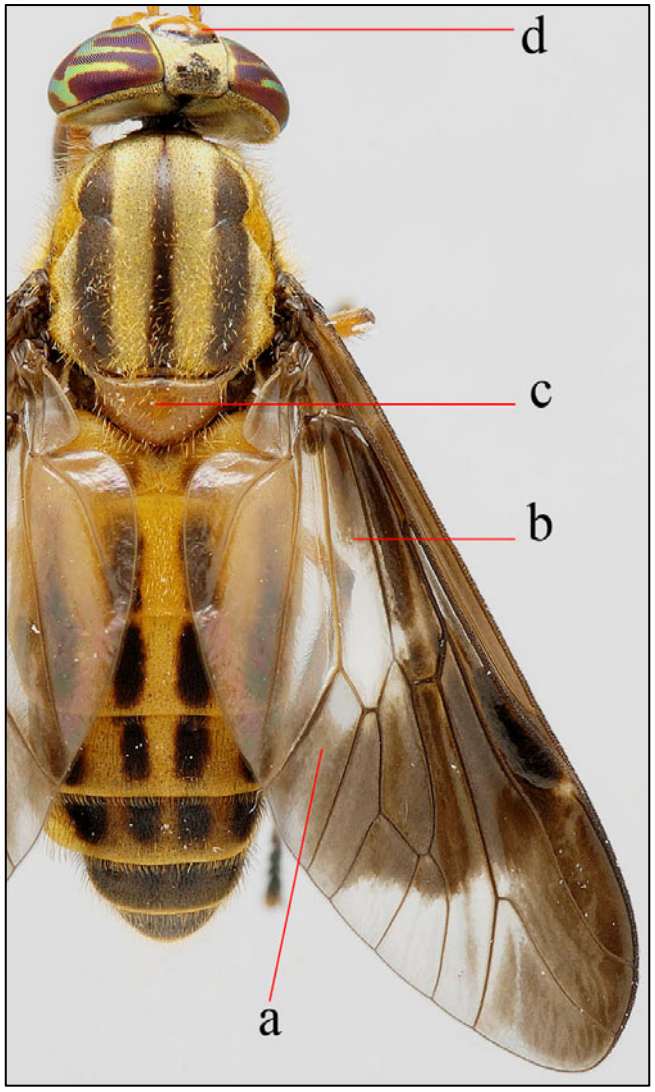


Fig. 97. *C. vittatus*

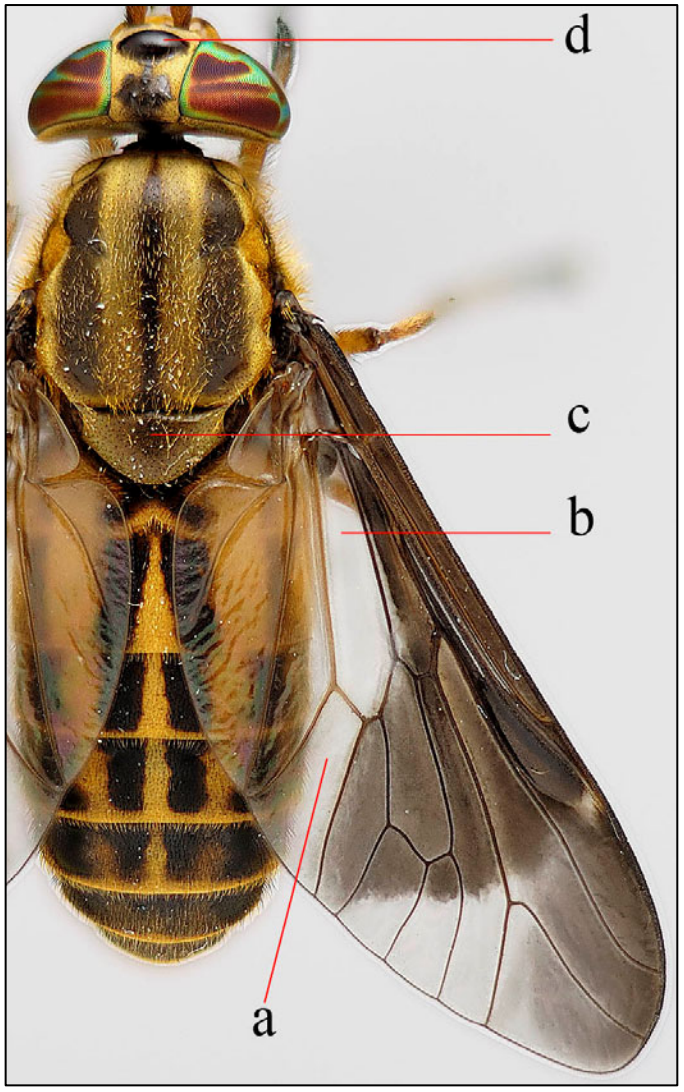


Fig. 98. *C. aberrans*

| | | |
|---|---|---|
| 26 (25) | Wing cell cua1 mostly infuscated (Fig. 97a); cell bm about one-third infuscated (Fig. 97b) Scutellum yellow (Fig. 97c); frontal callus yellow with darker dorsal margin (Fig. 97d) | *vittatus* |
| | Wing cell cua1 hyaline (Fig. 98a); cell bm hyaline (Fig. 98b). Scutellum dark (Fig. 98c); frontal callus dark (Fig. 98d) | *aberrans* |

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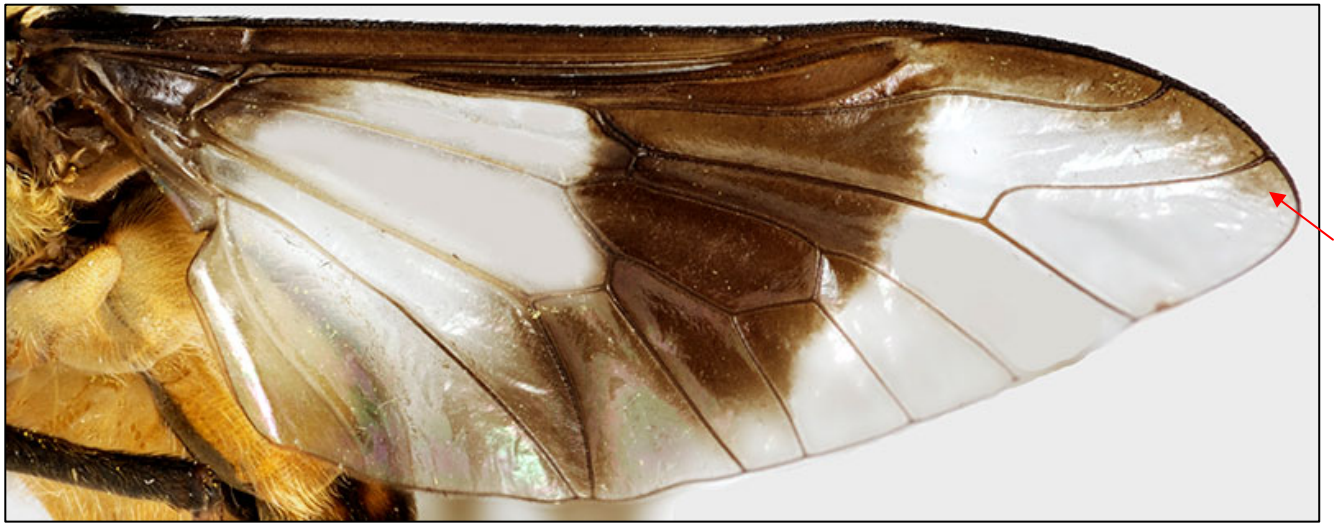

Fig. 99. *C. callidus*

Fig. 100. *C. montanus*

.

| | | |
|---|---|---|
| 27 (20) | Apical spot of uniform width, usually covering no more than apical third of vein R4 (Fig. 99) (rarely covering apical half in some *pudicus).* 6 spp. | 28 |
| | Apical spot not of uniform width, widening to cover more than one-half of vein R4 (Fig. 100). 8 spp. | 33 |

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Fig. 101
*C. luteopennis*
*C. sackeni*
*C. pudicus*

Fig. 102
*C. delicatulus*
*C. aestuans*
*C. callidus*

| | | |
|---|---|---|
| 28 (27) | Apex of hyaline triangle just reaching or almost reaching vein R2+3. 3 spp. (Fig. 101) | 29 |
| | Apex of hyaline triangle crossing vein R2+3. 3 spp. (Fig.102) | 31 |

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Fig. 103
*C. luteopennis*

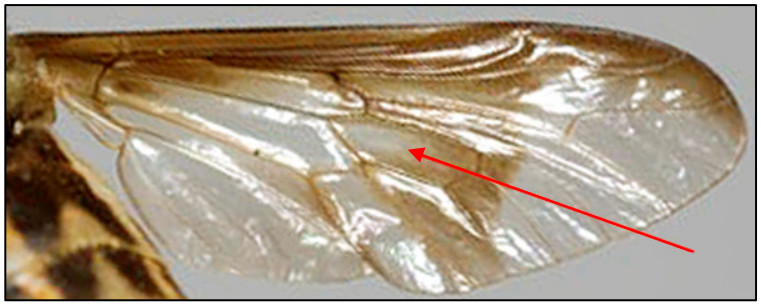

Fig. 104. *C. luteopennis*

Fig. 105
*C. sackeni*
*C. pudicus*

Fig. 106.
*C. sackeni*
*C. pudicus*

| | | |
|---|---|---|
| 29 (28) | Abdominal tergites 2, 3, and 4 with isolated sublateral black spots (Fig. 103) Wing pattern not saturate and discal cell about one-half hyaline (Fig. 104). Southern Ontario, rare. | *luteopennis* |
| | Abdominal tergites with expanded black markings (thus reducing the yellow lateral area) and no sublateral black spots (Fig. 105). Wing pattern saturate and discal cell almost entirely saturate (Fig. 106). 2 spp. | 30 |

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Fig. 107. *C. sackeni*

Fig. 108. *C. pudicus*

| | | |
|---|---|---|
| 30 (29) | Black inverted V on tergite 2 continuous with black markings on tergites 1 & 3 (Fig. 107) | *sackeni* |
| | Black inverted V on tergite 2 isolated from black markings on tergites 1 & 3 (Fig. 108) | *pudicus* |

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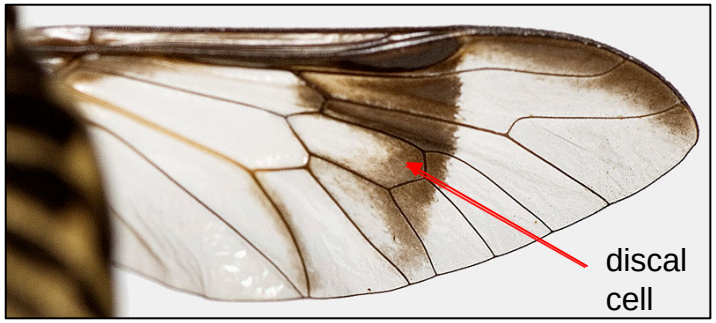


Fig. 109. *C. delicatulus*

Fig. 111 *C. aestuans, C. callidus*

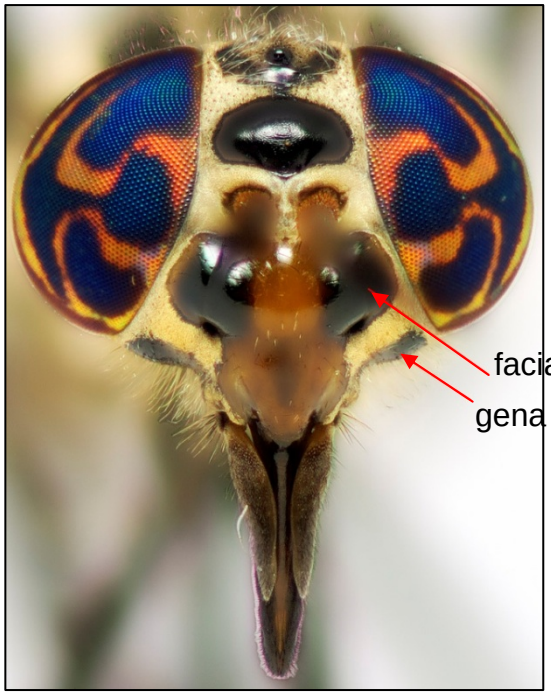


Fig. 110. *C. delicatulus*

Fig. 112. *C. aestuans, C. callidus*

| | | |
|---|---|---|
| 31 (28) | Lower half of crossband narrow so that discal cell is about one-half or more hyaline (Fig. 109); facial callus & gena black (Fig. 110) | *delicatulus* |
| | Crossband fills all of discal cell (Fig. 111); facial callus & gena yellow/orange. 2 spp. (Fig. 112) | 32 |

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Fig. 113. *C. aestuans*

Fig. 114. *C. callidus*

Fig. 115. *C. aestuans*

Fig. 116. *C. callidus*

| | | |
|---|---|---|
| 32 (31) | Pale markings on tergites grayish or dull yellow, tergite 2 with one black triangle on either side of median inverted V (Fig. 113). Wing with apical spot paler than crossband (Fig. 115). Widespread , Prince Edward Island to British Columbia | *aestuans* |
| | Pale markings on tergites yellow, no black lateral triangles on tergite 2 (fig. 114). Apical spot as dense as crossband (Fig. 116). Southern Ontario and adjacent Quebec | *callidus* |

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Fig. 117. *C. univittatus*

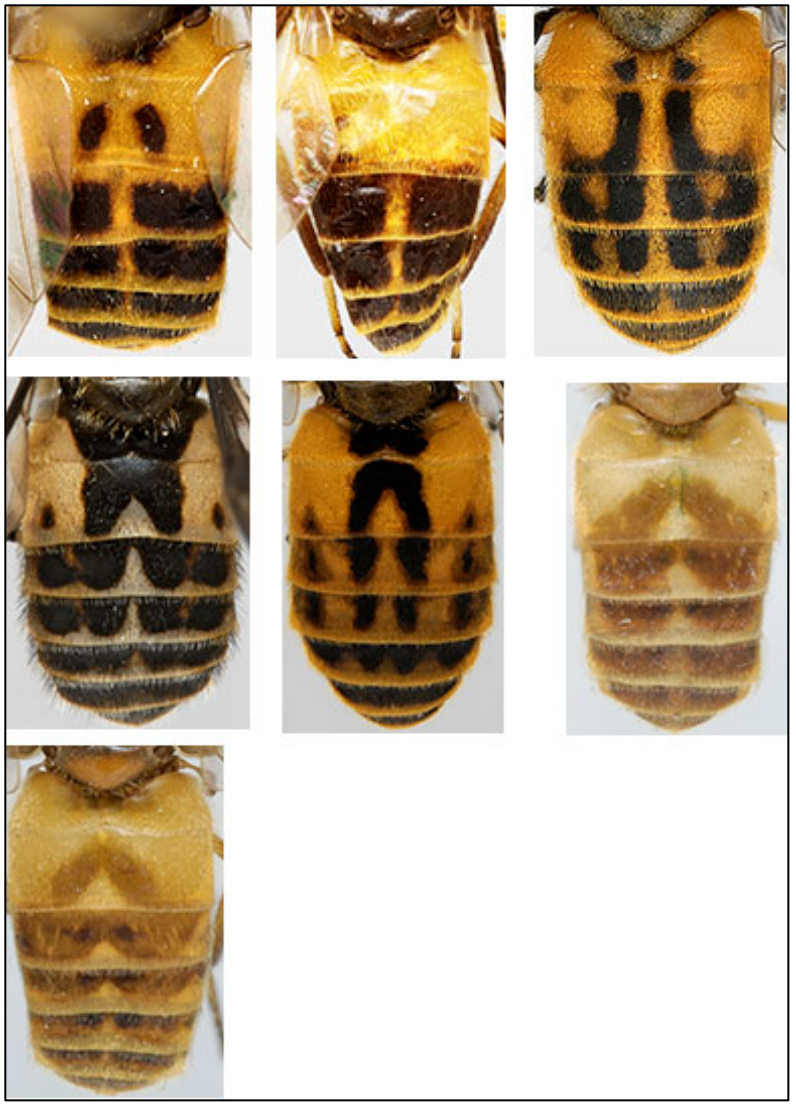

Fig. 118

| | | |
|---|---|---|
| 33 (27) | Tergites mostly black or dark brown but with a median yellow stripe and incipient sublateral yellow stripes (Fig. 117) | *univittatus* |
| | Laterally, tergites 1 & 2 mostly yellow or pale brown. 7spp. (Fig. 118). | 34 |

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Fig. 121

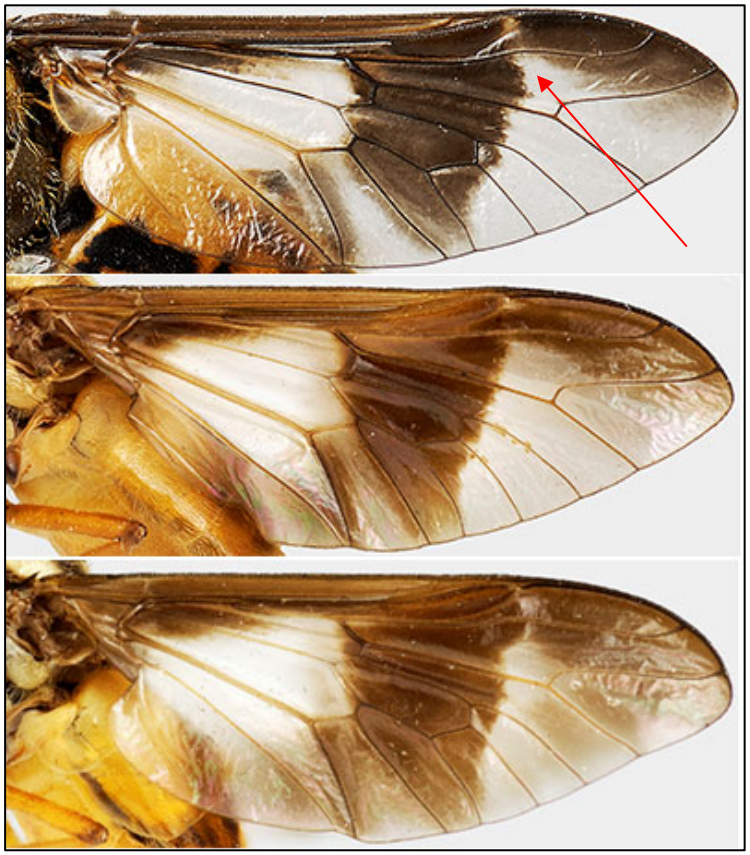

Fig. 122

| | | |
|---|---|---|
| 34 (33) | Apex of hyaline triangle crossing vein R2+3 and often extending to costa so that apical spot appears separated from crossband. 4 spp. (Fig. 121) | 35 |
| | Apex of hyaline triangle not crossing vein R2+3. 3 spp. (Fig. 122) | 38 |

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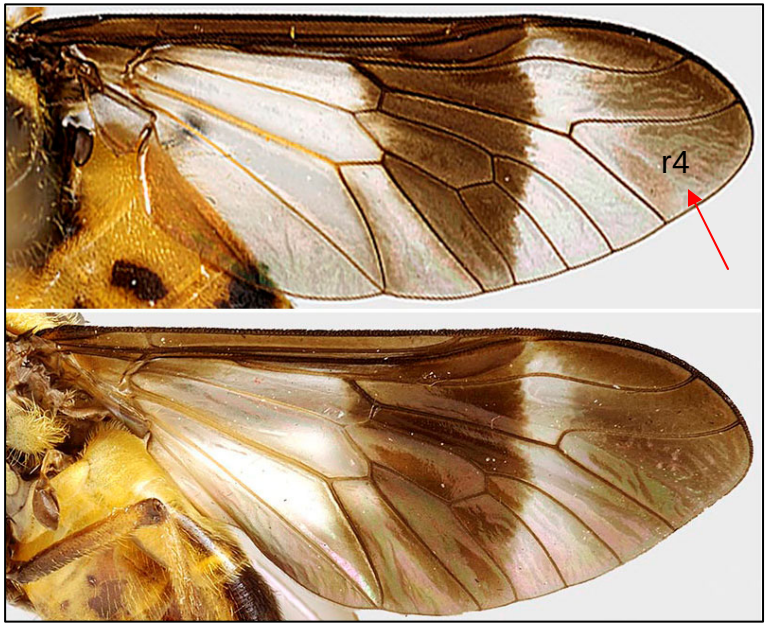


Fig. 123

Fig. 124

| | | |
|---|---|---|
| 35 (34) | Apical spot occupying almost all of wing cell r4, crossband broadly reaching hind margin of wing (Fig. 123). 2spp. Rare, extreme southern Ontario and southwestern Quebec. | 36 |
| | Apical spot occupying only about one half of cell r4, crossband just reaching, or not reaching, hind margin of wing (Fig. 124). 2spp. More widespread. | 37 |

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Fig. 125. *C. geminatus*

Fig. 126. *C. impunctus*

.

| | | |
|---|---|---|
| 36 (35) | Second abdominal tergite with pair of oblique lines or black inverted V (Fig. 125) | *geminatus* |
| | 1st and 2nd abdominal tergites entirely yellow (Fig. 126) | *impunctus* |

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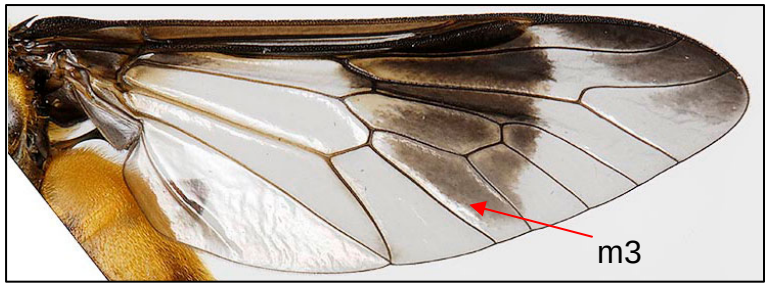


Fig. 127. C. *lateralis*

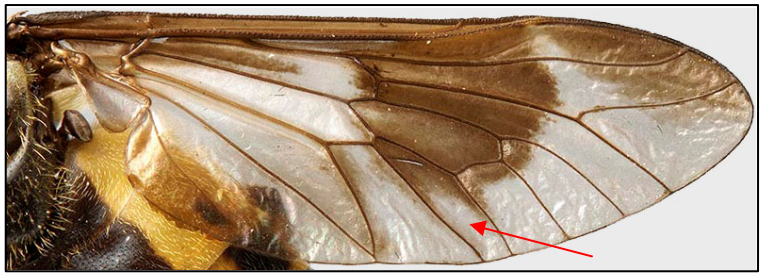

Fig. 129. *C. furcatus*

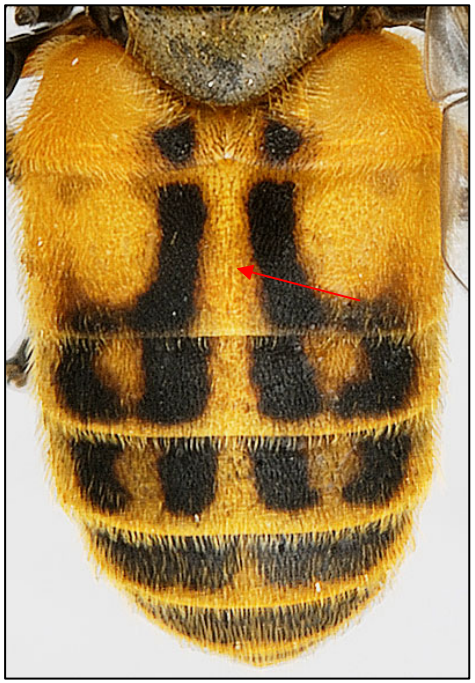

Fig. 128 *C. lateralis*

Fig. 130 *C. furcatus*

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| | | |
|---|---|---|
| 37 (35) | Wing cell m3 over three-quarters infuscated, cua1 hyaline, cell br about two-thirds hyaline (Fig. 127). Tergite 2 with median yellow stripe between submedian black stripes (Fig. 128) | *lateralis* |
| | Cell m3 about one-half infuscated, cua1 infuscated at base, cell br about one-third hyaline (Fig. 129 ). Tergite 2 with median yellow triangle ( Fig. 130) | *furcatus* |

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Fig. 131. *C. montanus*

Fig. 132

| | | |
|---|---|---|
| 38 (34) | Tergites dark yellow/orange with 4 longitudinal rows of black spots, median inverted V on tergite 2 (Fig. 131). Widespread, New Brunswick to Manitoba. | *montanus* |
| | Tergites pale yellow with pale brownish markings or few dark bars not in rows (Fig. 132). 2 spp., known only from Lake Erie shore in Canada. | 39 |

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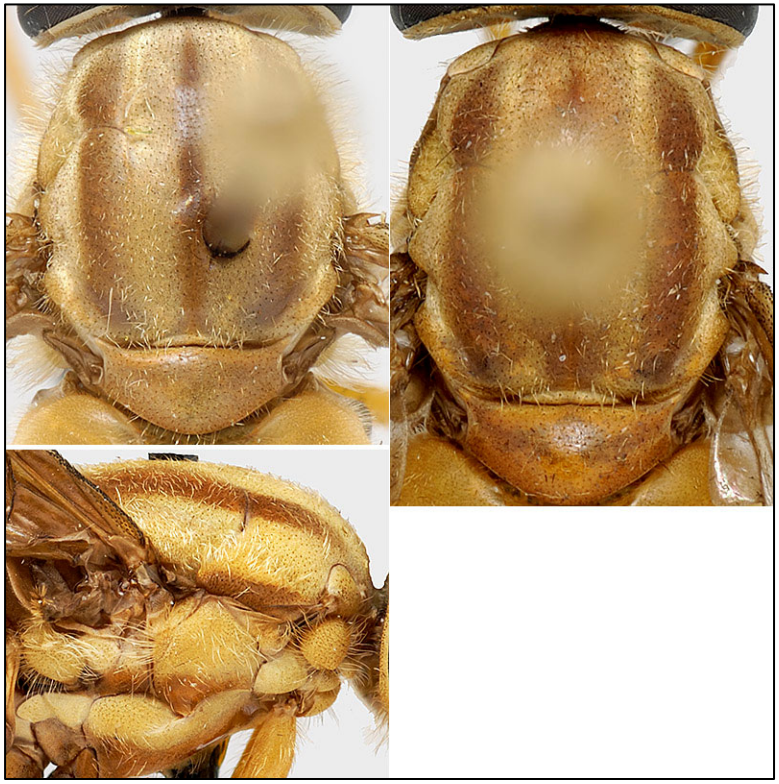
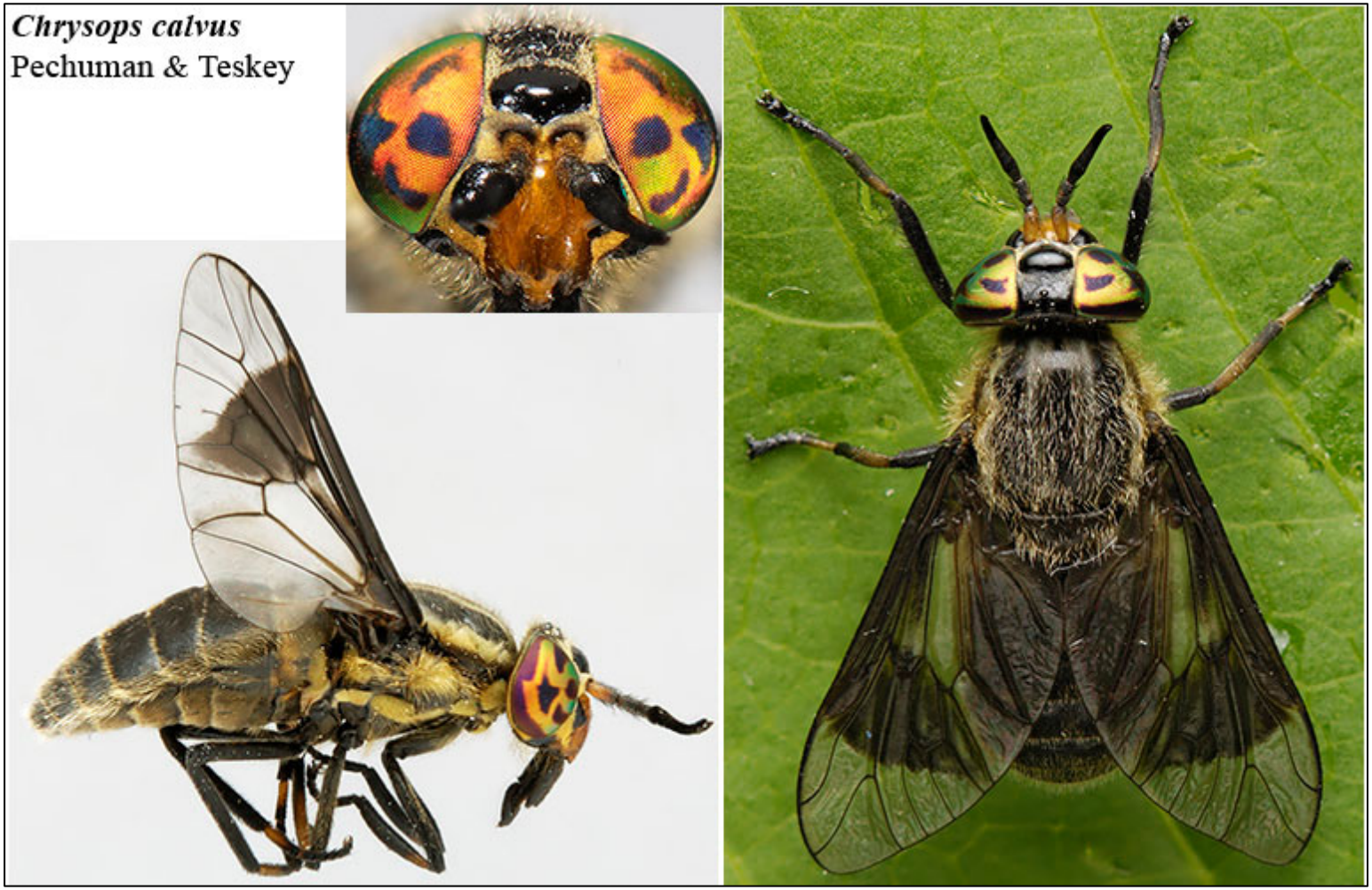


Fig. 133. *C. flavidus*

Fig. 134. *C. celatus*

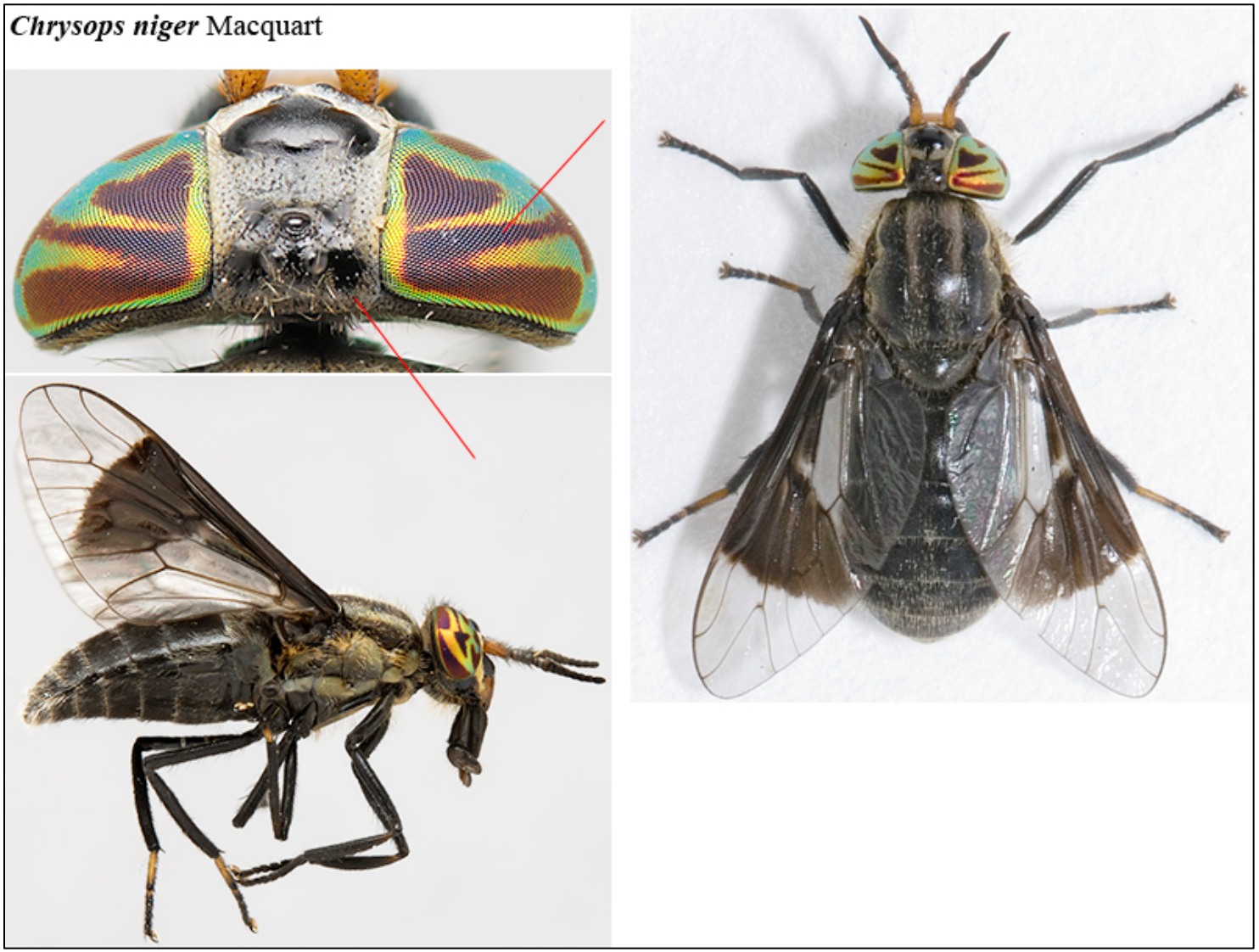
| | | |
|---|---|---|
| 39 (38) | Thorax with yellowish to pale brownish pruinose area separating darker brown subshining stripes (Fig. 133). Outer margin of crossband irregular, somewhat sinuous. | *flavidus* |
| | Pruinose area iridescent greenish or bluish gray and subshining stripes dark brown to black (Fig. 134). Outer margin of crossband straight or concave. | *celatus* |




***Chrysops calvus*** Pechuman & Teskey

Length 7-10 mm. An all black species with a hyaline wing apex (cell $r_1$ along costa rarely smoky-tinged). Readily separated from other all black species, except *C. niger* Macquart, by the combination of a yellow clypeus without a pruinose stripe and the completely hyaline wing cell bm. It can be separated from *Chrysops niger* by the intensity of the thoracic sublateral stripes, the shiny vertex and eye pattern (see key).

Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key.




***Chrysops niger*** Macquart

Length 7-10 mm. An all black species with a hyaline wing apex and a yellow clypeus without a pruinose stripe. Very similar to *C. calvus* but differs in intensity of sublateral thoracic stripes, pruinose vertex and eye pattern (see key).

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key.

***Chrysops cincticornis*** Walker

***Chrysops cincticornis*** Walker

Length 8-11 mm. An all black species with a hyaline wing apex and a black face with a yellow pruinose stripe. Instantly recognizable by the bright yellowish orange hairs laterally on the thorax. Teskey (1990) noted that some individuals have only light yellow to cream-coloured hairs making their separation from *C. mitis* difficult. However, the differences in extent of the crossband should distinguish the two species.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key

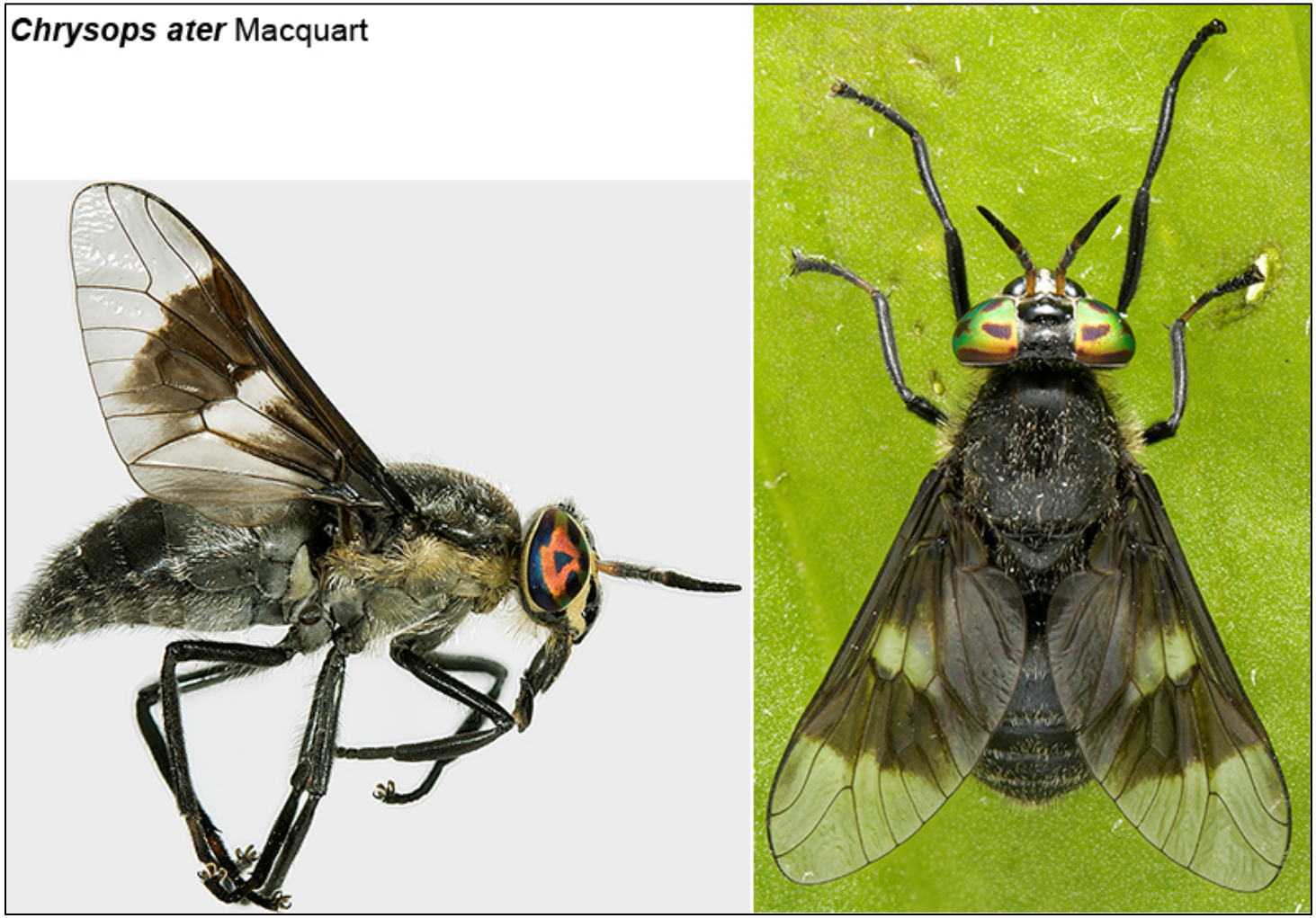
***Chrysops mitis*** Osten Sacken

***Chrysops mitis*** Osten Sacken

Length 8-11 mm. An all black species with a hyaline wing apex and a black face with a yellow pruinose stripe, and only likely to be confused with *Chrysops ater* when that species lacks or almost lacks the hyaline spot at the base of wing cell $cua_1$. Teskey (1990) noted that some individuals of *Chrysops cincticornis* Walker lack the characteristic yellowish orange hairs on the sides of the thorax and thus resemble *C. mitis*. However, the differences in extent of the crossband distinguish the two species.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key

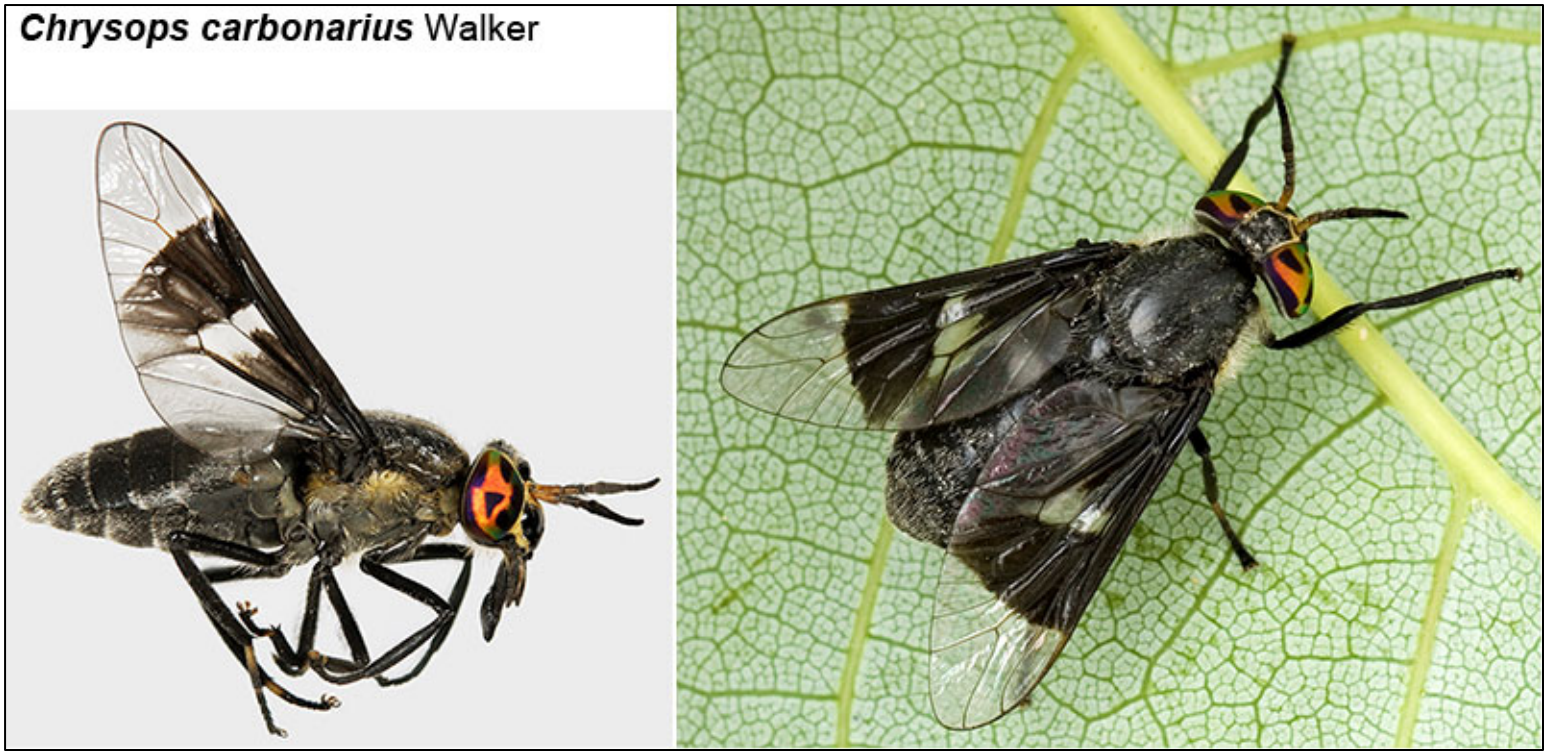



***Chrysops ater*** Macquart

Length 7-10mm. An all black species with a hyaline wing apex and a black face with a yellow pruinose stripe. Only likely to be confused with *Chrysops carbonarius* and *Chrysops mitis* Osten Sacken. Reliably separated from *C. carbonarius* by wing pattern but when the the base of wing cell $cua_1$ is almost fully infuscated individuals may be indistinguishable from *C. mitis.*

Abdomen plate. . Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key




***Chrysops carbonarius*** Walker

Length 7-10 mm. An all black species with a hyaline wing apex and a black face with a yellow pruinose stripe. Only likely to be confused with *Chrysops ater* Macquart, but reliably distinguished from that species by wing pattern. Teskey (1990) stated that he had seen evidence of hybridization of the two species.

Abdomen plate. Face plate. Distribution map.

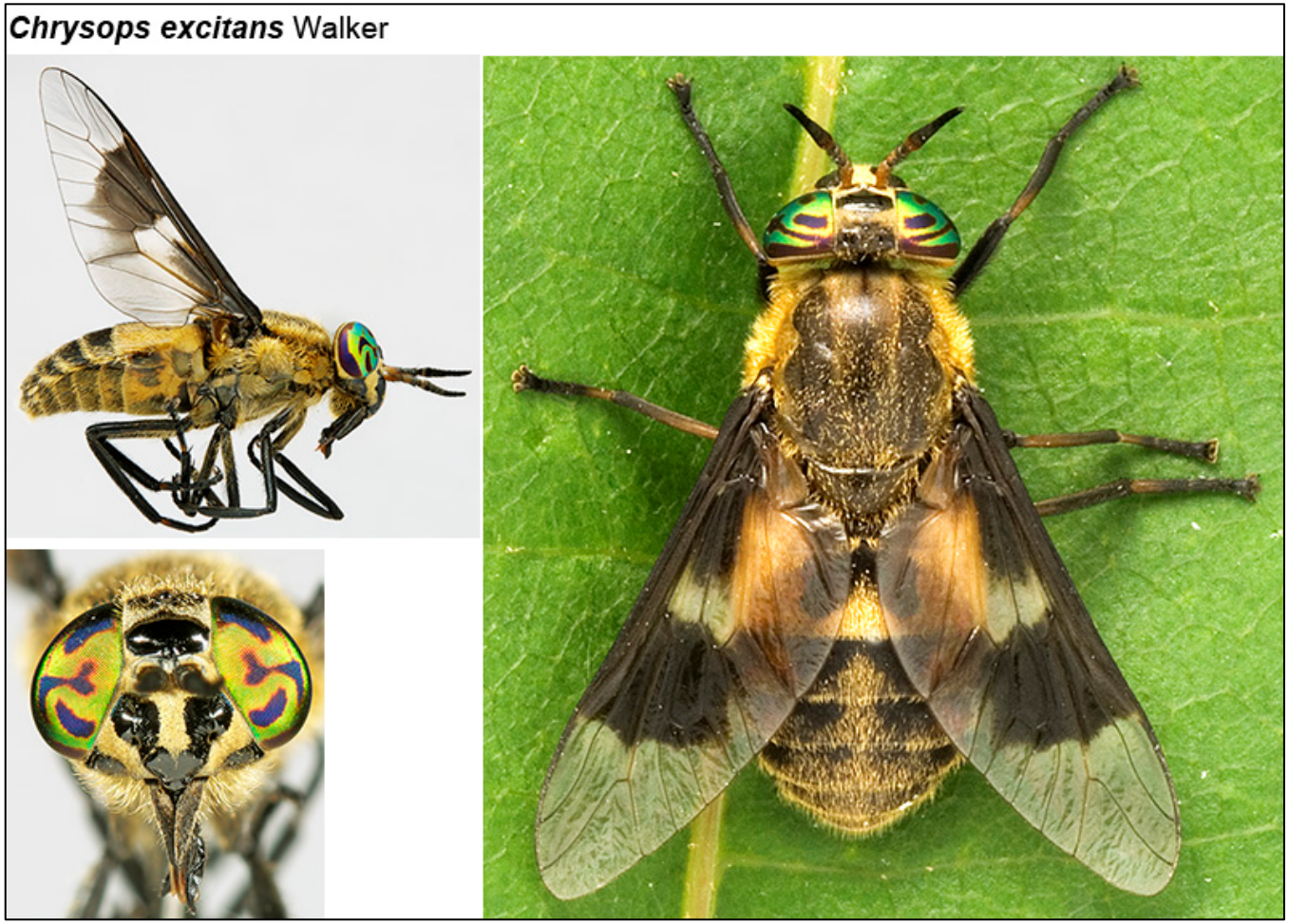
Back to Checklist. Back to *Chrysops* key


***Chrysops sordidus*** Osten Sacken

Length 8-10 mm. Individuals are best identified by the almost black abdomen with gray borders and gray mid line triangles. Yellow patches, when present, are restricted to tergites 1 & 2. Apical costal margin of wing either hyaline or with a smoky tinge.

Abdomen plate. . Face plate. Distribution map.

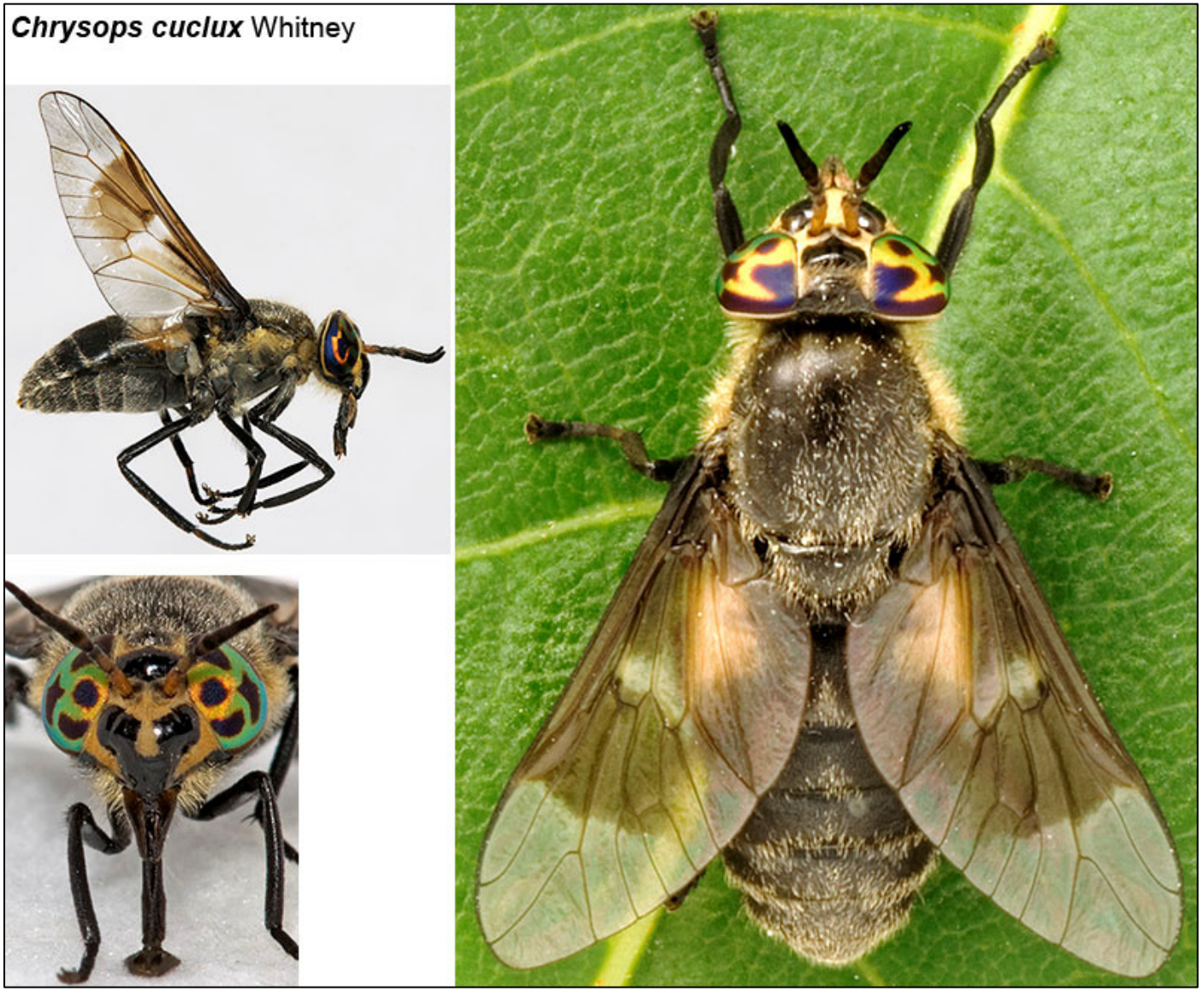
Back to Checklist. Back to *Chrysops* key




***Chrysops excitans*** Walker

Length 9-12 mm. Usually readily recognizable by the combination of wing pattern (cells br and bm about two-thirds infuscated, saturate crossband not reaching posterior wing margin, lack of apical spot) and tergite 2 laterally orange-yellow with an inverted black V leaving a large yellow triangle in the midline. However, some individuals superficially resemble *Chrysops dawsoni* in having tergite 2 extensively blackened with the lateral orange yellow patches and the midline triangle reduced.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key

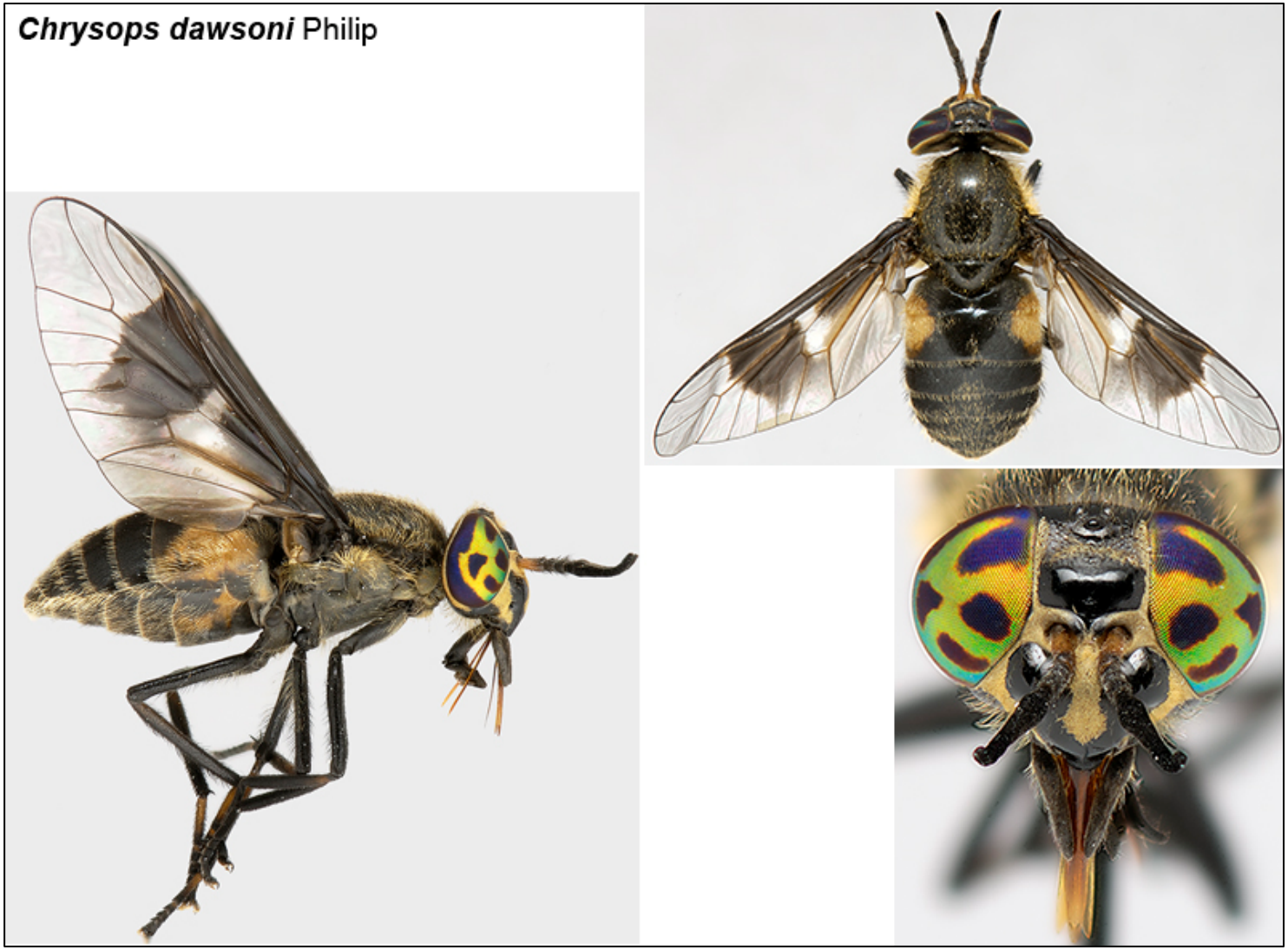



***Chrysops cuclux*** Whitney

Length 7-10mm. Abdomen predominantly black with tergites 1 & 2 narrowly yellow laterally, wing pattern pale.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key




***Chrysops dawsoni*** Philip

Length 7-10mm. Distinguished from *C. excitans* by the absence of a pale triangle in the middle of tergite 2 and the reduced areas of yellow laterally on tergites 1 & 2; and from *C. cuclux* by the saturate crossband.

Variations. Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key


***Chrysops discalis*** Williston

Length 8-11mm. A pale brown western species only likely to be confused with *C. fulvaster* but readily distinguished by characters given in the key.

Abdomen plate. . Face plate. Distribution map.

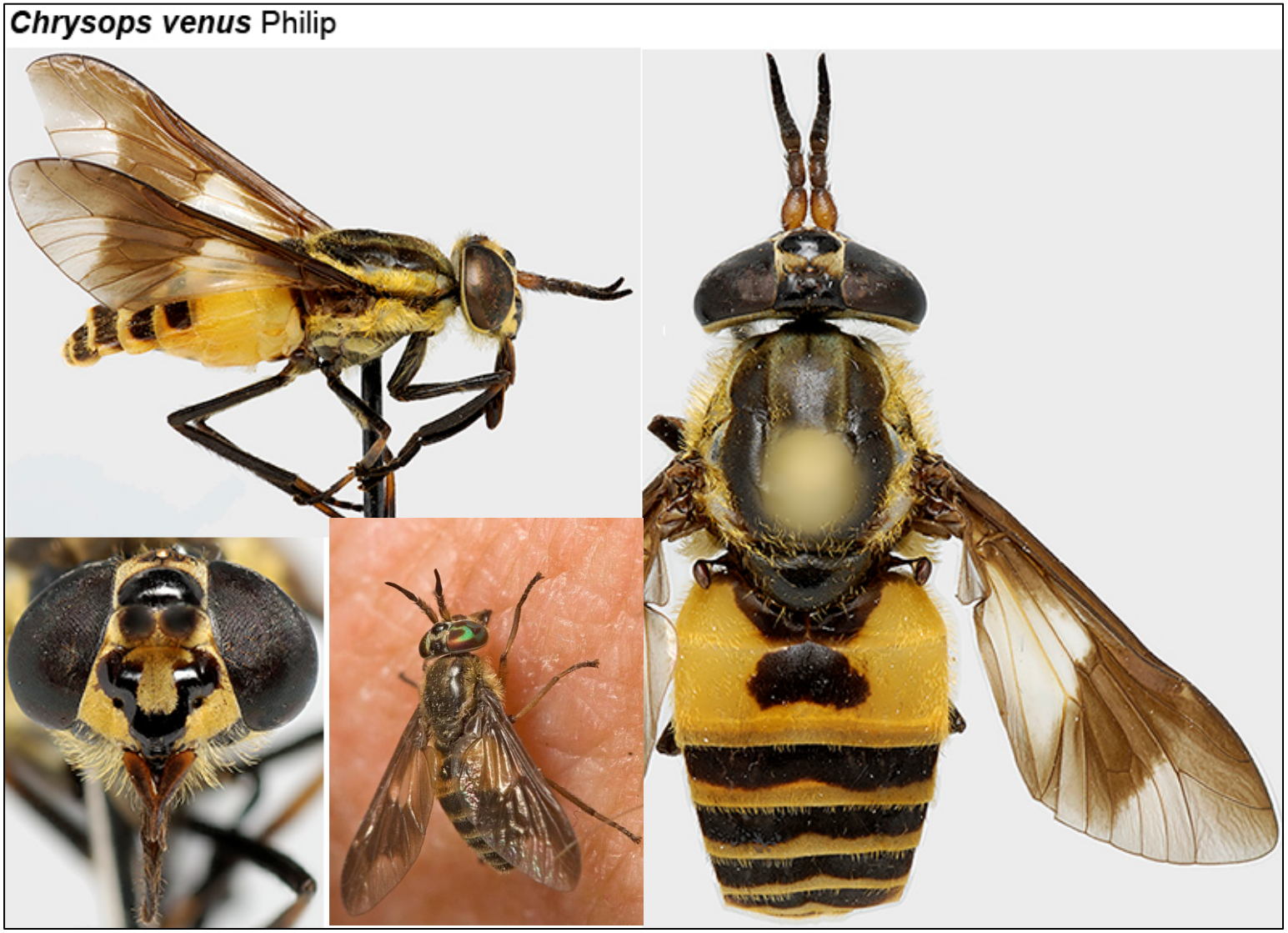
Back to Checklist. Back to *Chrysops* key


***Chrysops fulvaster*** Osten Sacken

Length 6-8mm. A brown western species only likely to be confused with *C. discalis* but readily distinguished by characters given in the key and with the scape more swollen than the other antennal segements.

Abdomen plate. . Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key




***Chrysops venus*** Philip

Length 8-11mm. A brightly coloured black and yellow species that was confused with *C. frigidus* before its description in 1950, but larger, brighter, and with a prominently banded abdomen and mostly black legs.

Abdomen plate. Face plate. Distribution map.

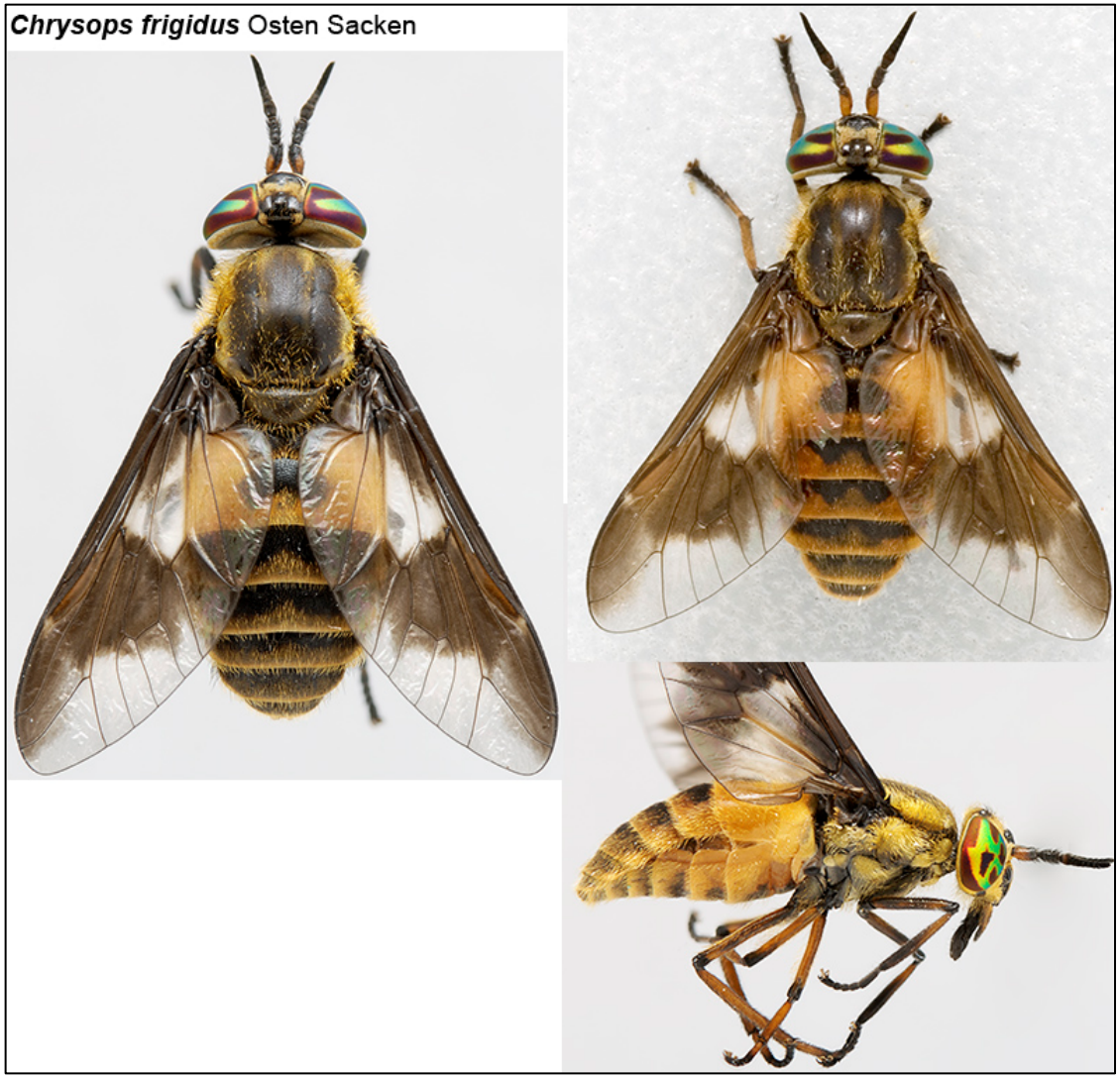
Back to Checklist. Back to *Chrysops* key


***Chrysops nigripes*** Zetterstedt

Length 8-10mm. A northern holarctic species most similar to *C. frigidus* and *C. zinzalus.*

Abdomen plate. Face plate. Distribution map.

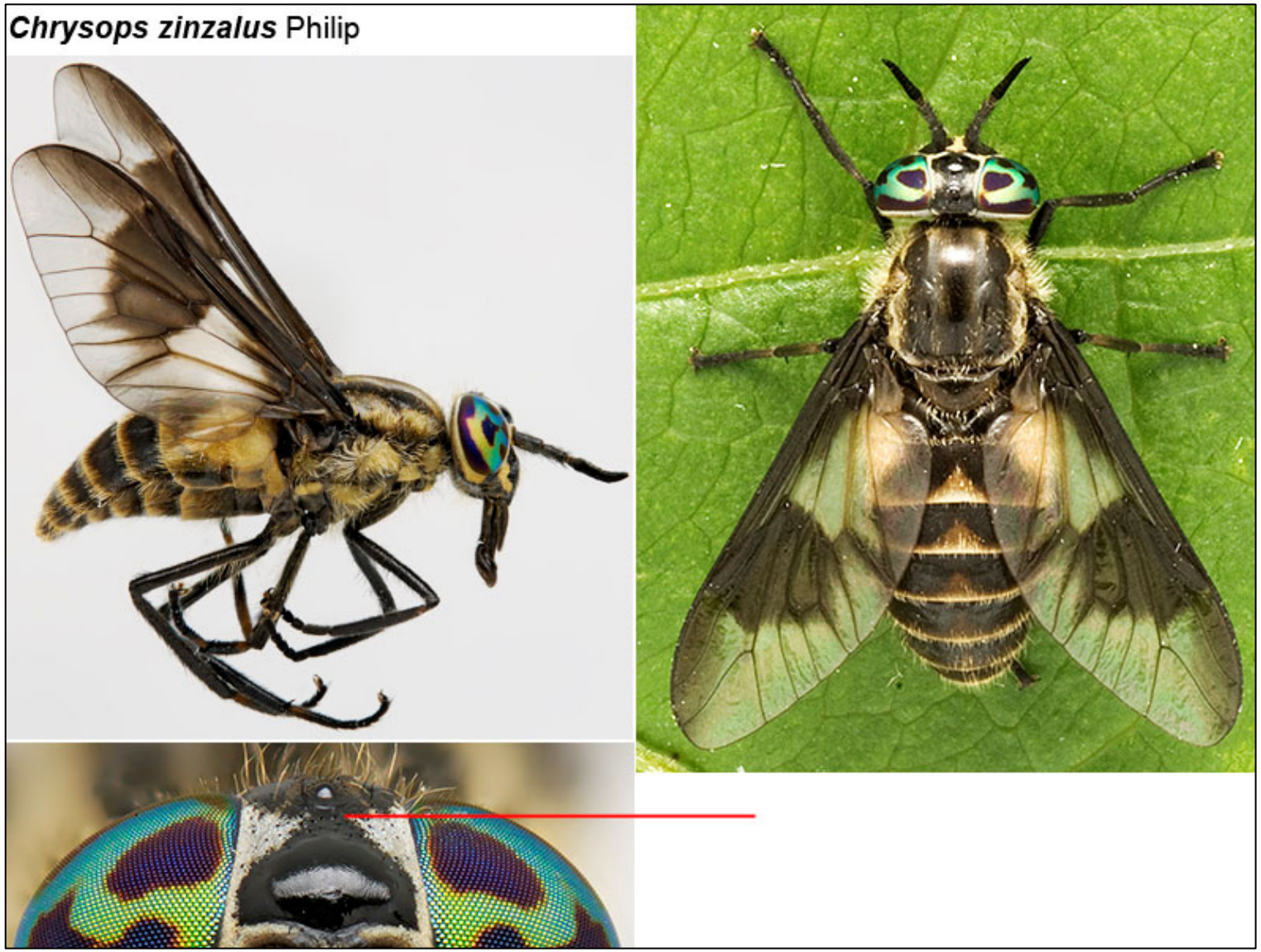
Back to Checklist. Back to *Chrysops* key




***Chrysops frigidus*** Osten Sacken

Length 6-9mm. Abdomen colour ranges from almost completely orange (var. *xanthas* Philip) to almost completely black. Most similar to *C. venus, C. nigripes*, and *C. zinzalus* but can be identified using characters in key.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key




***Chrysops zinzalus*** Philip

Length 7-9mm. Similar to *C. nigripes* but reliably separated from that species by wing pattern and the glossy frontal callus connected to the ocellar prominence.

Variations. Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key

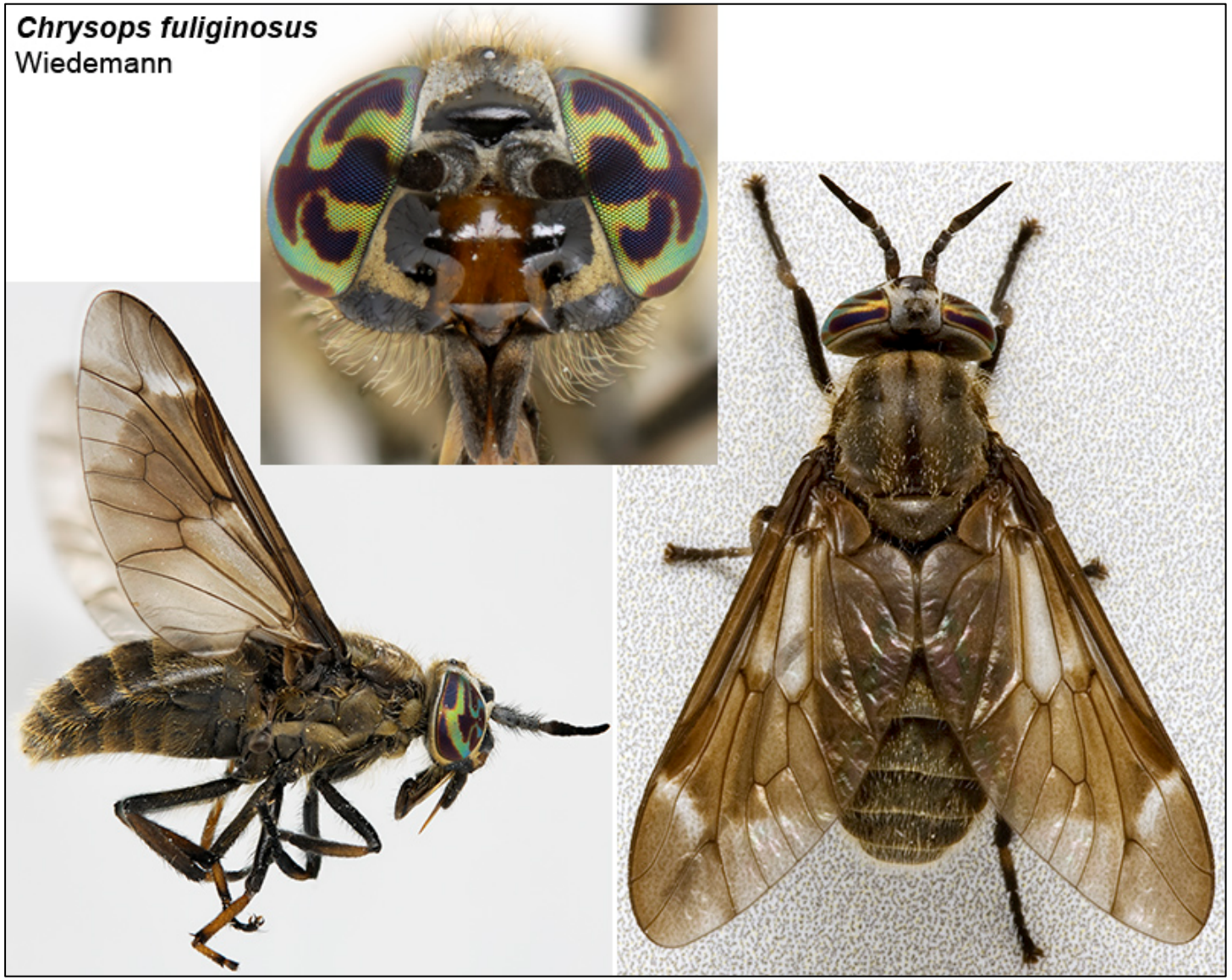
**_Chrysops shermani_** Hine

**_Chrysops shermani_** Hine

Length 7-10mm. The combination of fenestrate wing pattern and striped abdomen are diagnostic.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key

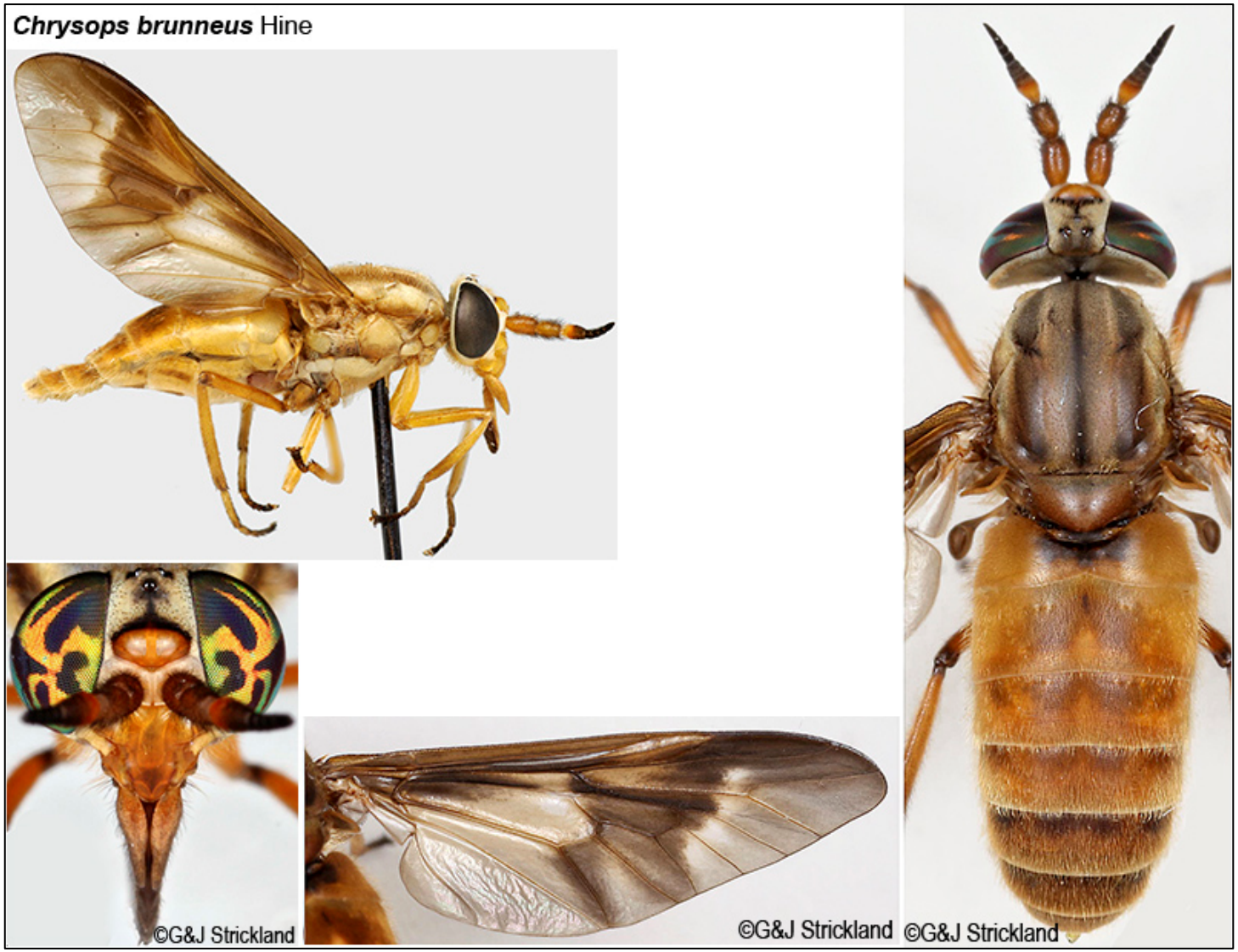



***Chrysops fuliginosus*** Wiedemann

Length 6-8mm. Unlikely to be confused with any other species due to its dull colouration and its Atlantic coastal salt marsh habitat.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key

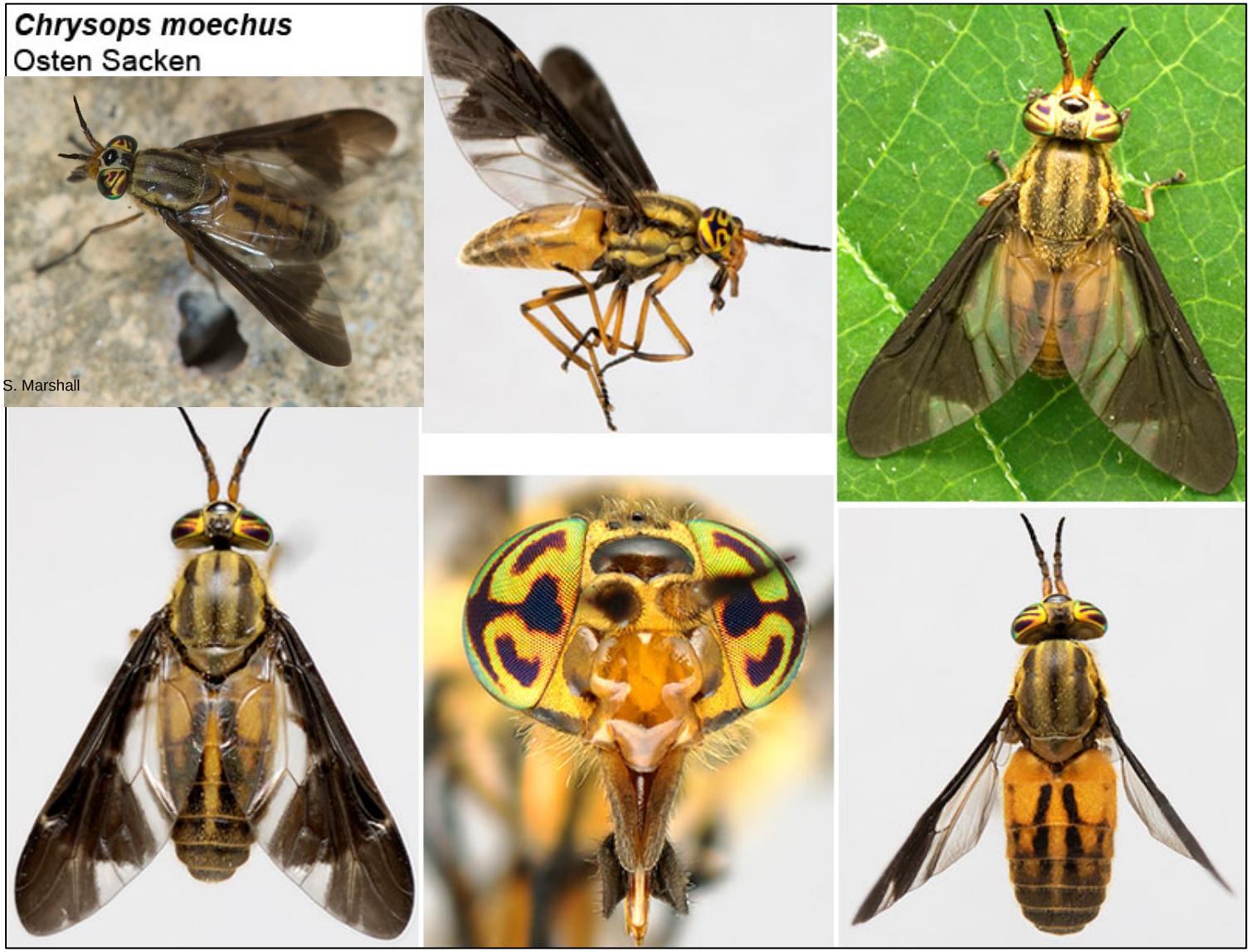



***Chrysops brunneus*** Hine

Length 8-11mm. Distinctive owing to yellowish brown colouration and swollen basal antennal segments. The only similar Canadian species are the western *C. fulvaster, C. flavidus* and *C. celatus* which are all separable by wing pattern.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key




***Chrysops moechus*** Osten Sacken

Length 7-8mm. Wings heavily infuscated with hyaline triangle truly triangular. *C. macquarti* is similar but with hyaline triangle more extensive.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops indus*** Osten Sacken

Length 7-10mm. The orange face, apical spot filling half of cell r4, dark scutellum and unstriped abdomen should make this species recognizable.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops striatus*** Osten Sacken

Length 7-10mm. A striped-abdomen species similar to *C. aberrans* but with a smaller apical spot, the central black abdominal stripes joined on the 2nd tergite, the sublateral abdominal stripes paler than the submedian stripes, and the frontal callus usually black.

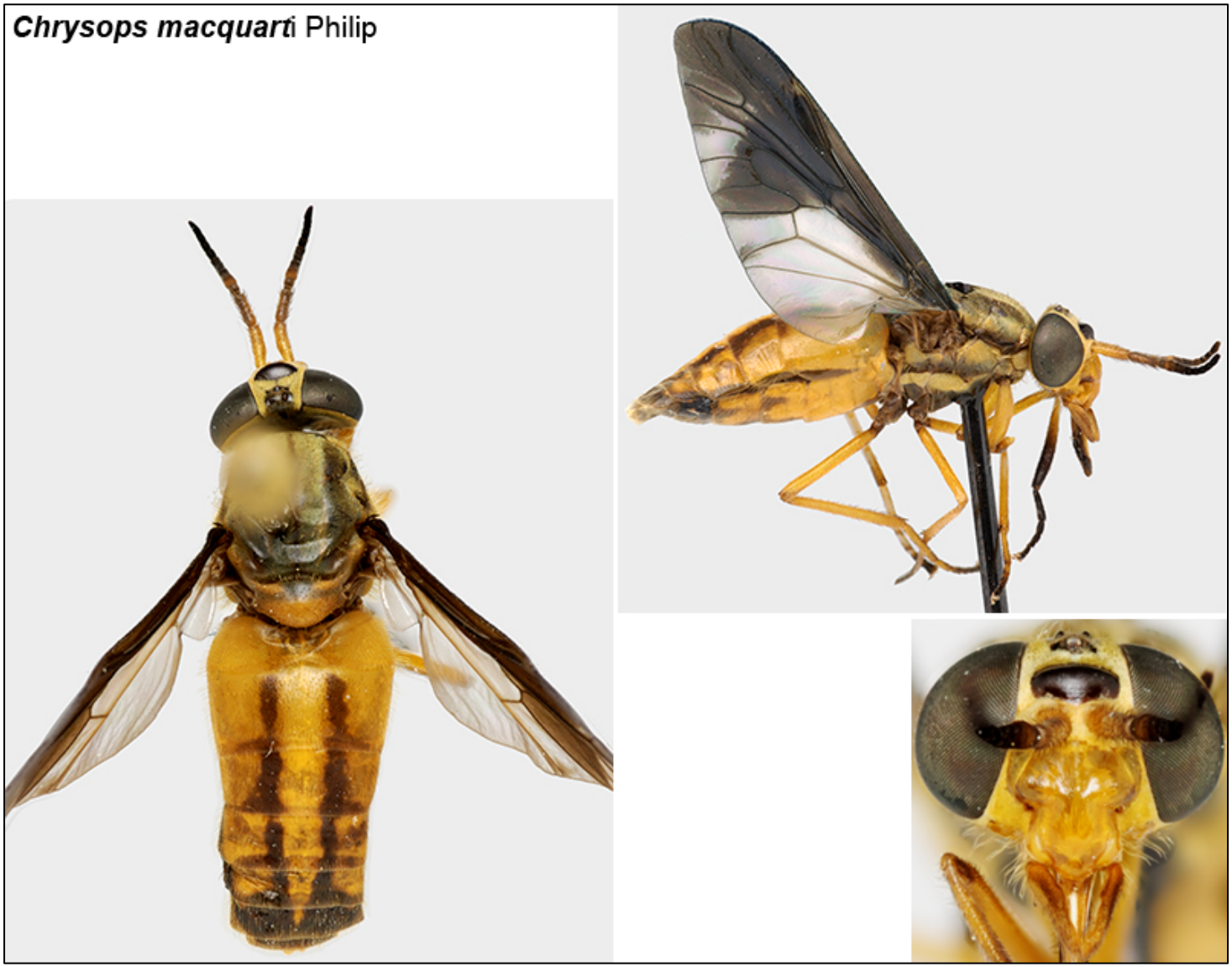
Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops pikei*** Whitney

Length 6-8mm. The 2 bold dark submedian abdominal stripes, yellow face lacking a pruinose stripe, fully infuscated wing cell br, extensive hyaline triangle, and restricted distribution should readily differentiate this species.

Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key




***Chrysops macquarti*** Philip

Length 6-8mm. 2 dark submedian abdominal stripes but tergite 1 mostly yellow, scutellum with at least apex yellow, and wing heavily infuscated.

Abdomen plate. · Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key


***Chrysops vittatus*** Wiedemann

Length 7-10mm. A common and aggressive species from southern Ontario to the Maritmes.

Variations. Abdomen plate. Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key


***Chrysops aberrans*** Philip

Length 7-9mm. Superficially similar to *C. striatus* but differing in having a slightly larger apical spot, sublateral stripes as dark as submedian stripes, submedian stripes usually not connected on tergite 2, and the frontal callus usually yellow.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops luteopennis*** Philip
Length 8mm. A very rare species known from only 5 localities, including 3 Canadian localities (both in Ontario). Teskey (1990) described wing cell br as fully pigmented and keyed this species on this basis. However, Teskey's (1990) wing photo shows cell br with only about the basal one-third infuscated as does the wing image in Pechuman et al. (1983). A combination of the pale wing pattern, discal cell only half infuscated and body pattern does allow for recognition of this species.

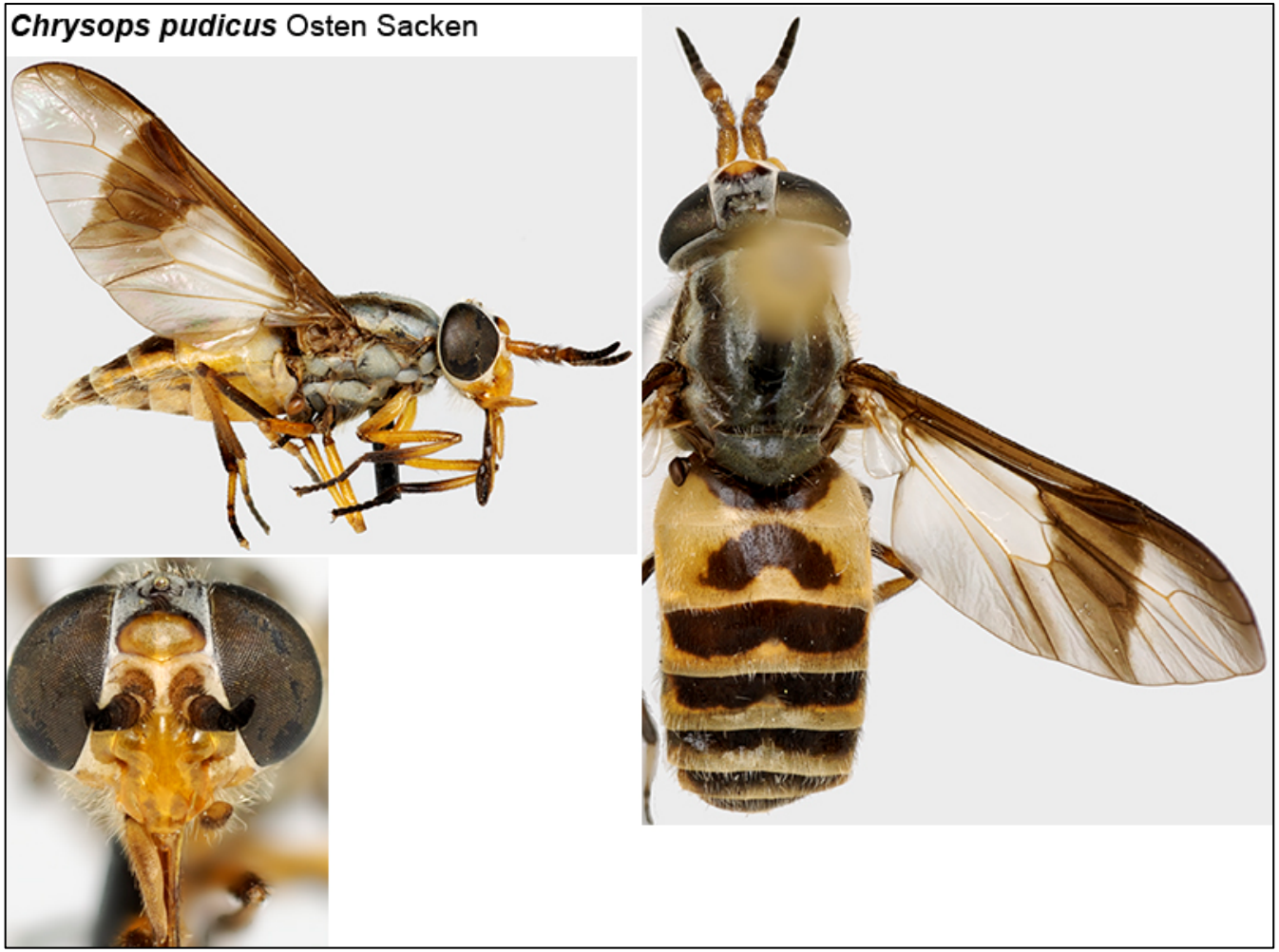
Abdomen plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops sackeni*** Hine

Length 8-11mm. Similar to *C. callidus* but usually separable by the extent of the hyaline triangle (Key couplet 28). The frontal callus is partly yellow or brown and about two-thirds as high as wide.

Abdomen plate. Face plate. Distribution map.

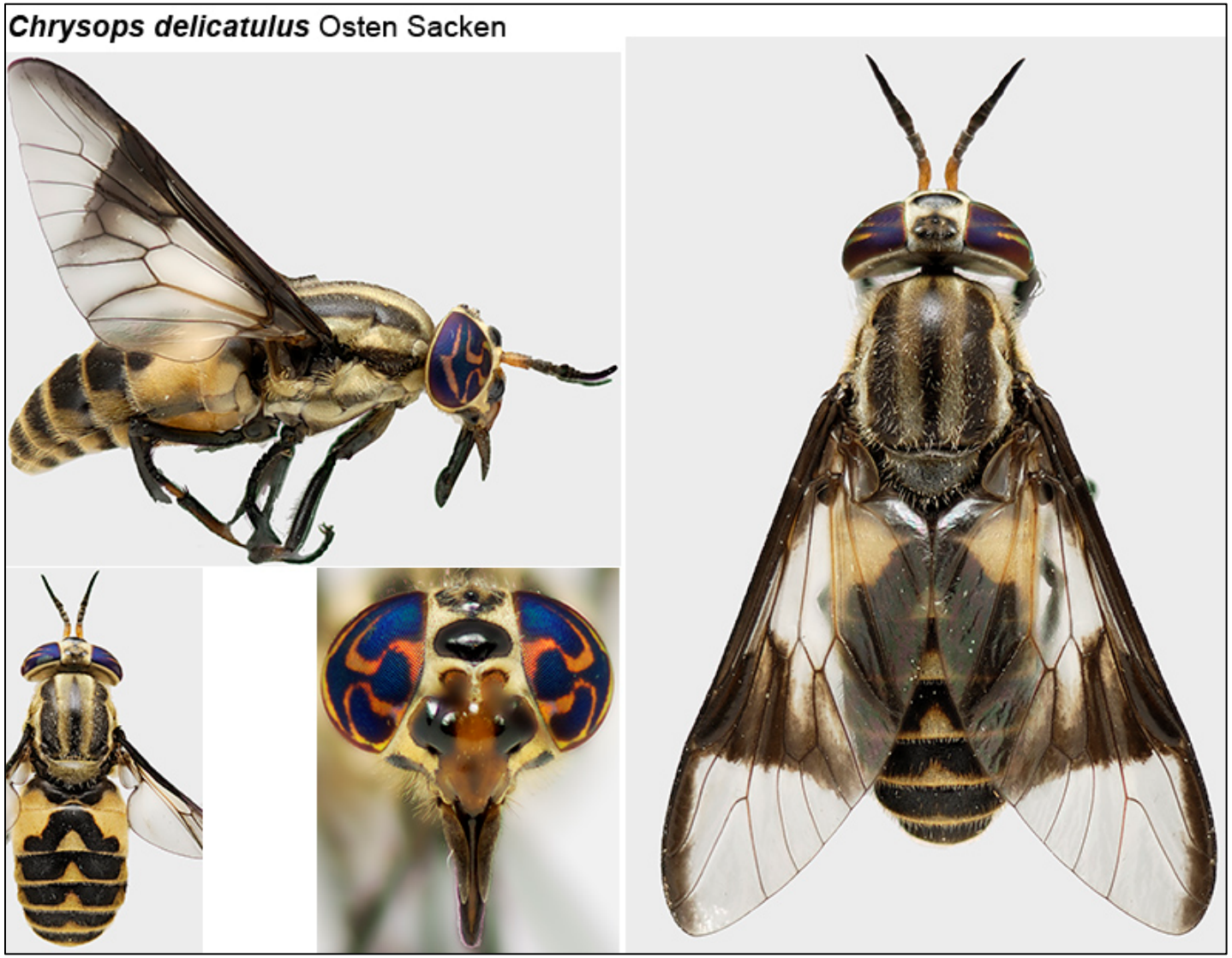
Back to Checklist. Back to *Chrysops* key




***Chrysops pudicus*** Osten Sacken

Length 6-8mm. Keys to same couplet as *C. sackeni* but distinctly different in abdominal pattern. The main stronghold of this species is the SE USA but it extends discontinuously north along the Atlantic coast to one locality in southwest Nova Scotia. This species is otherwise known in Canada from two Ontario localities (one newly reported here). *Chrysops pudicus* is part of the *C. flavidus* group, revised by Baier (1999).

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key




***Chrysops delicatulus*** Osten Sacken

Length 7-9mm. The narrow apical spot and mostly hyaline discal cell makes this species distinctive. A rarely collected species ranging from southwestern Ontario to southwestern Nova Scotia.

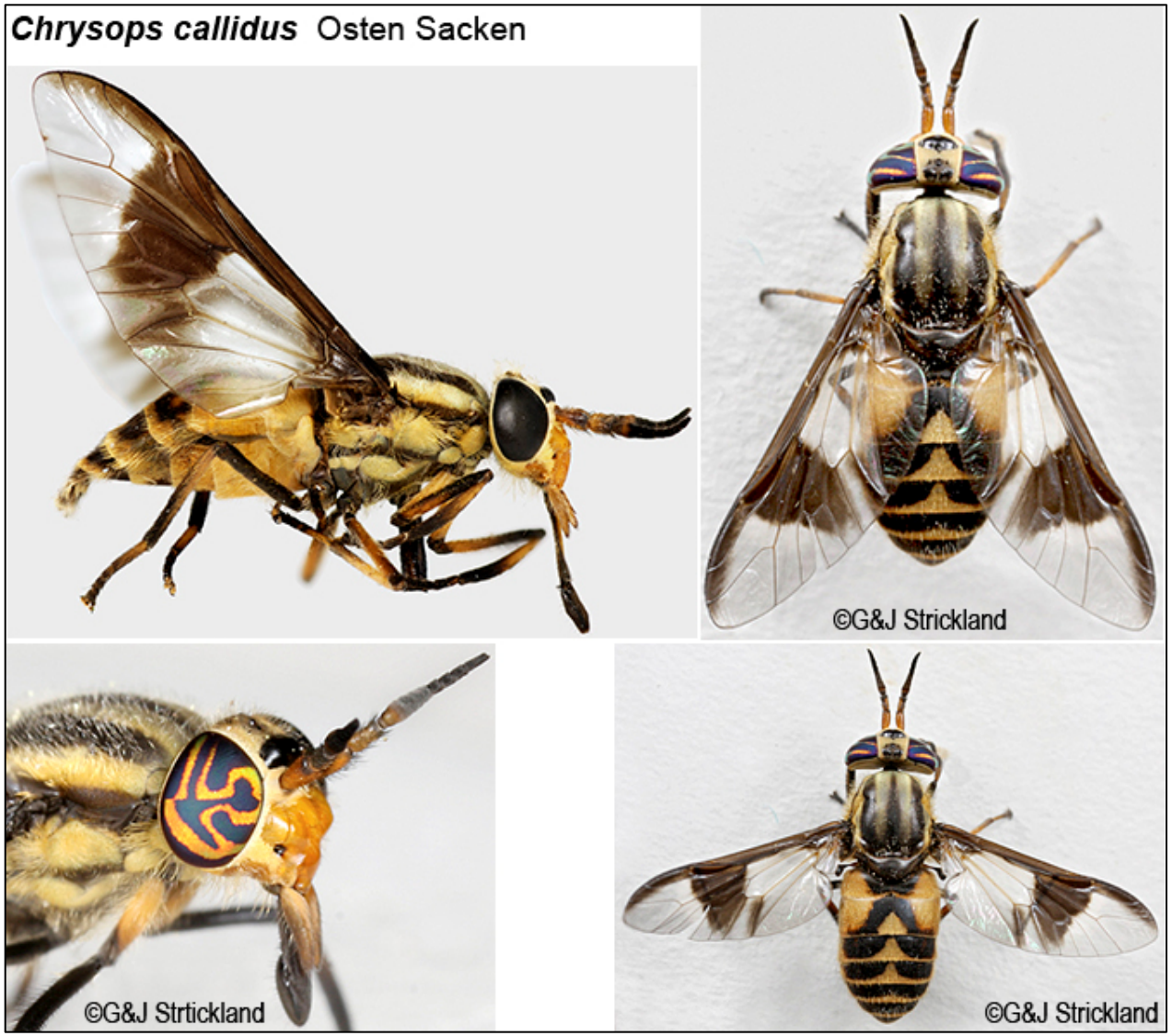
Abdomen plate. · Face plate. Distribution map.

Back to Checklist. Back to *Chrysops* key


***Chrysops aestuans*** Van der Wulp

Length 8-10mm. A black and gray/pale yellow species with a very narrow apical spot. There are differences in leg and ventral abdominal color between the disjunct eastern and western populations, with the eastern populations mostly black and the western ones extensively yellow. East of the Great Lakes *C. aestuans* is associated with large bodies of water; in the west with several types of wet habitats (Teskey 1990).

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key

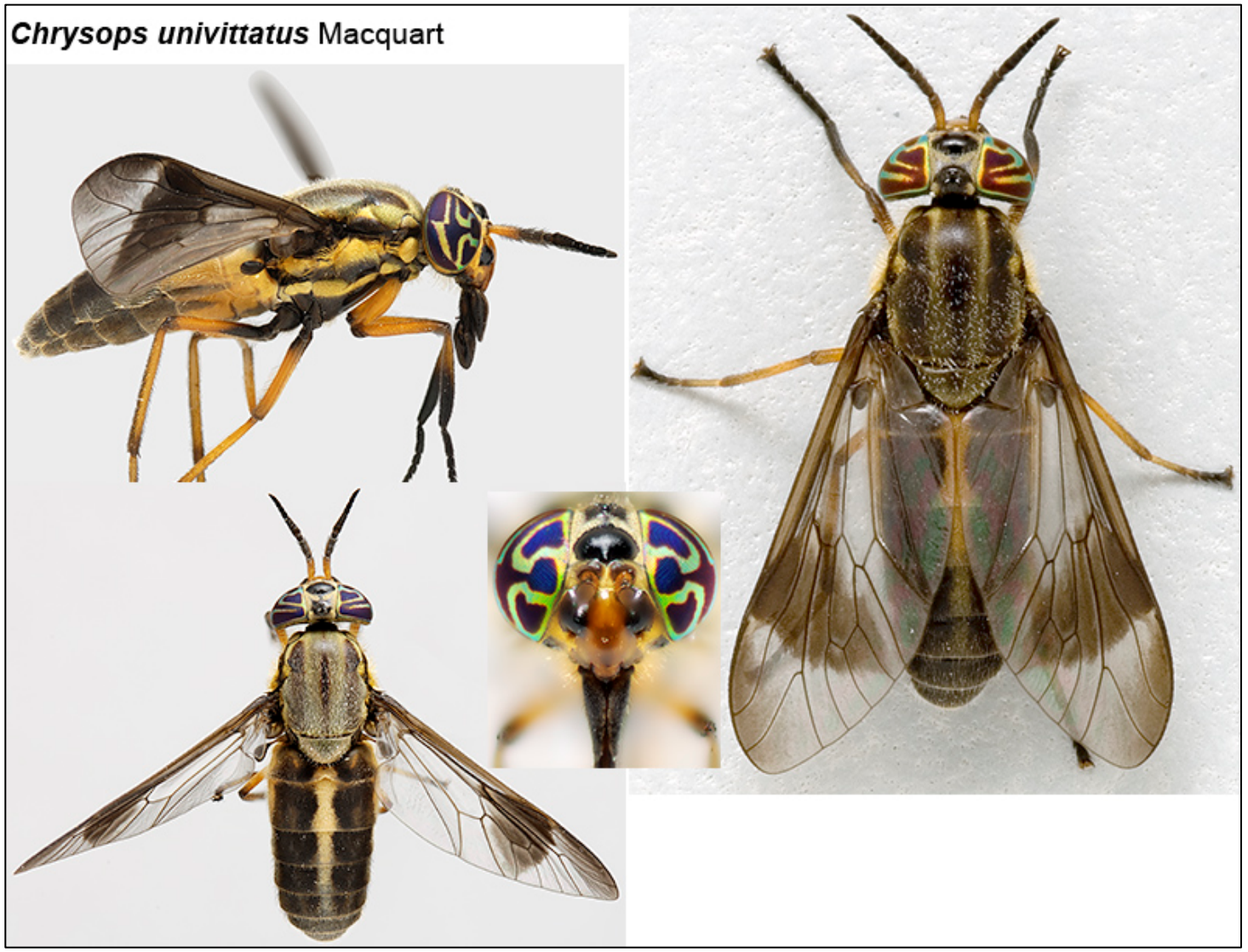



***Chrysops callidus*** Osten Sacken

Length 7-9mm. A black and yellow species with wing and abdomen patterns similar to *C. sackeni* but usually separable by the extent of the hyaline triangle (Key couplet 28). Frontal callus usually black and about half as high as wide.

Abdomen plate. Face plate. Distribution map

Back to Checklist. Back to *Chrysops* key




***Chrysops univittatus*** Macquart

Length 5-8mm. Small black or dark brown species with a median yellowish stripe. Rarely there may be a distinct yellow stripe either side of the median stripe, or the median stripe may be greatly reduced; wing pattern is distinctive.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops geminatus*** Wiedemann

Length 5-8mm. A small black and yellow species with abdominal markings not in the form of stripes. Apical spot widened apically and not connected to crossband. Black inverted V on 2nd tergite sometimes reduced to a vague shadow. In Canada in extreme SW Ontario and southern Quebec.

Abdomen plate. Face plate. Distribution map

Back to Checklist. Back to *Chrysops* key

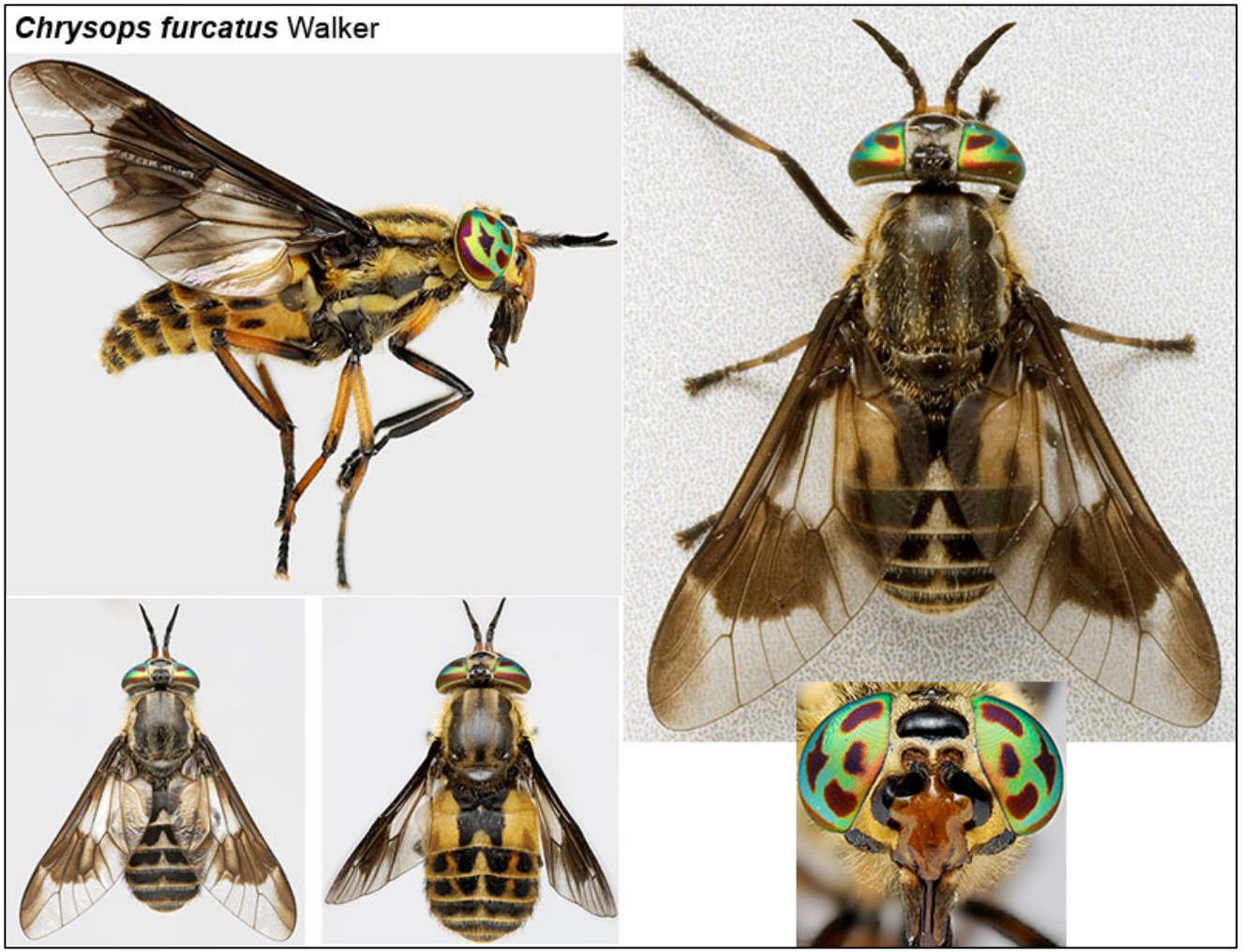
**_Chrysops impunctus_** Krober

**_Chrysops impunctus_** Krober
Length: 5-8mm. Treated in Teskey (1990) as a var. of *C. geminatus* but Burger (1995) listed it as a distinct species. Apical spot and crossband slightly more extensive than *C. geminatus*; 1st and 2nd tergites yellow. In Canada known only from the type locality of Port Stanley, Ontario.

Abdomen plate. Distribution map. Back to Checklist Back to *Chrysops* key


***Chrysops lateralis*** Wiedemann
Length 8-10mm. A black and yellow species with a median yellow stripe on the tergites. Often abundant and pestiferous.

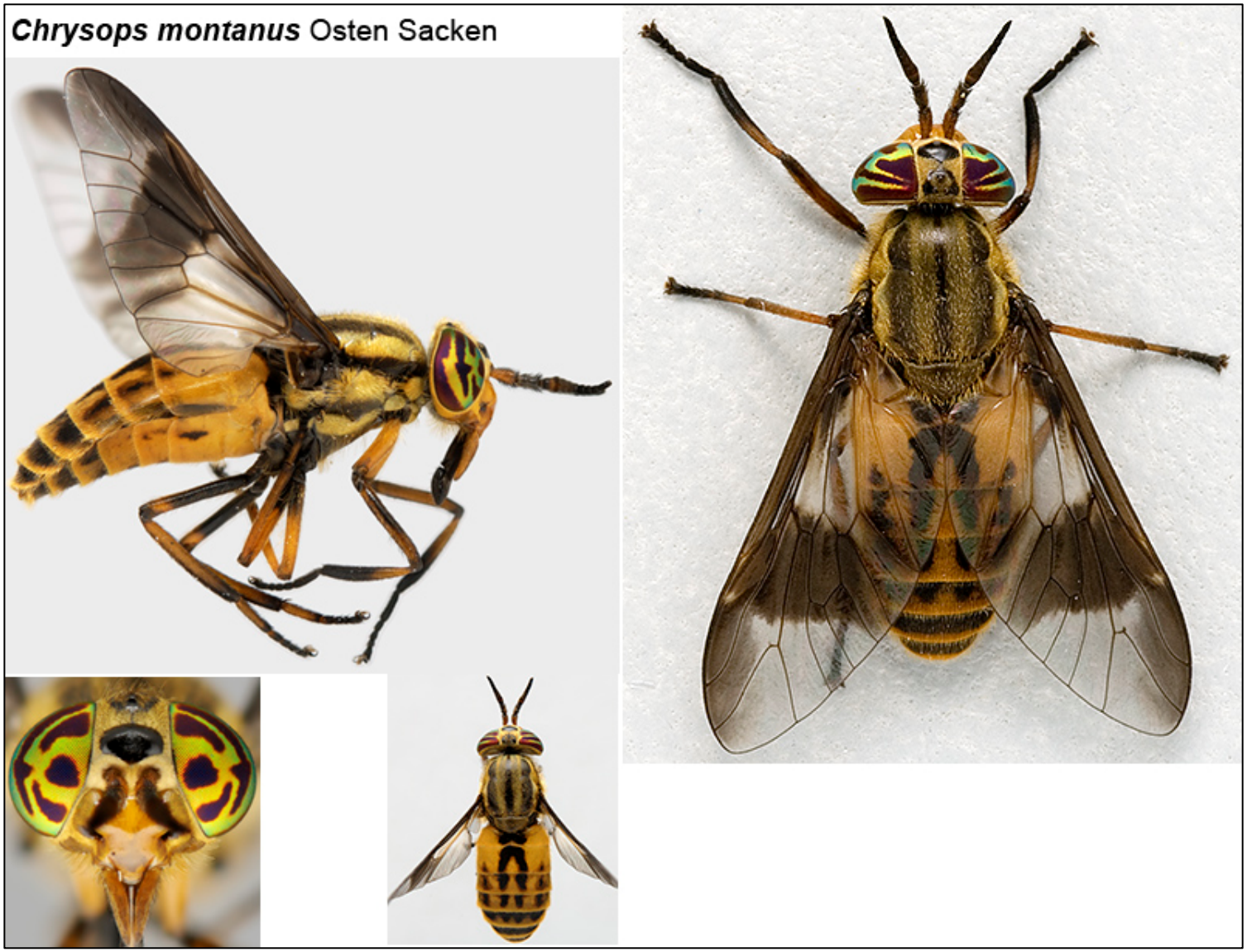
Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key




***Chrysops furcatus*** Walker

Length 7-10mm. Best identified by the combination of wing, face and pattern on the first two tergites. Central black area of tergite 1 joined to parallel-sided median geminate mark on tergite enclosing a median pale triangle. Rest of abdomen variable: tergite 2 may have black sublateral marks of varying size and density but often just yellow; tergites 3-5 can vary in the amounts of black and yellow.

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key

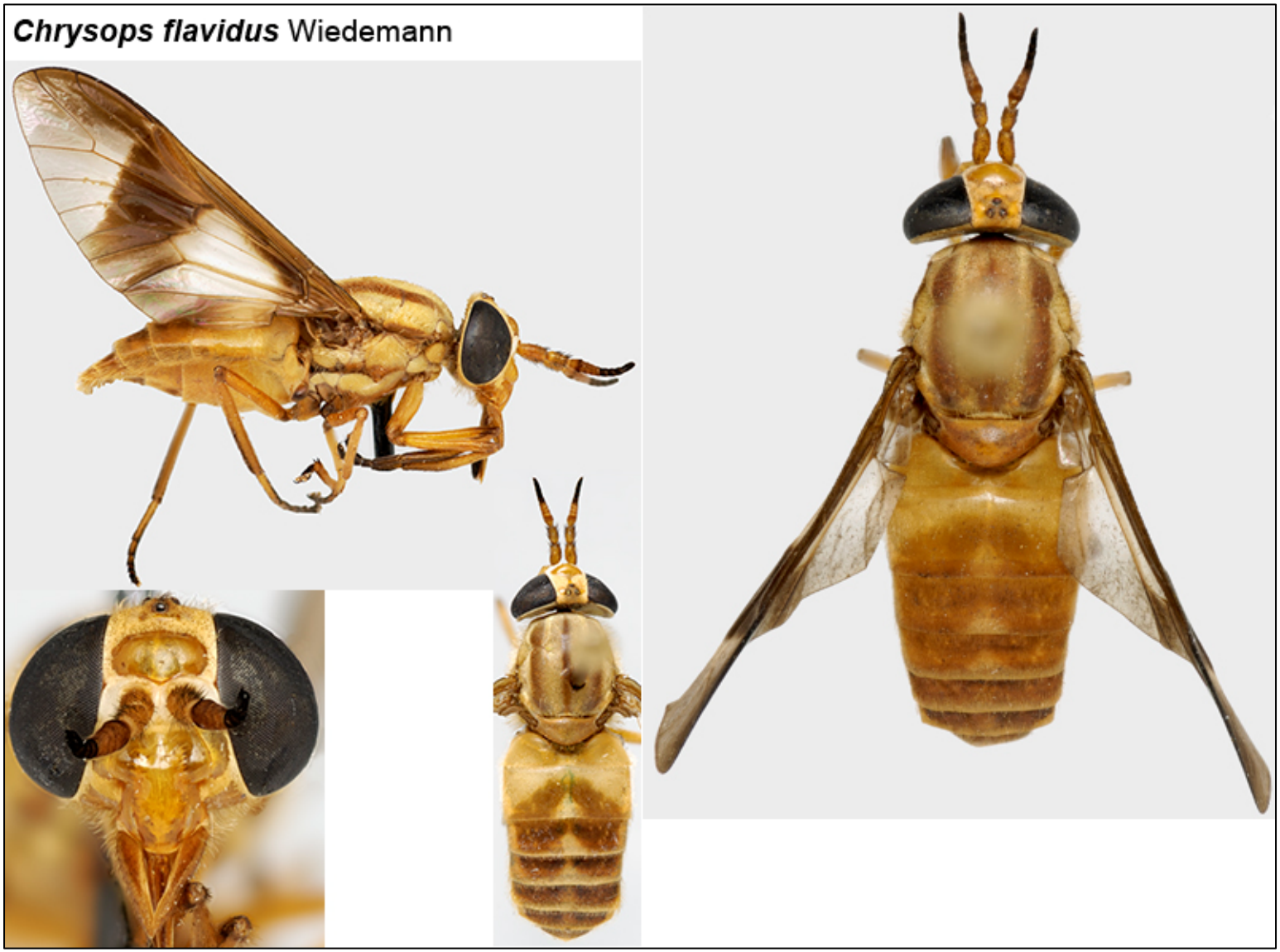



***Chrysops montanus*** Osten Sacken

Length 8-10mm. Similar to some forms of *C. furcatus* but distinguished by the yellow facial callus (black in *C. furcatus*).

Abdomen plate. Face plate. Distribution map

Back to Checklist. Back to *Chrysops* key




***Chrysops flavidus*** Wiedemann

Length 8-10mm. This species and *C. celatus* are almost identical and each reaches its northern limit in extreme southwestern Ontario. See key couplet 39 for identifying characters. Body colouring similar to *C. brunneus* (see key couplet 19). Part of the *C. flavidus* group, revised by Baier (1999).

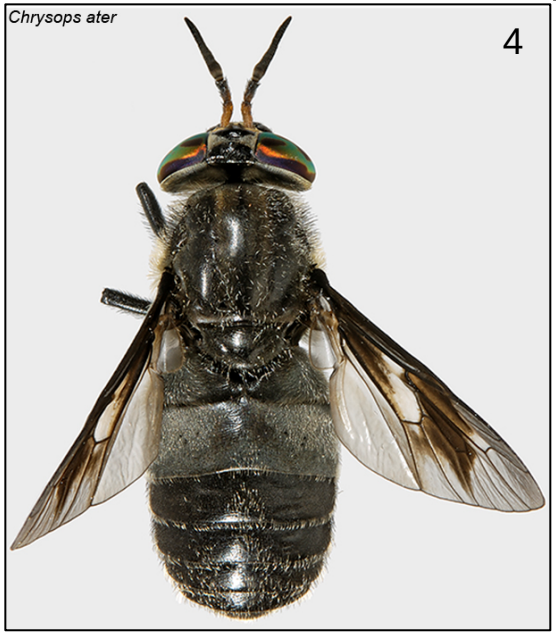
Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key


***Chrysops celatus*** Pechuman

Length 7-10mm. This species and *C. flavidus* are almost identical and each reaches its northern limit in extreme southwestern Ontario. See key couplet 39 for identifying characters. Body colouring similar to *C. brunneus* (see key couplet 19). Part of the *C. flavidus* group, revised by Baier (1999).

Variations. Abdomen plate. Face plate. Distribution map.
Back to Checklist. Back to *Chrysops* key



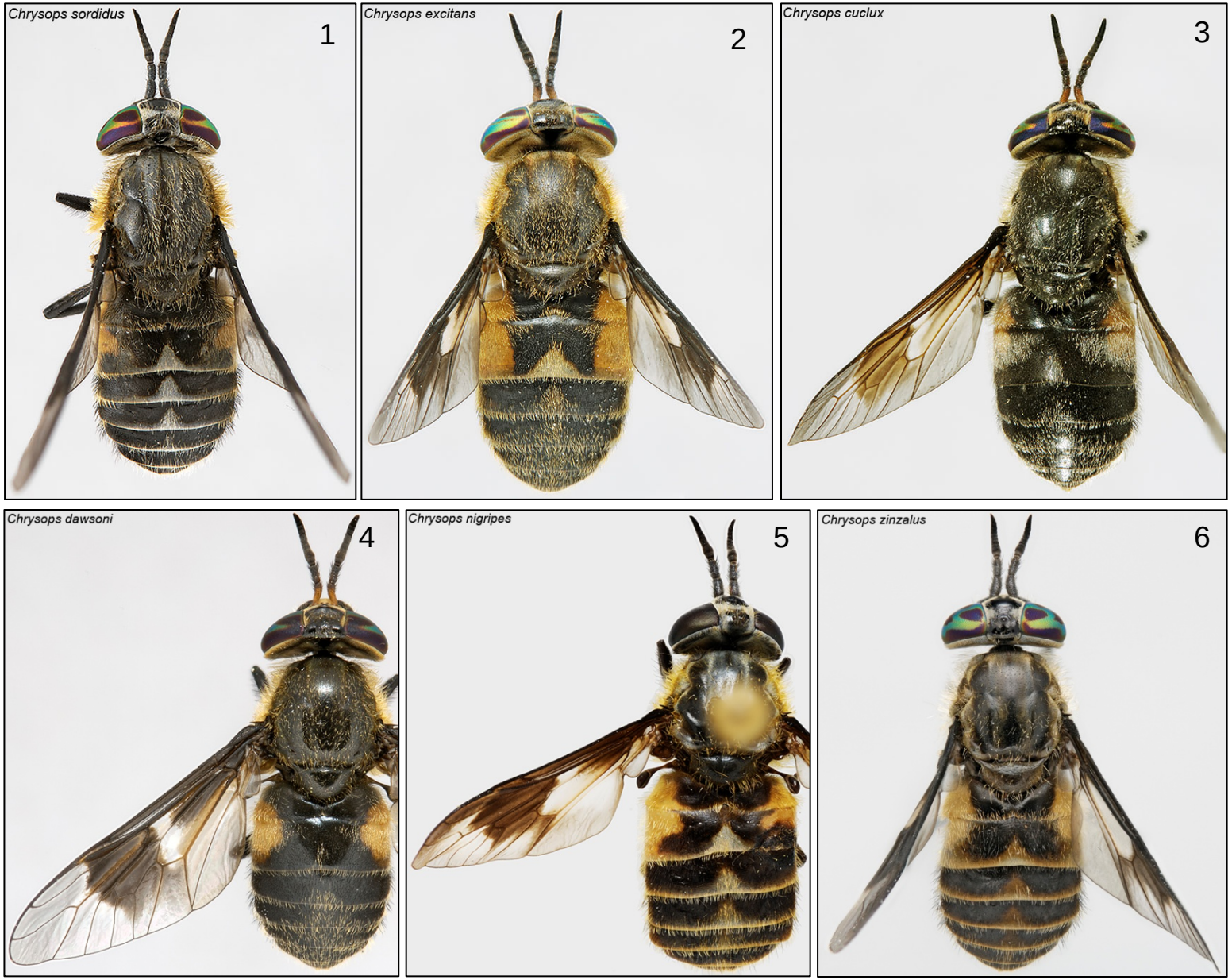






Black *Chrysops* spp. 1: *calvus*; 2: *niger*; 3: *carbonarius*; 4: *ater*; 5: *mitis*; 6*: cincticornis*.

Click on species name to go back to species page

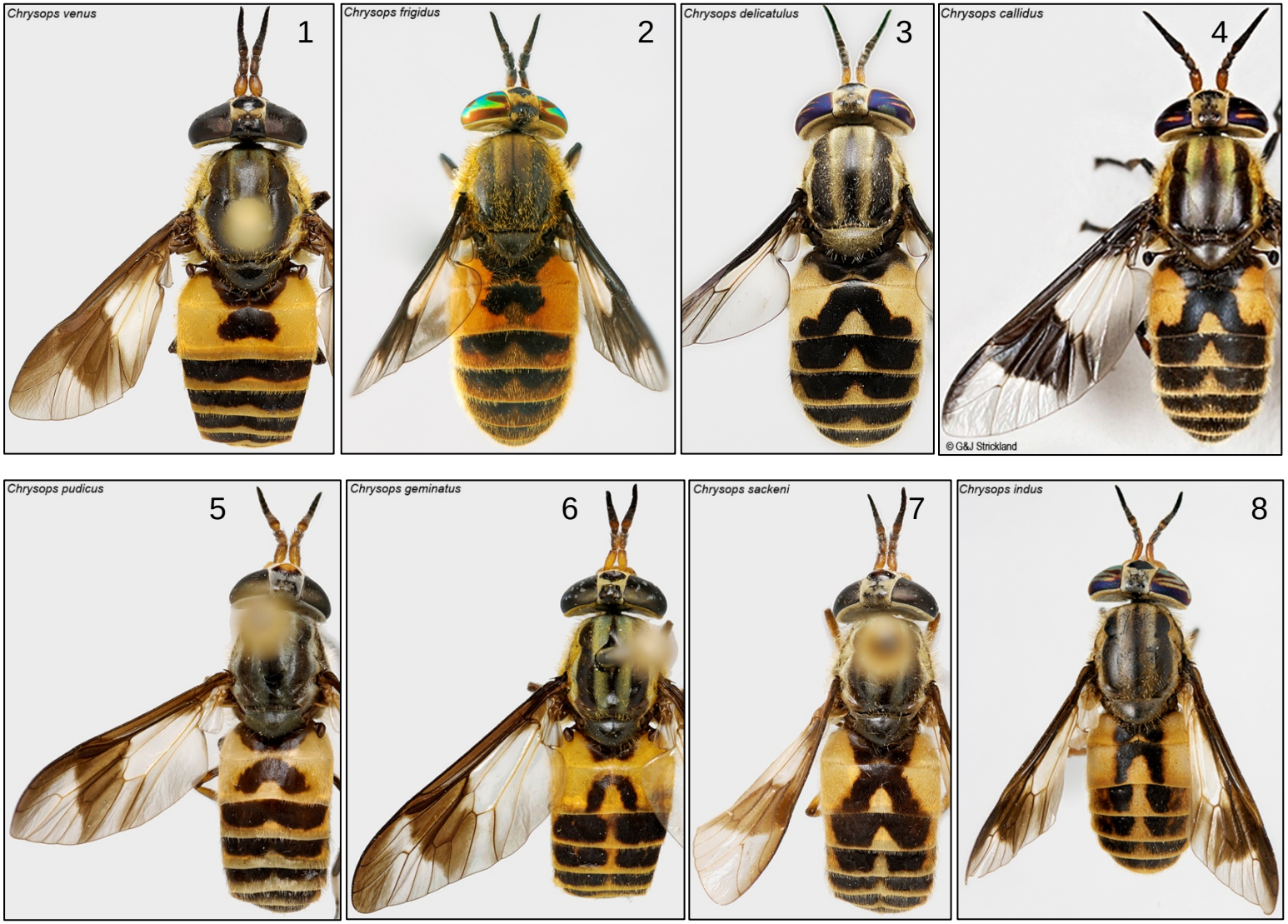
List of plates




Dark *Chrysops* spp. 1: *sordidus*; 2*: excitans*; 3: *cuclux*; 4: *dawsoni*; 5: *nigripes*; 6: *zinzalus.*

Click on species name to go back to species page

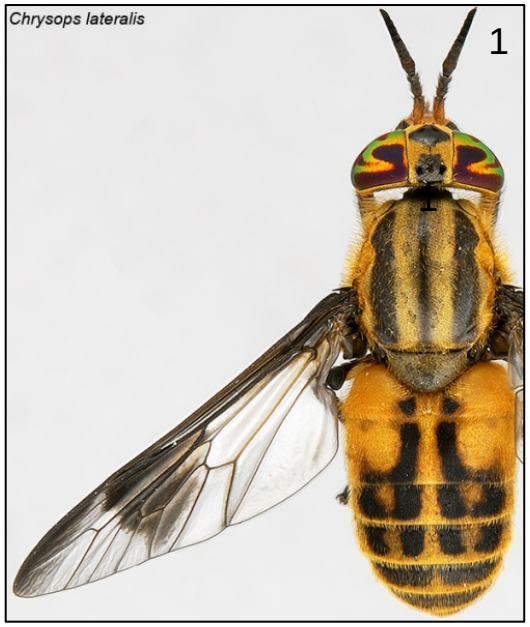
List of plates




Black & yellow, non-striped abdomen *Chrysops* spp. !: *venus*; 2: *frigidus*; 3: *delicatulus*; 4: *callidus*; 5: *pudicus*; 6: *geminatus*; 7: *sackeni*; 8*:* *indus*.

Click on species name to go back to species page

List of plates









Black & yellow *Chrysops* spp. 1: *lateralis*; 2: *pikei*; 3: *furcatus*; 4: *luteopennis*; 5*: impunctus*; 6: *macquarti.*

Click on species name to go back to species page

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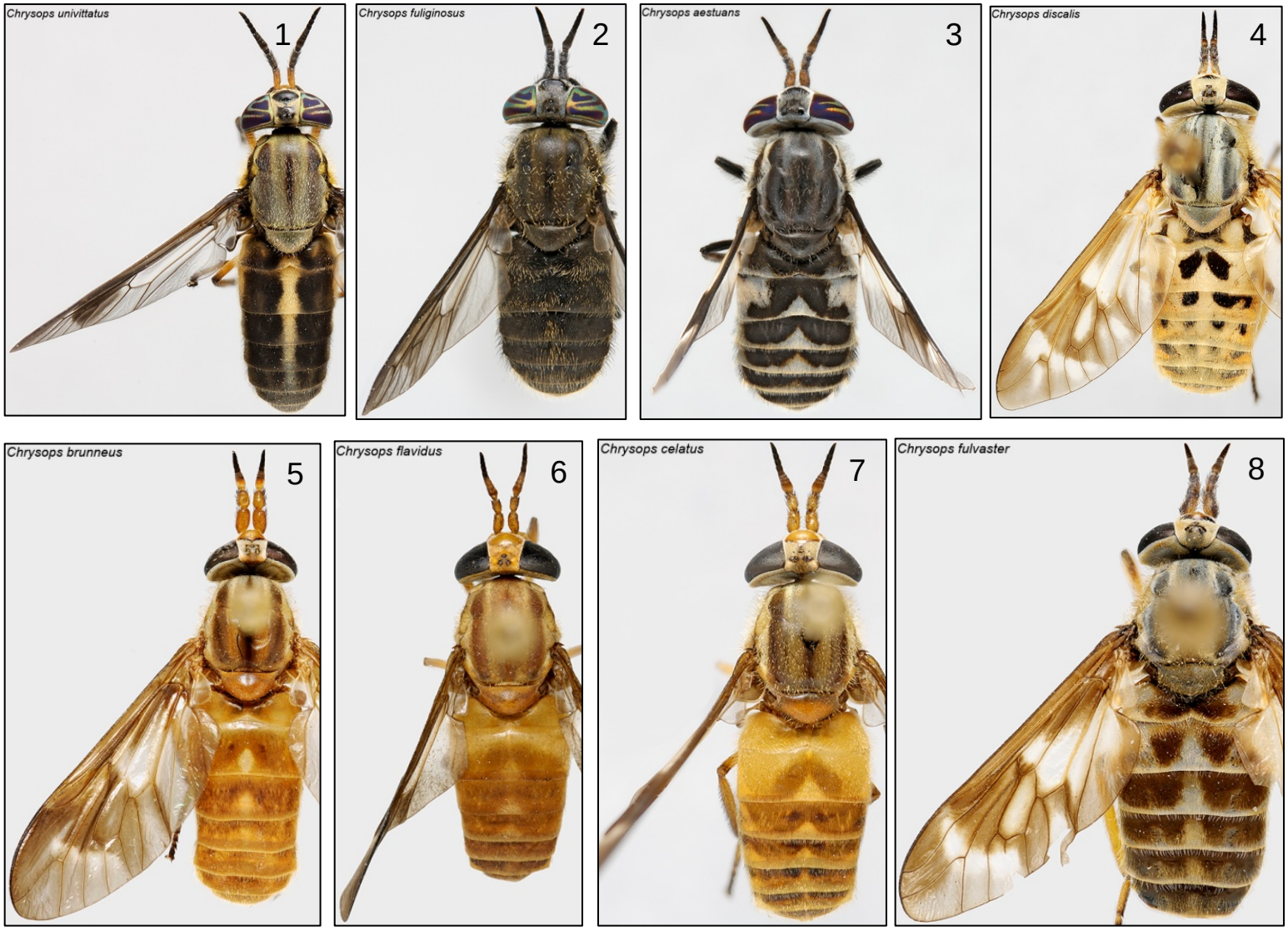


Dark and pale *Chrysops* spp. 1: *univittatus*; 2: *fuliginosus*; 3: *aestuans*; 4: *discalis*; 5: *brunneus*; 6*:* *flavidus*; 7: *celatus*; 8: *fulvaster*.

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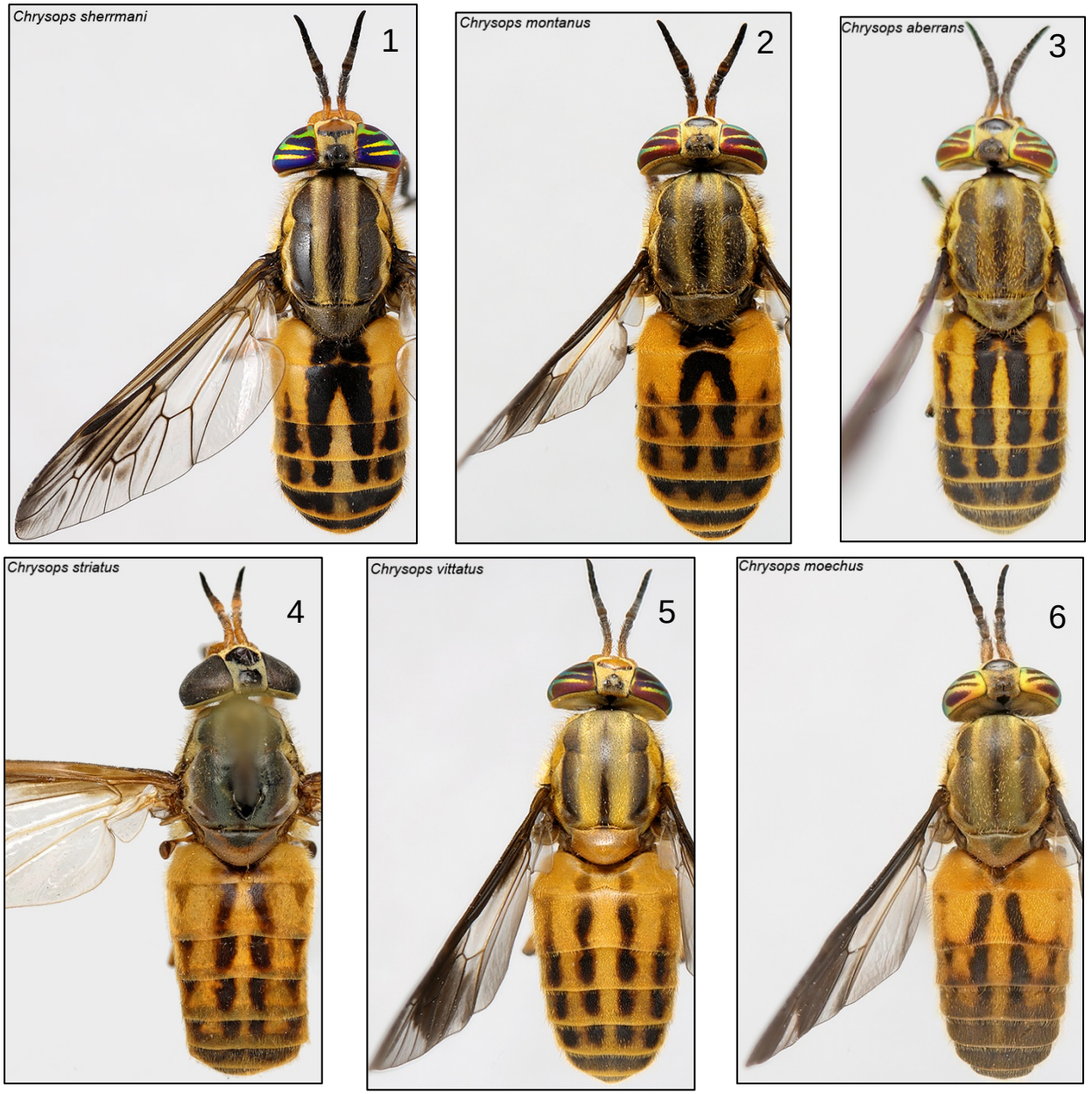


4-striped abdomen *Chrysops* spp. 1: *shermani*; 2: *montanus*; 3: *aberrans*; 4: *striatus*; 5: *vittatus*; 6: *moechus*.

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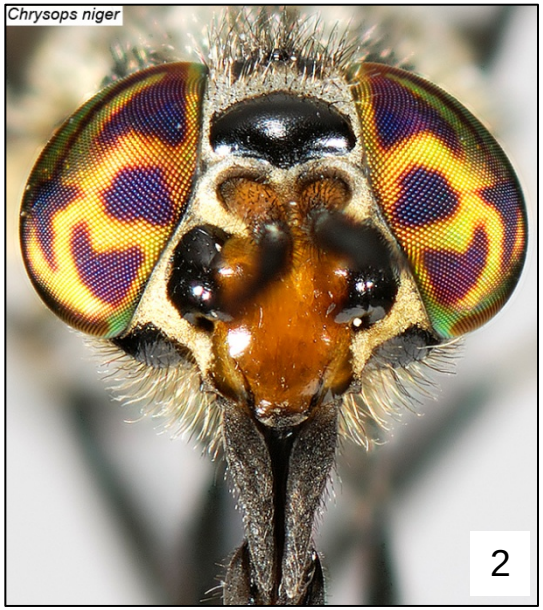



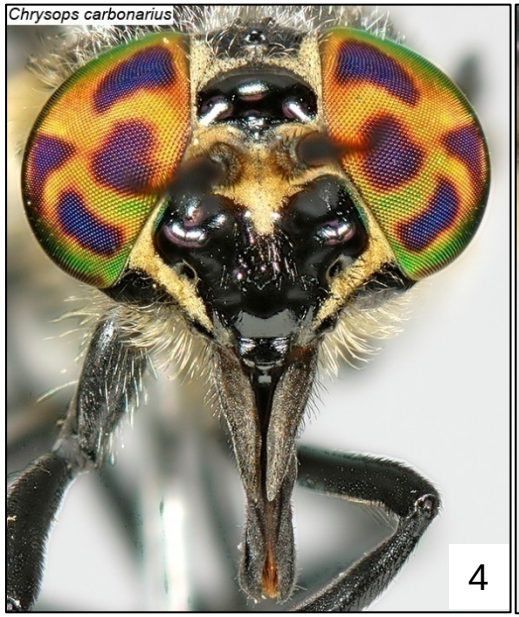


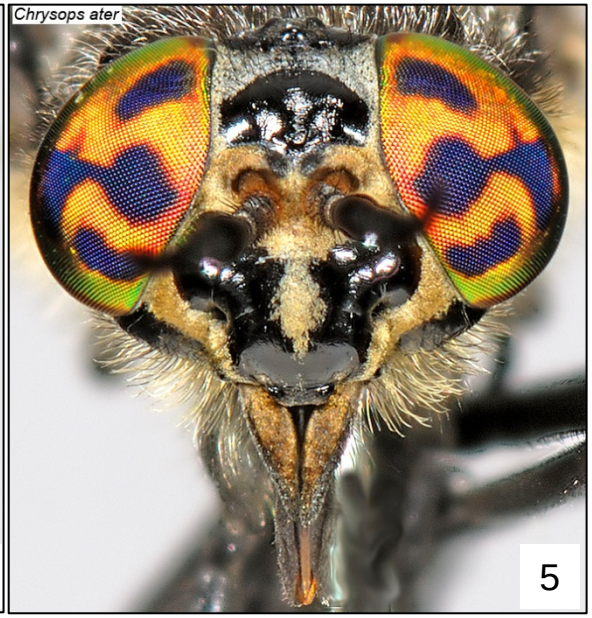



*Chrysops* spp., faces. 1:*calvus*; 2: *niger*; 3: *cincticornis*; 4: *carbonarius* 5*: ater*; 6: *mitis*.
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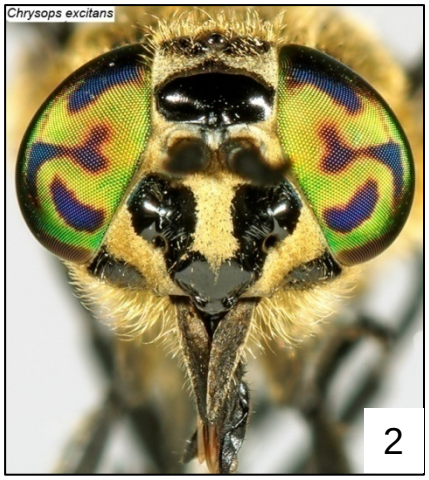


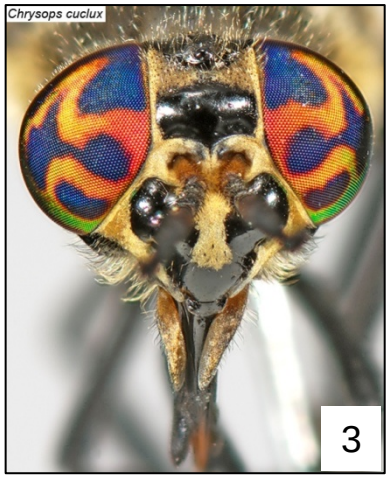



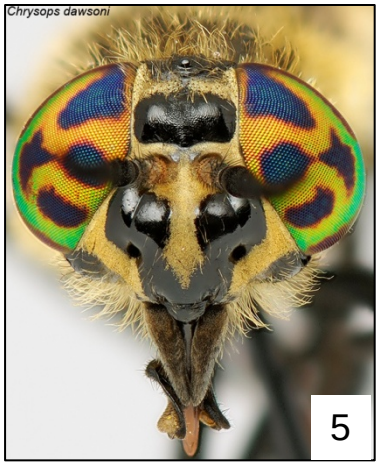


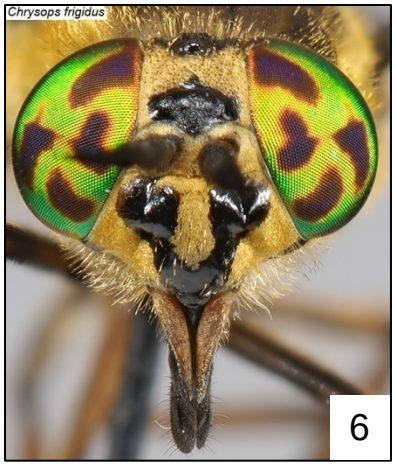




*Chrysops* spp. faces. 1: *sordidus*; 2*:* *excitans*; 3*:* *cuclux*; 4: *nigripes* ; 5: *dawsoni*; 6: *frigidus*; 7: *zinzalus*; 8: *venus*.

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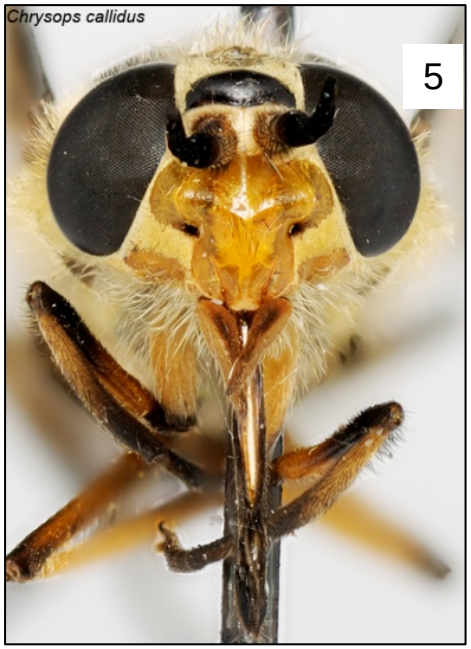


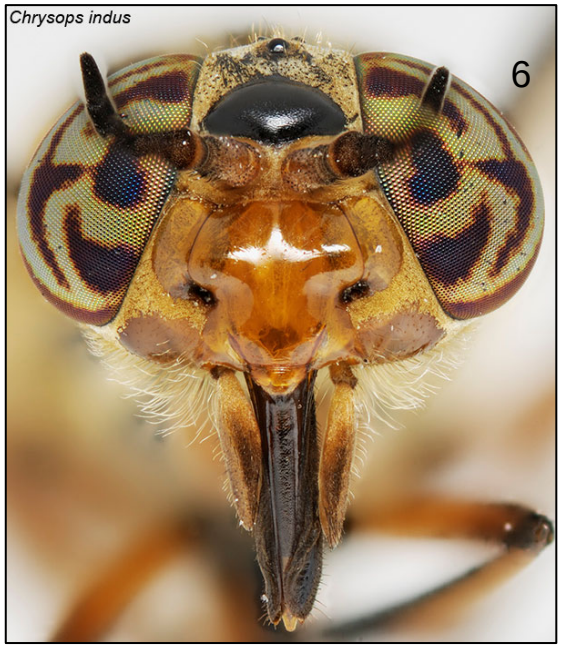


*Chrysops* spp. faces. 1: *delicatulus*; 2: *pudius*; 3: *sackeni*; 4: *geminatus*; 5: *callidus*; 6: *indus*.

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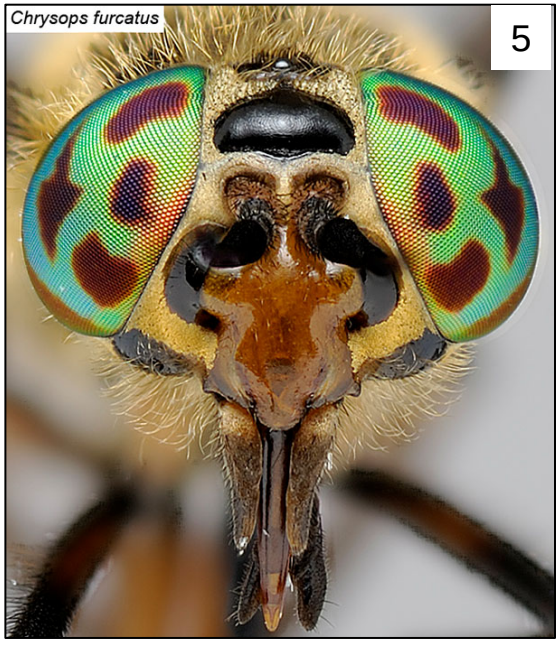



*Chrysops* spp. faces. 1: *lateralis*; 2: *moechus*; 3. *montanus*; 4: *pikei*; 5: *furcatus*; 6: *macquarti*.

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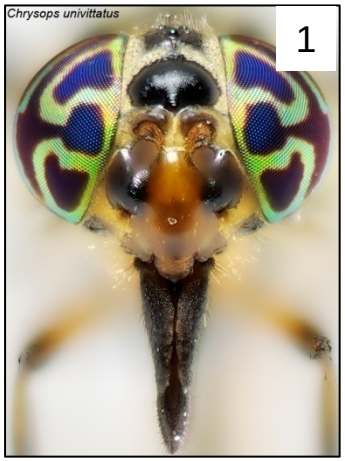


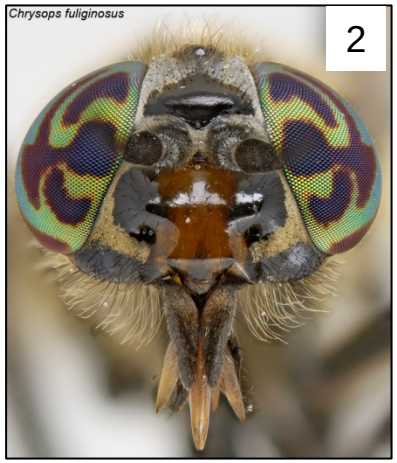



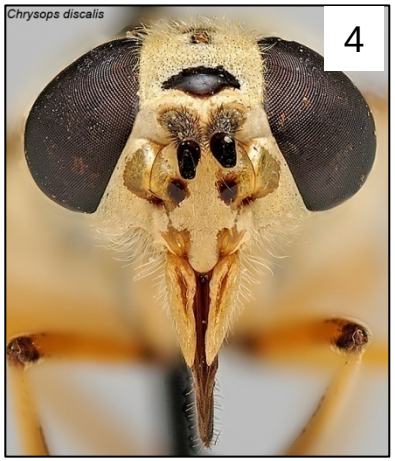






*Chrysops* spp. faces. 1: *univittatus*; 2: *fuliginosus*; 3*: aestuans*; 4: *discalis*;5: *brunneus*; 6*: flavidus*; 7*: clelatus*; 8*: fulvaster.*

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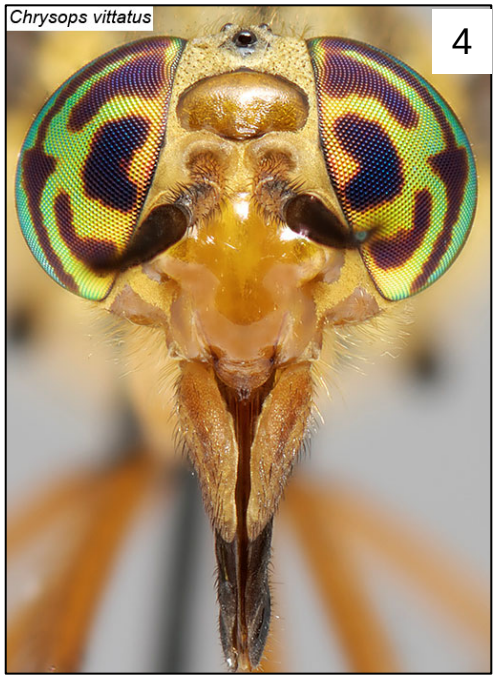


*Chrysops* spp. faces. 1: *striatus*; 2: *aberrans* (2 flies); 3: *shermani*; 4: *vittatus*.

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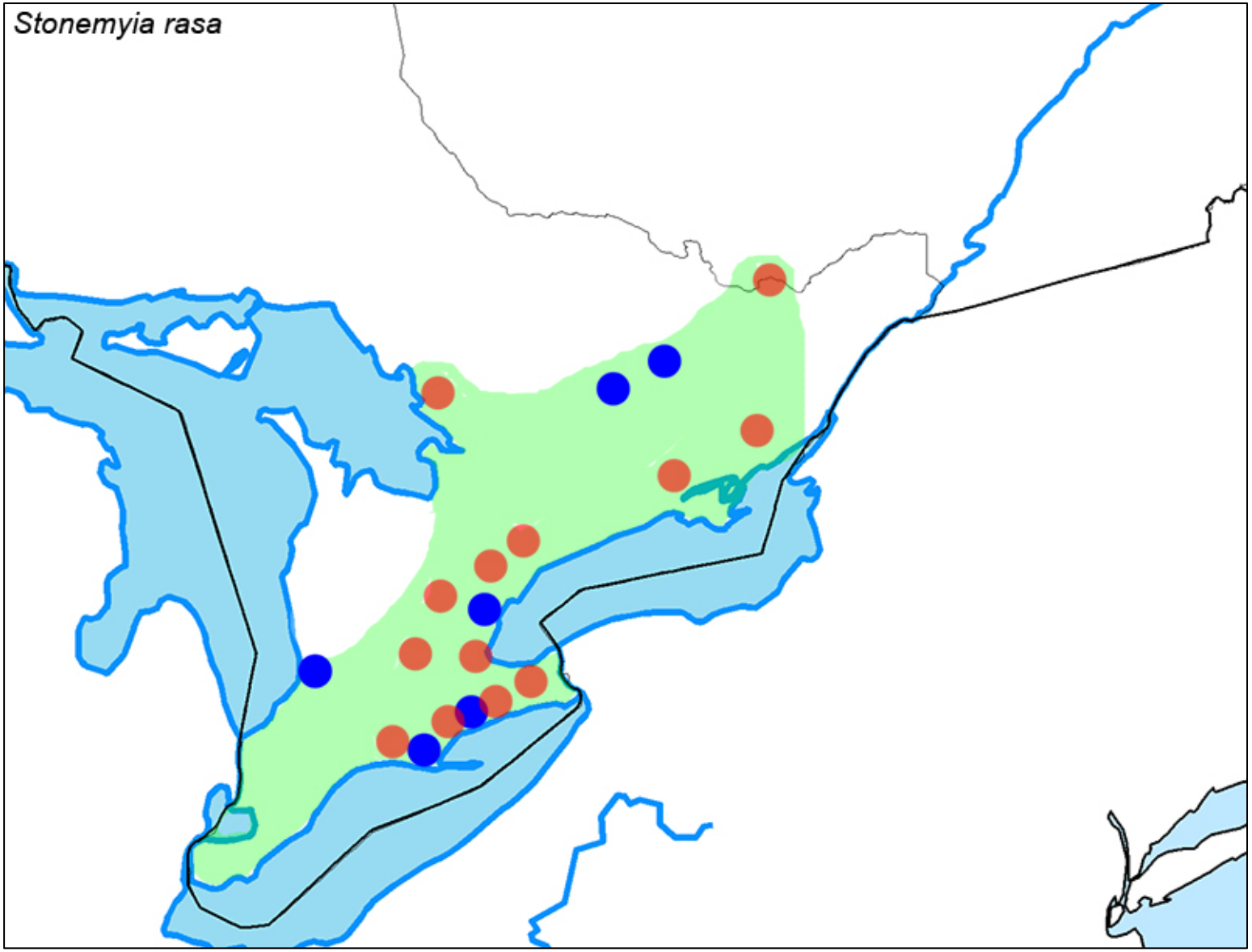


Map 1. *Stonemyia rasa* (red – from Teskey (1990). blue – DEBU records.

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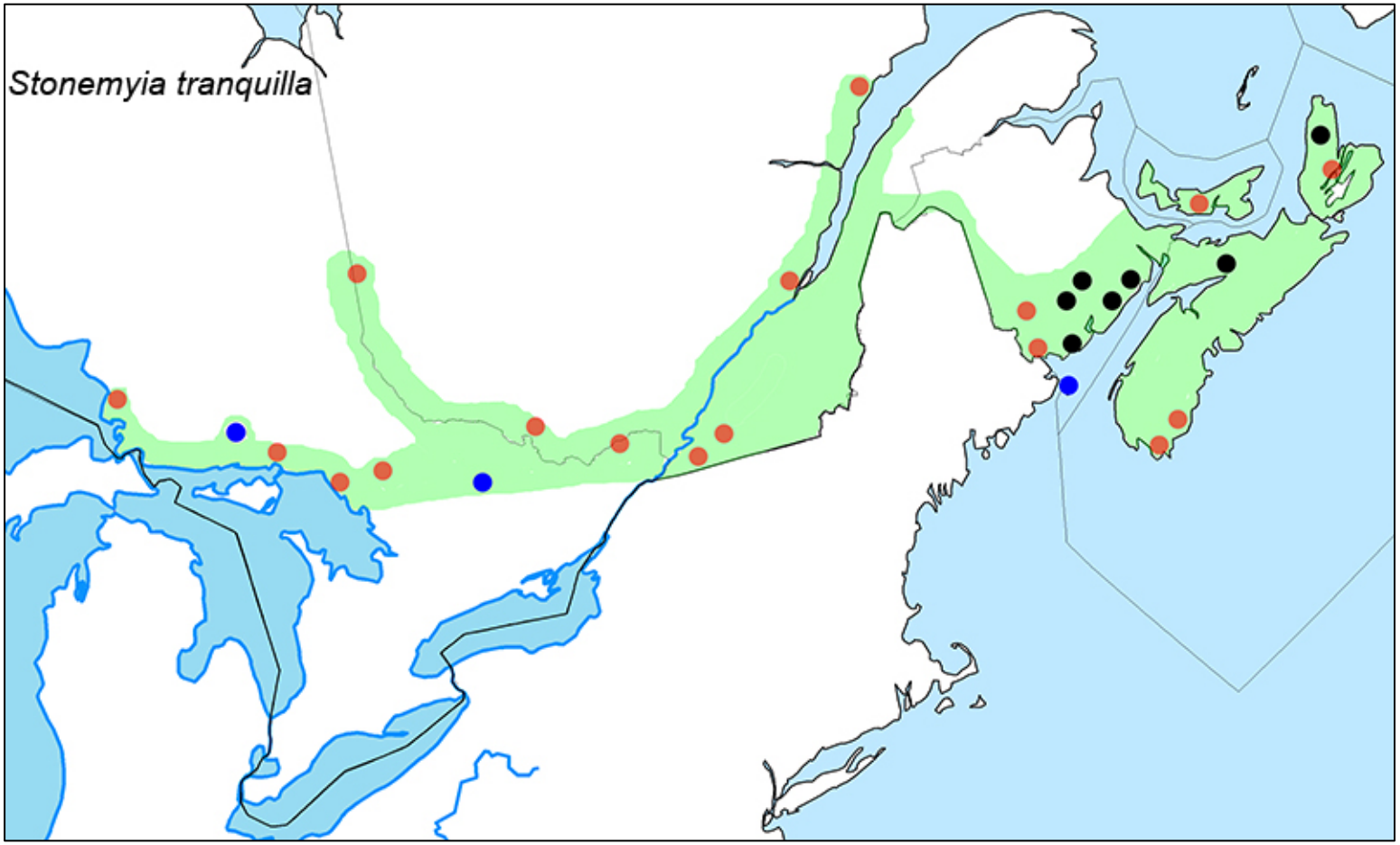


Map 2. *Stonemyia tranquilla* (red – from Teskey (1990), black - AWT records, blue – DEBU records),

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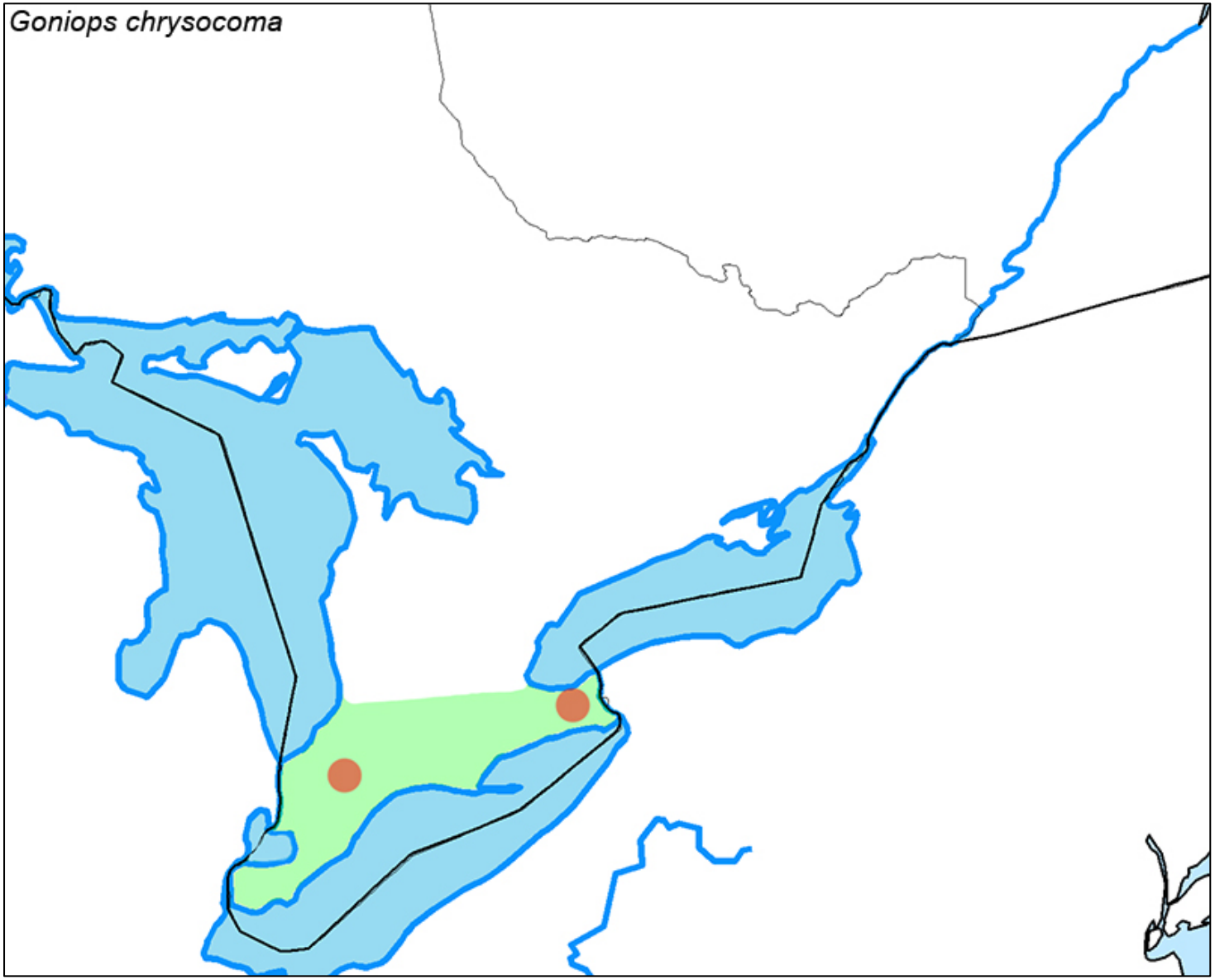


Map 3. *Goniops chrysocoma* (red – from Teskey (1990)).

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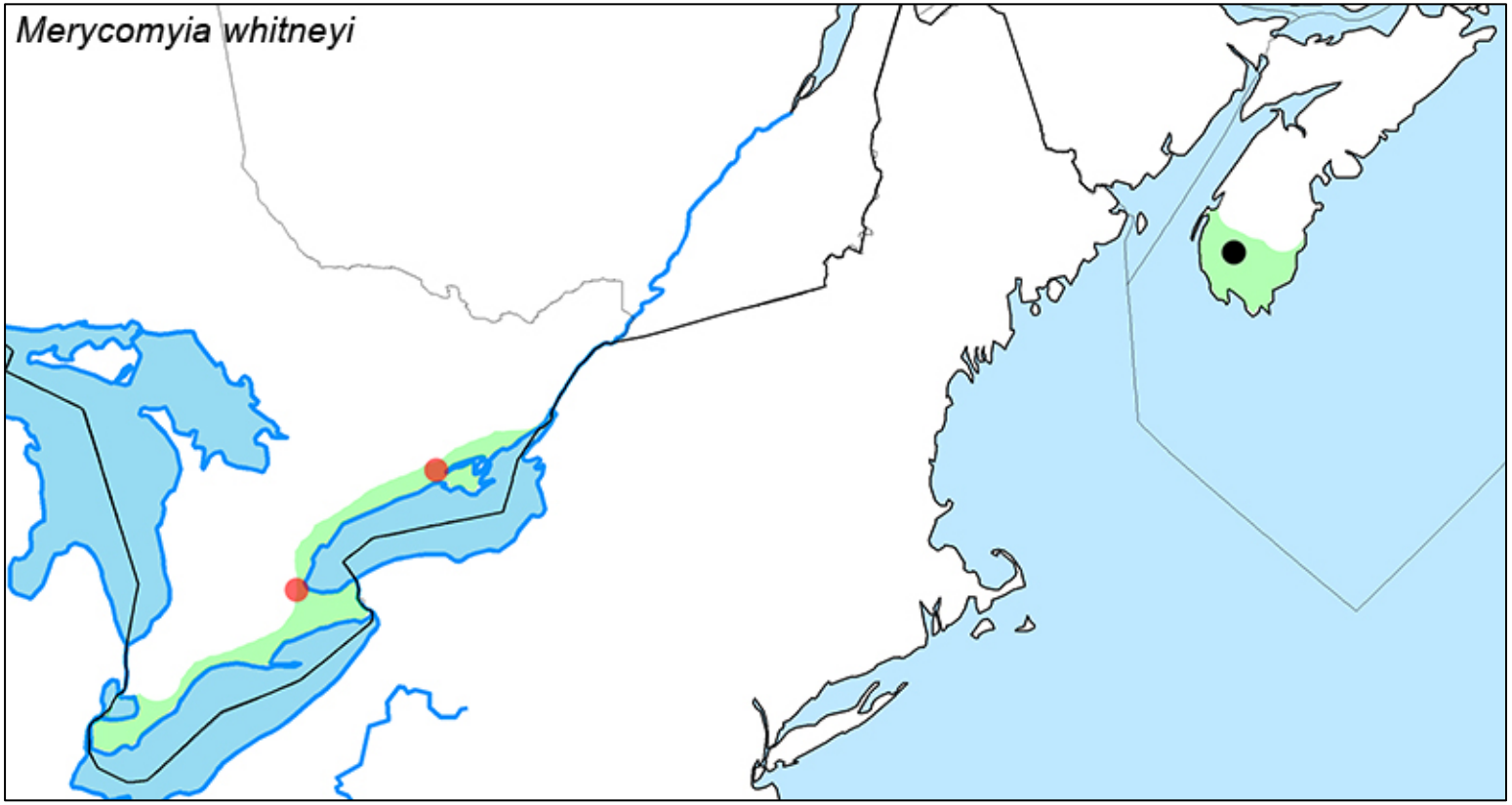


Map 4. *Merycomyia whitneyi* (red – from Teskey (1990), black – Hurlburt et al. record).

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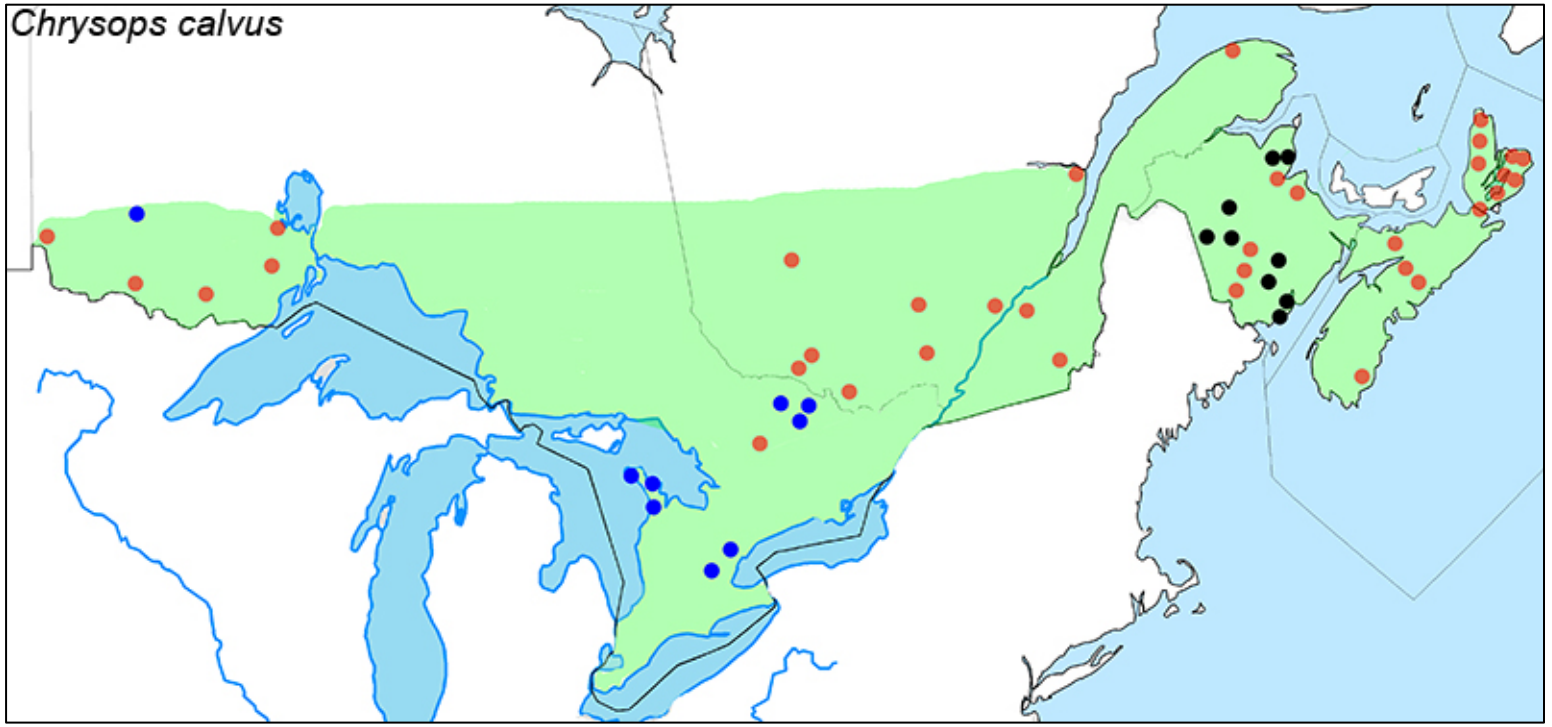


Map 5. *Chrysops calvus* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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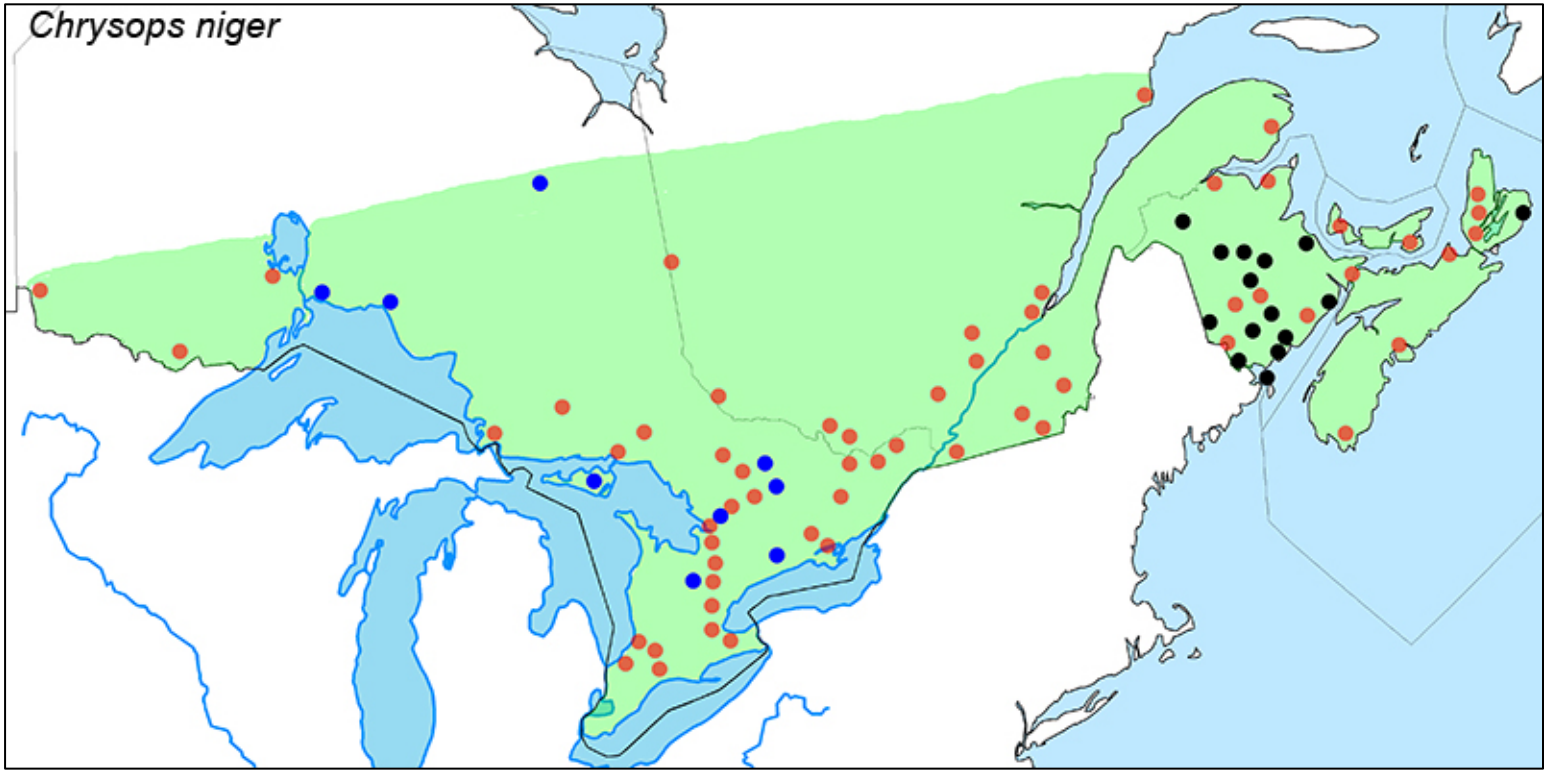


Map 6. *Chrysops niger* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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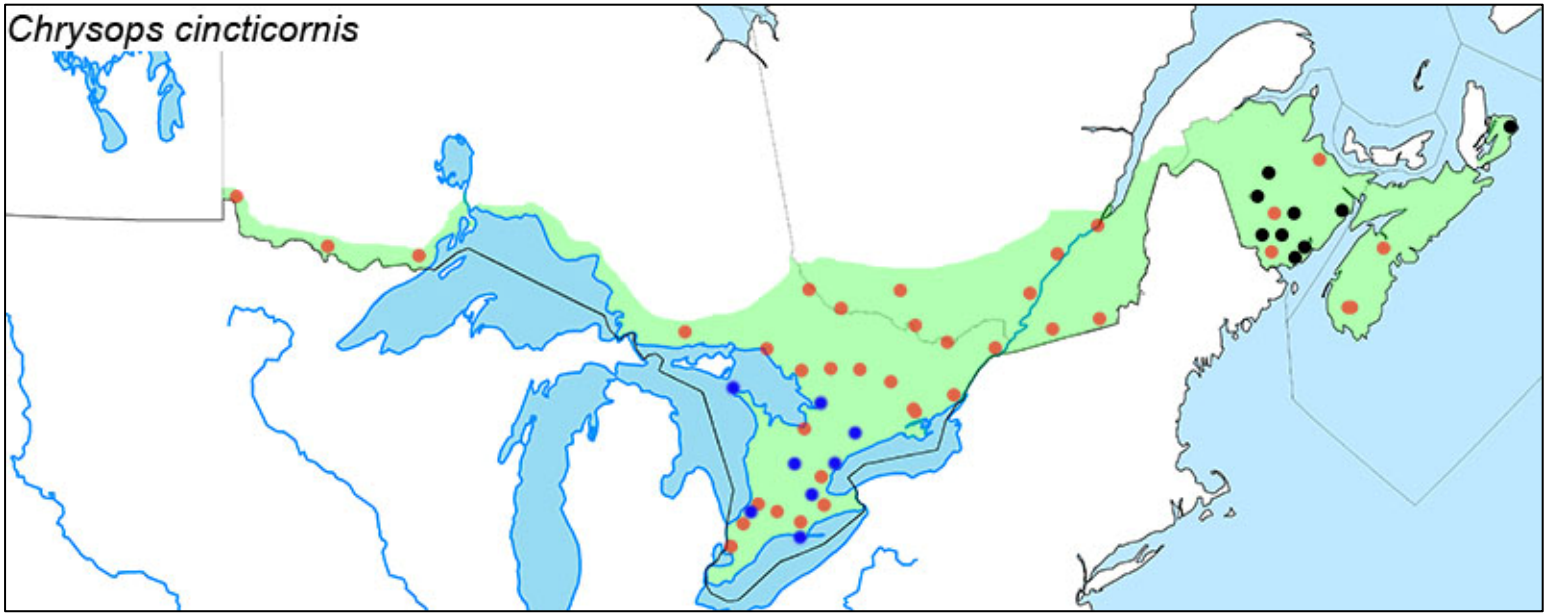


Map 7. *Chrysops cincticornis* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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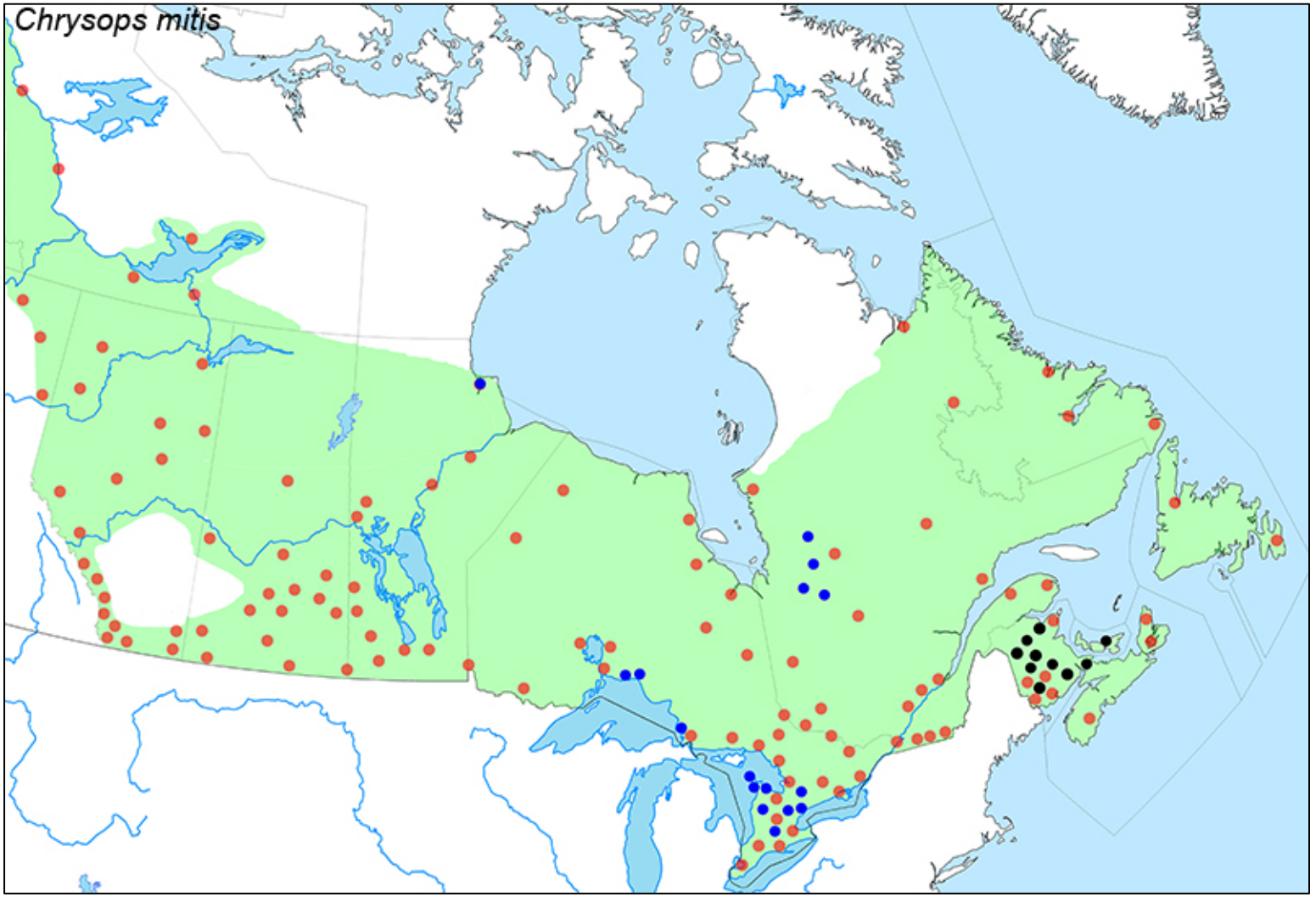


Map 8. *Chrysops mitis* (red – from Teskey (1990), black – AWT records, blue - DEBU records).

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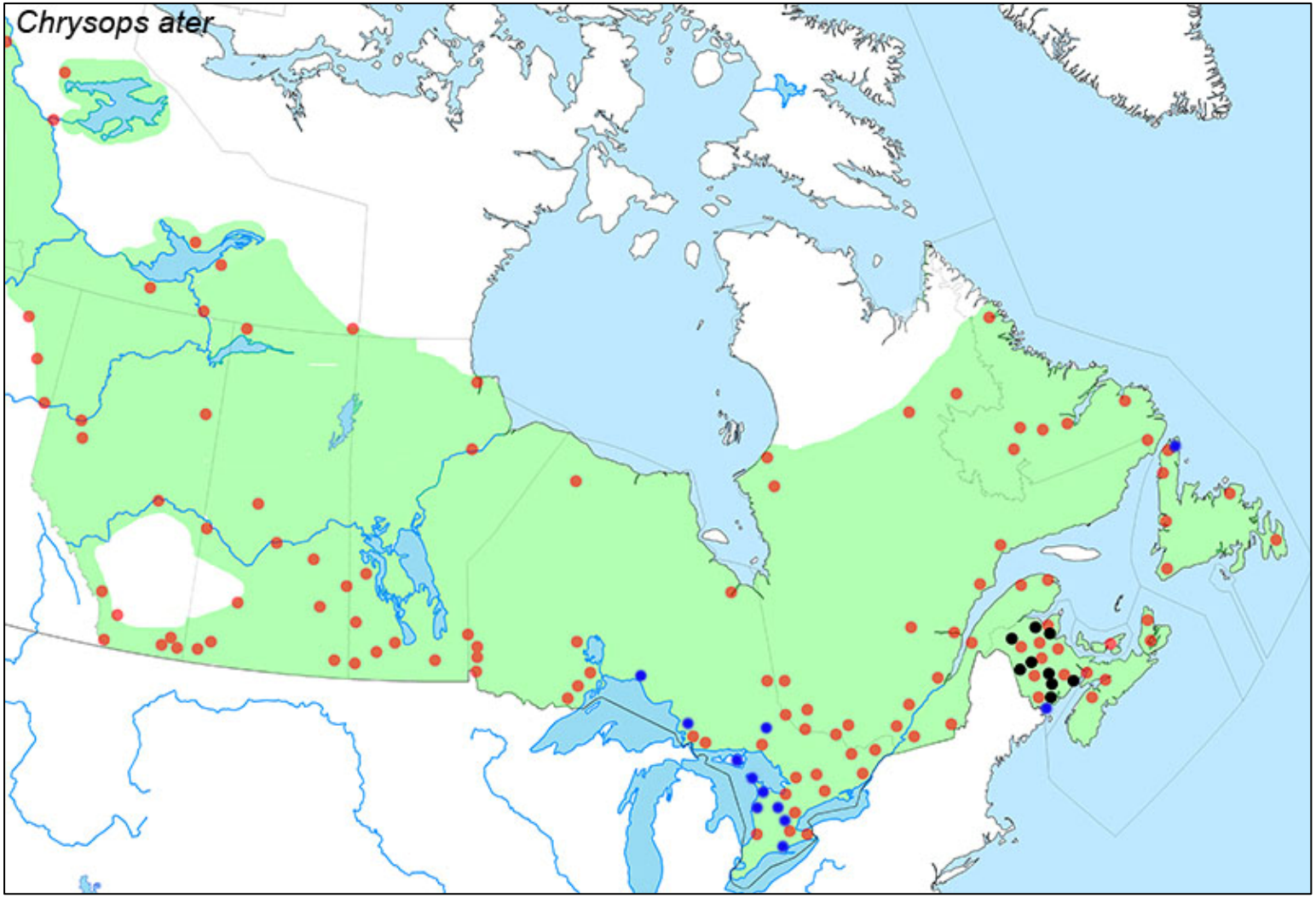


Map 9. *Chrysops ater* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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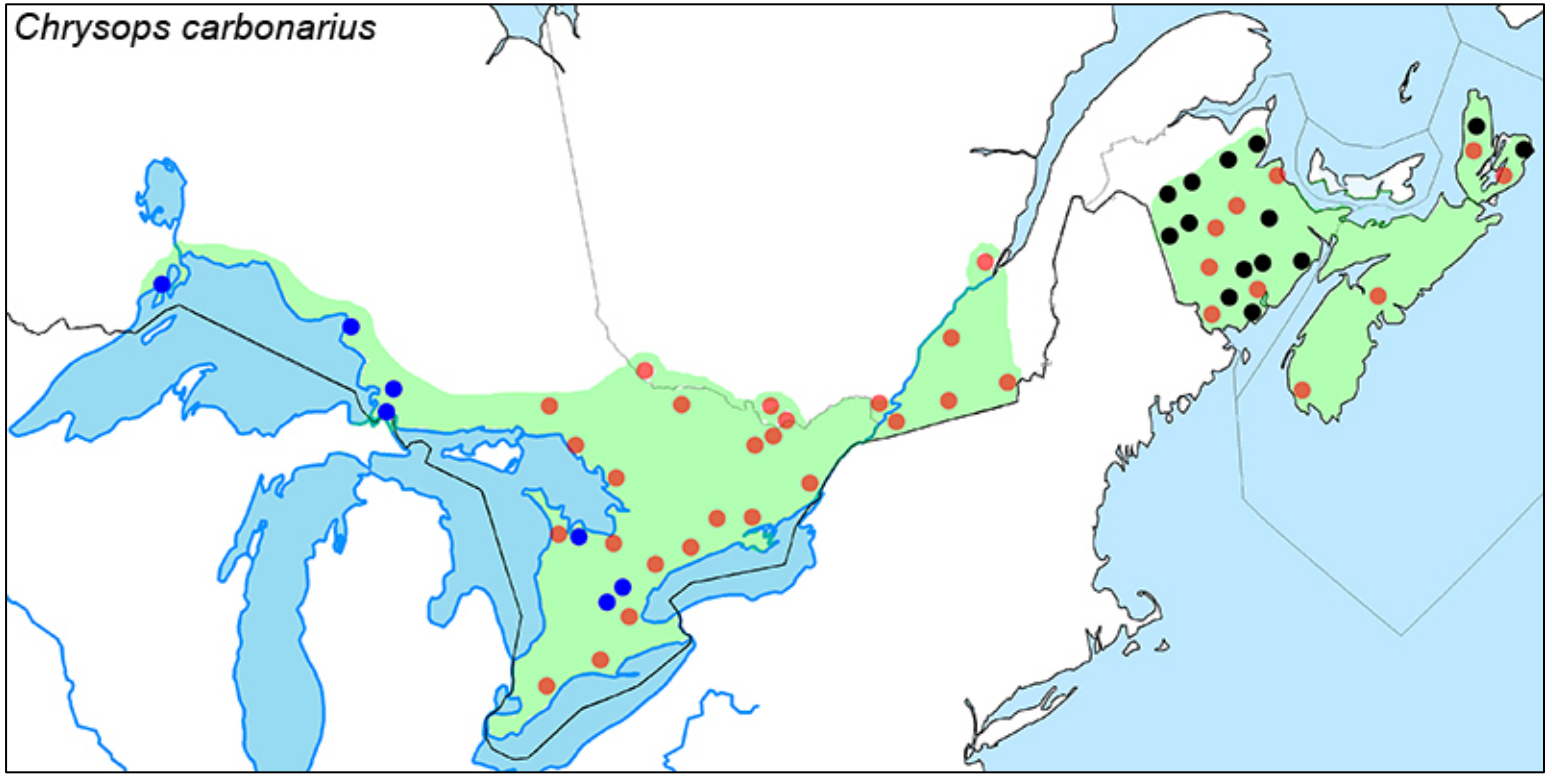


Map 10. *Chrysops carbonarius* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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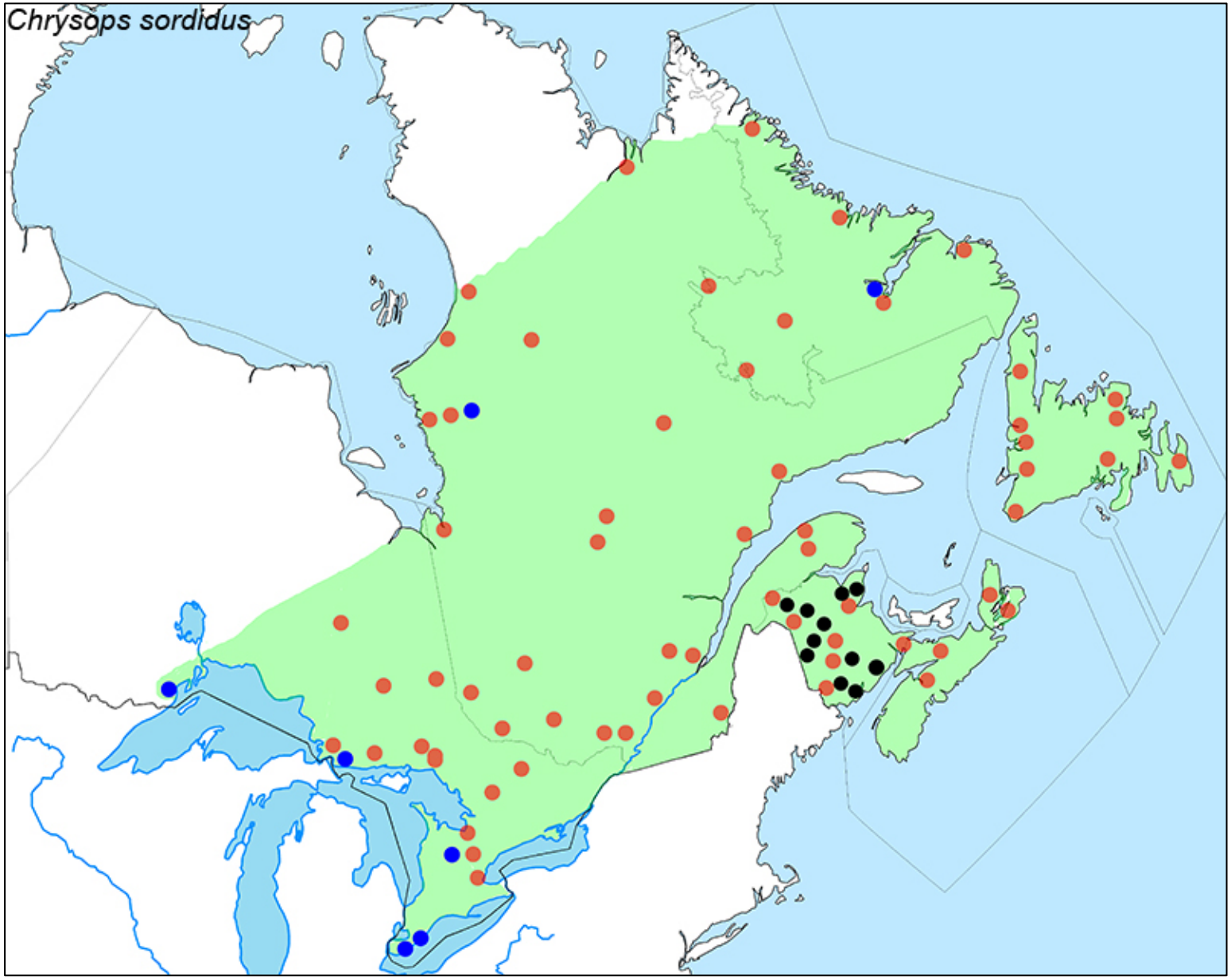


Map 11. *Chrysops sordidus* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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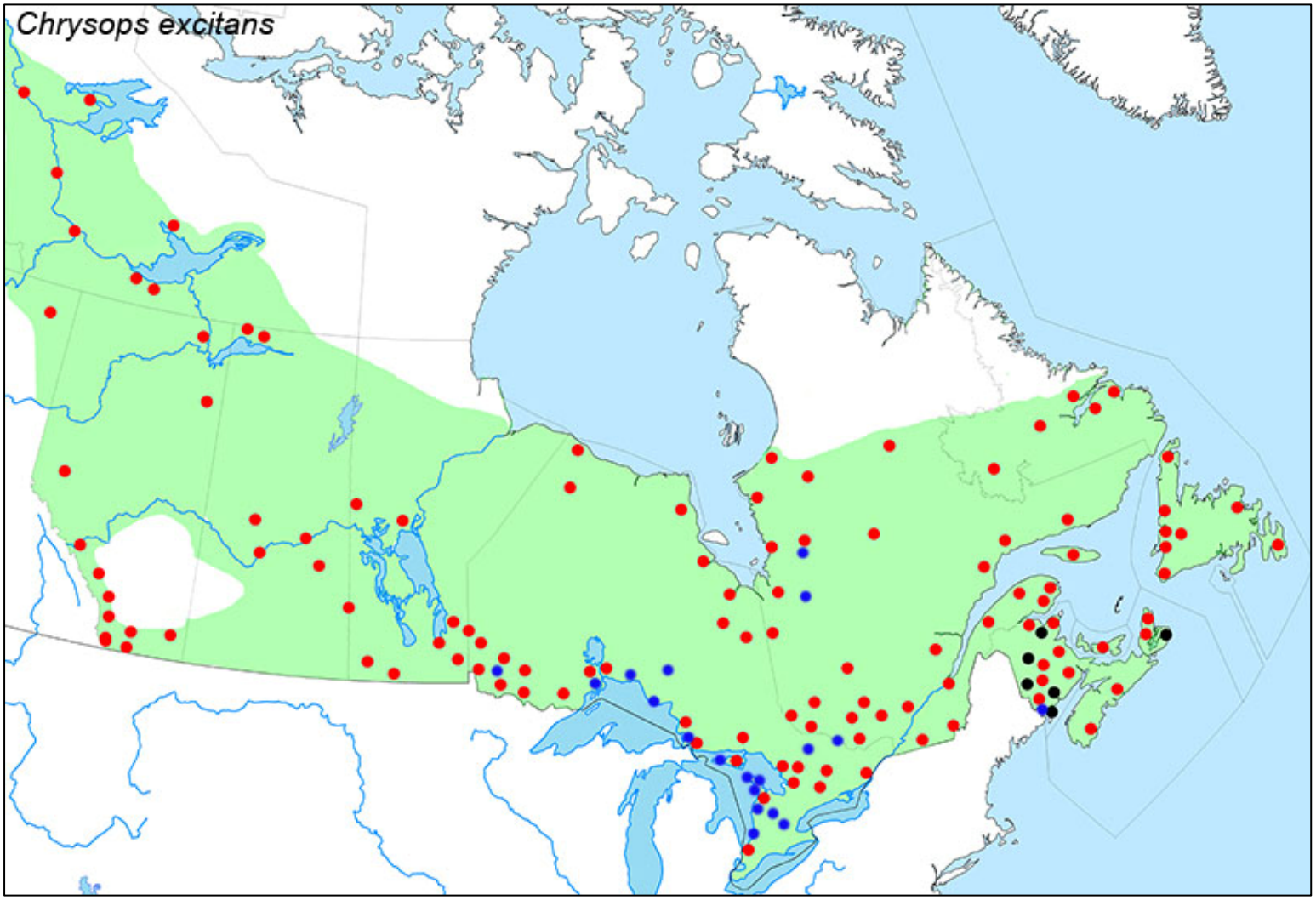


Map 12. *Chrysops excitans* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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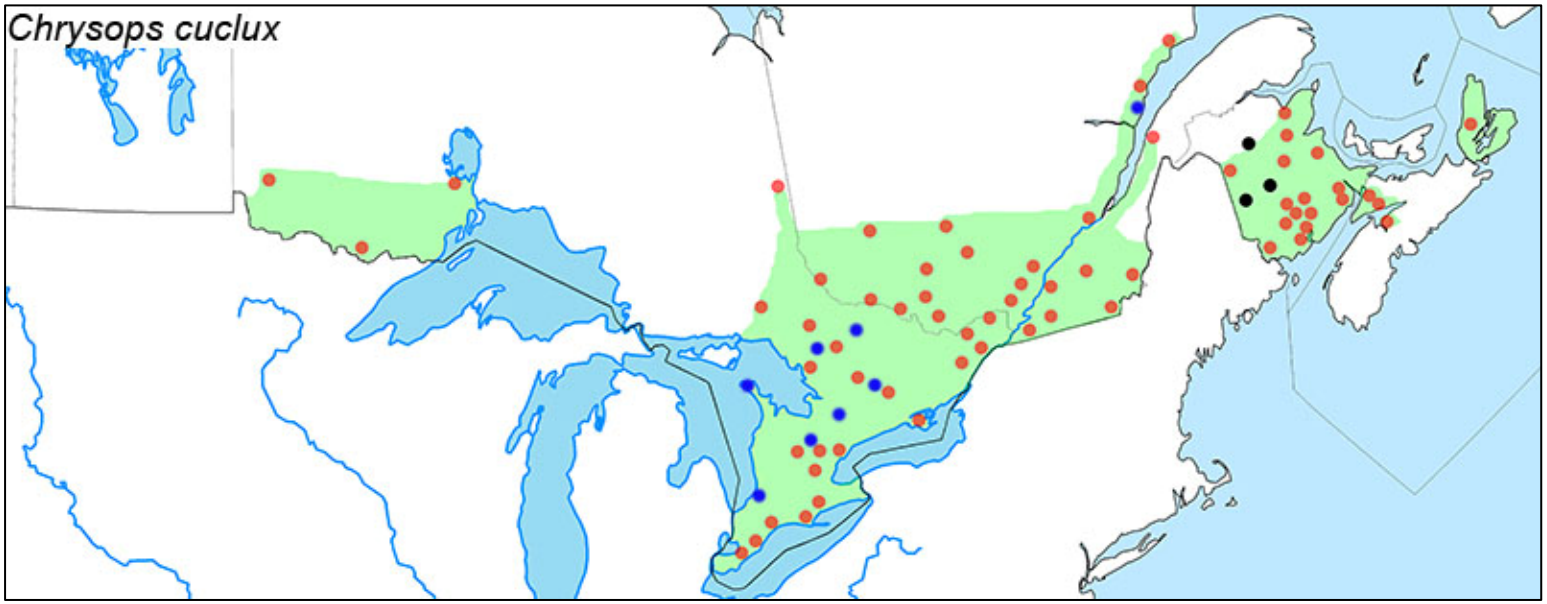


Map 13. *Chrysops cuclux* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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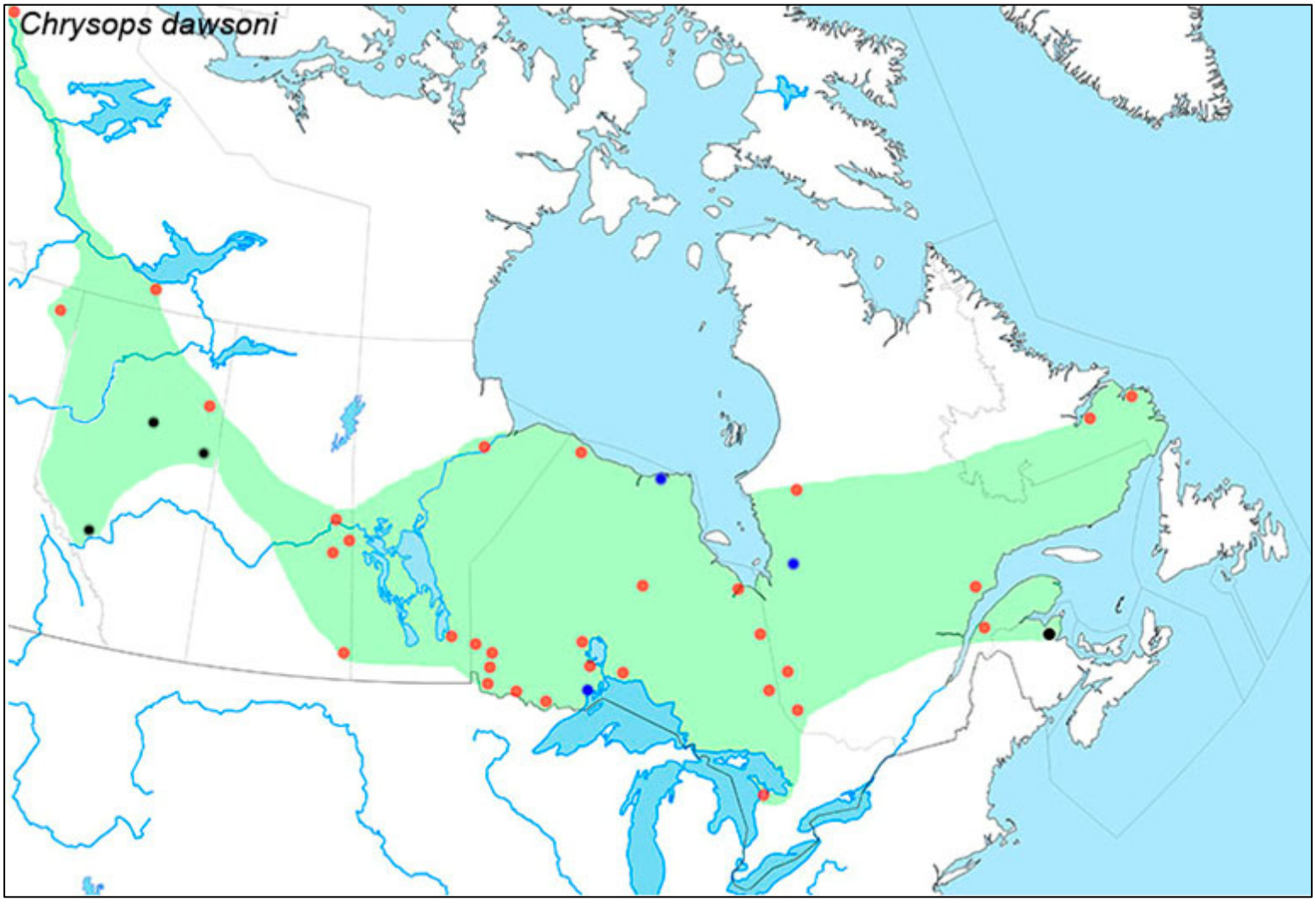


Map 14. *Chrysops dawsoni* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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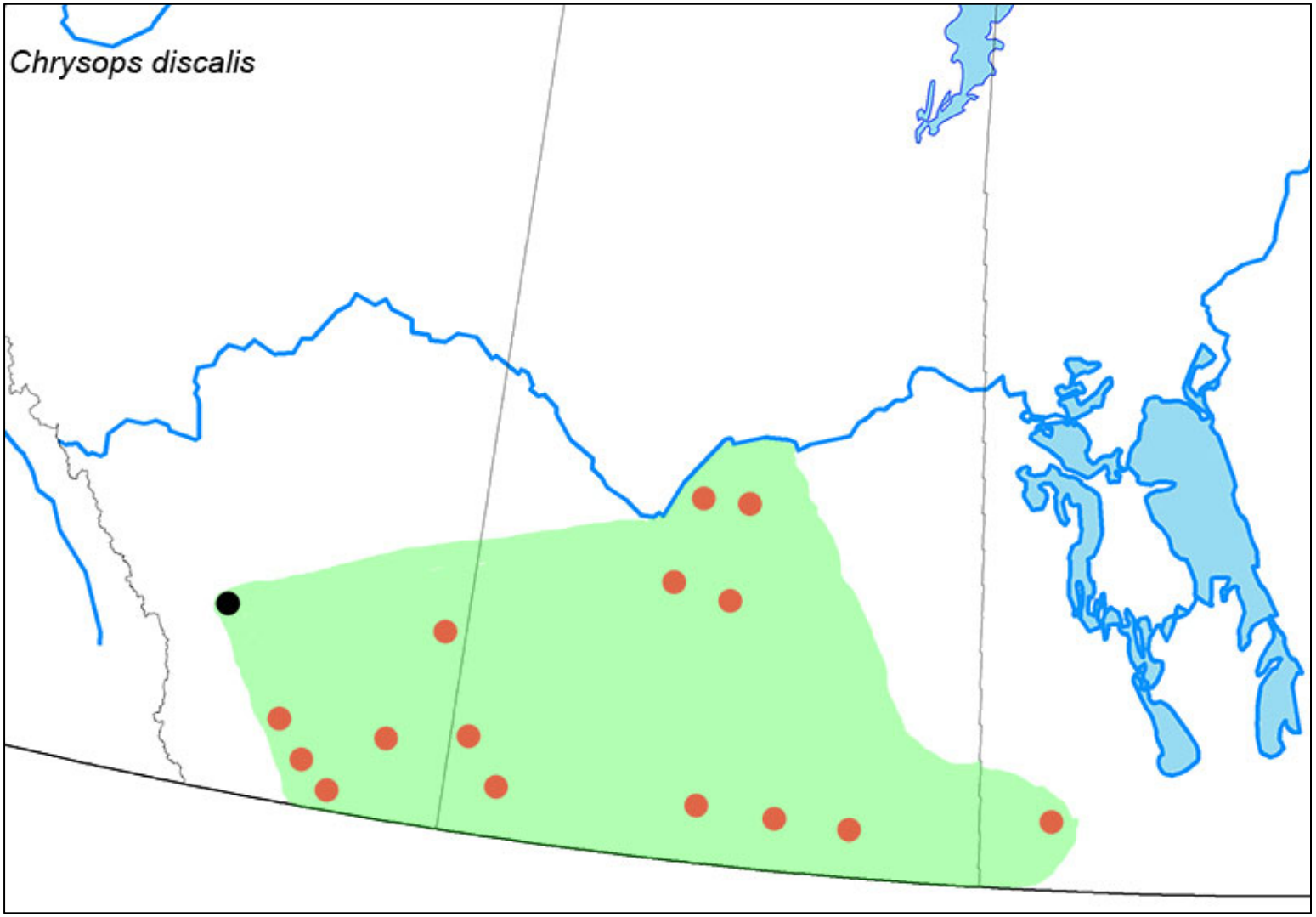


Map 15. *Chrysops discalis* (red – from Teskey (1990), black – AWT record).

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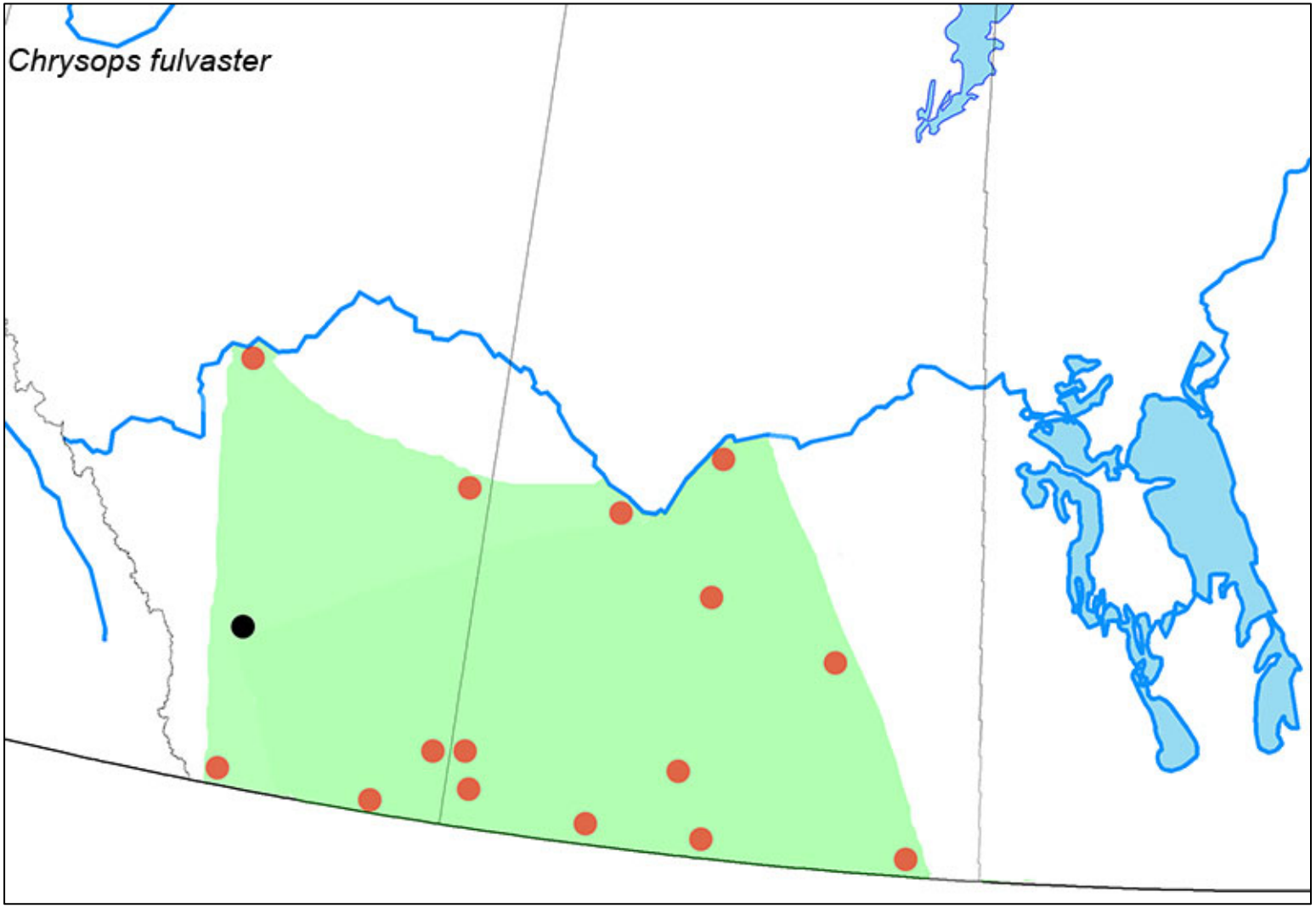


Map 16. *Chrysops fulvaster* (red – from Teskey (1990), black – AWT record).

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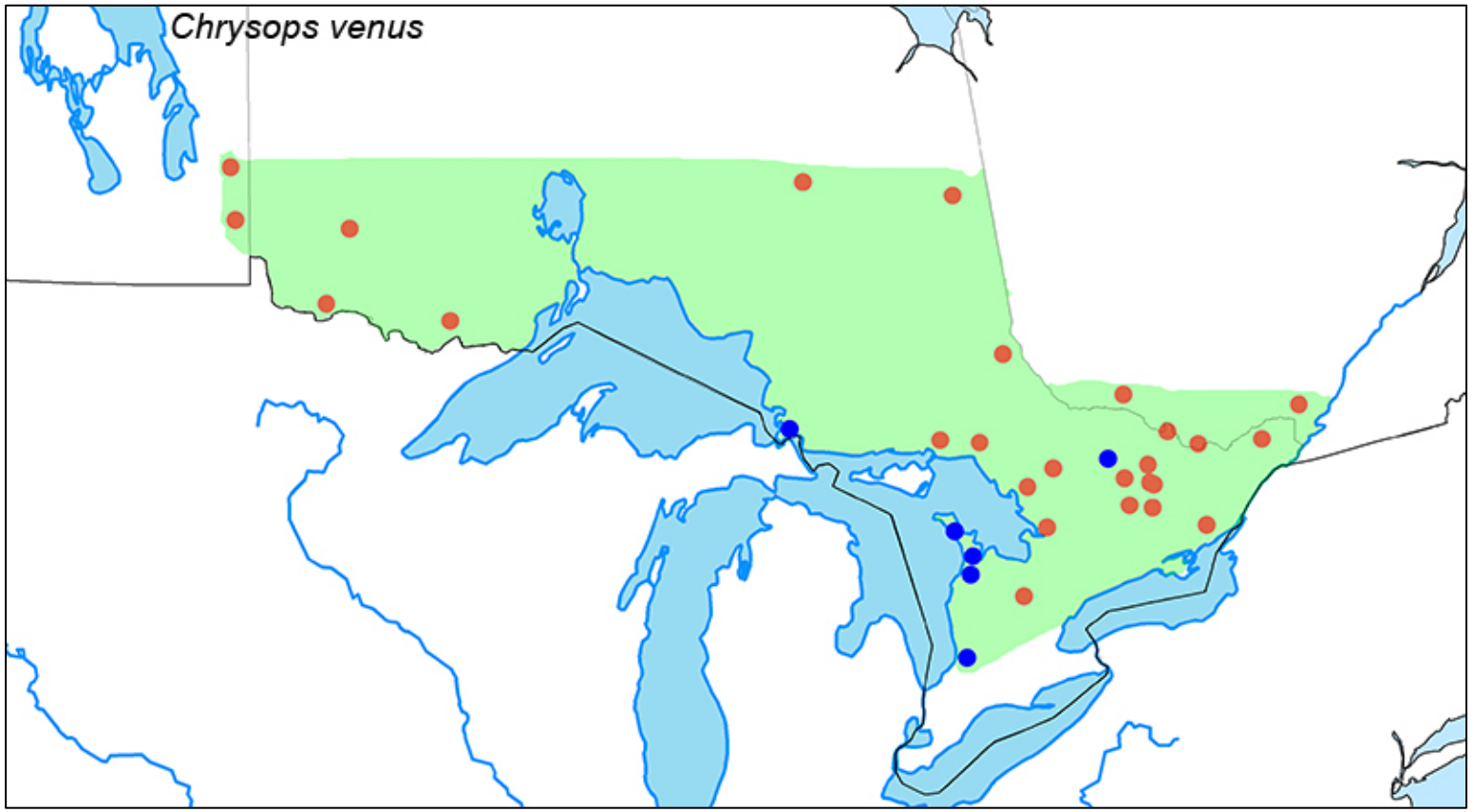


Map 17. *Chrysops venus* (red – from Teskey (1990), blue – DEBU records).

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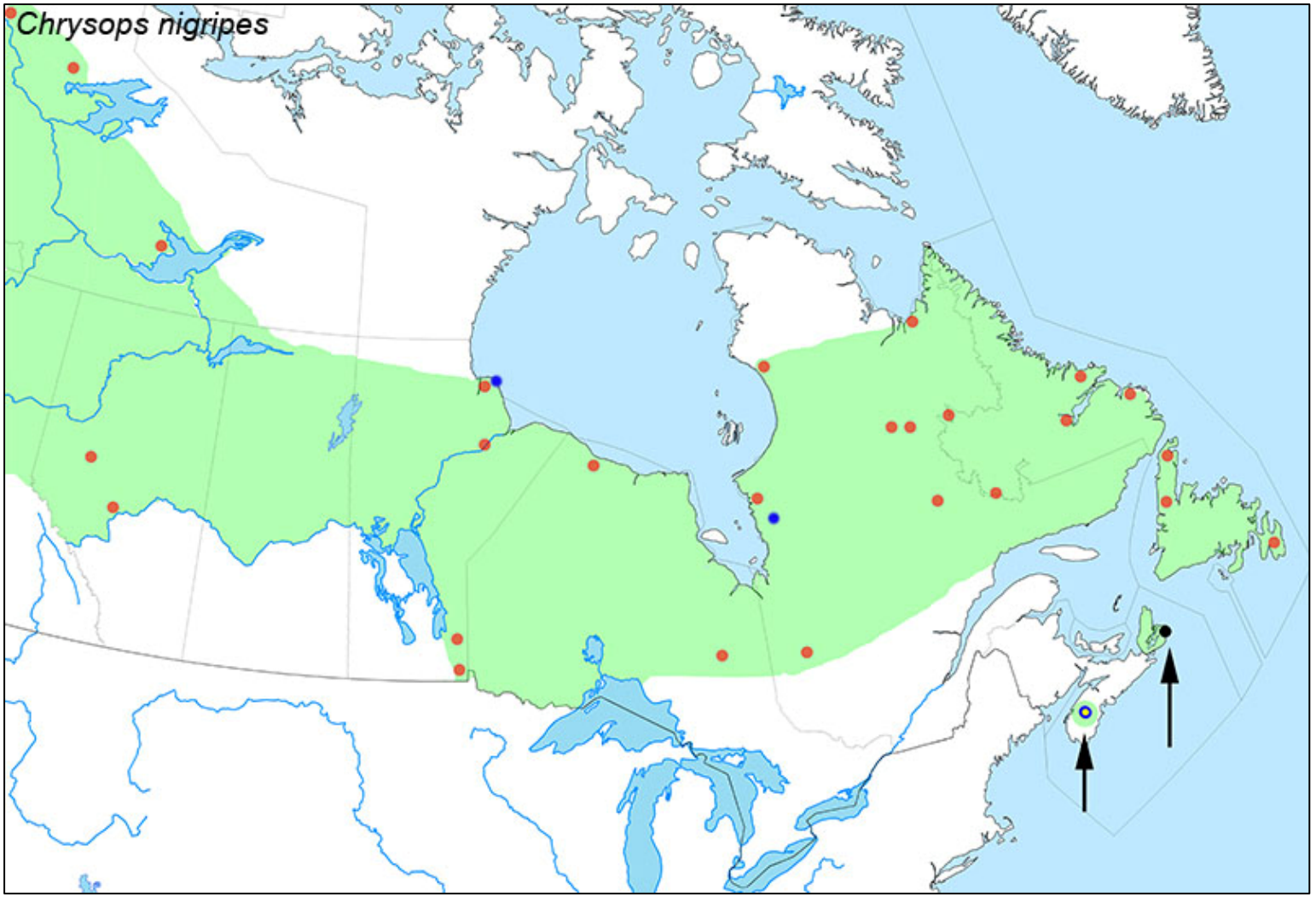


Map 18. *Chrysops nigripes* (red – from Teskey (1990), black – AWT record, yellow in black – Hurlburt et al record, blue – DEBU records).

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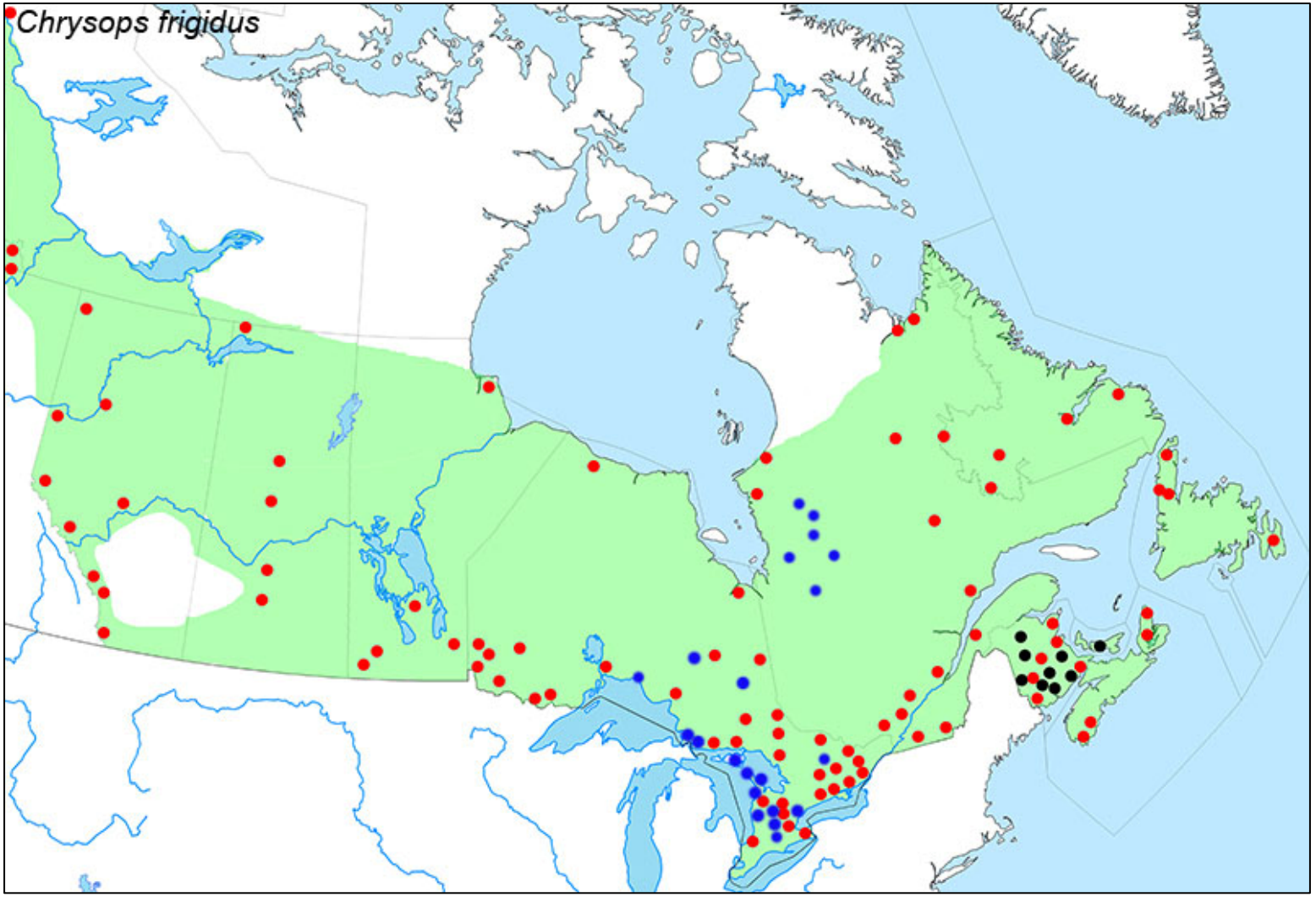


Map 19. *Chrysops frigidus* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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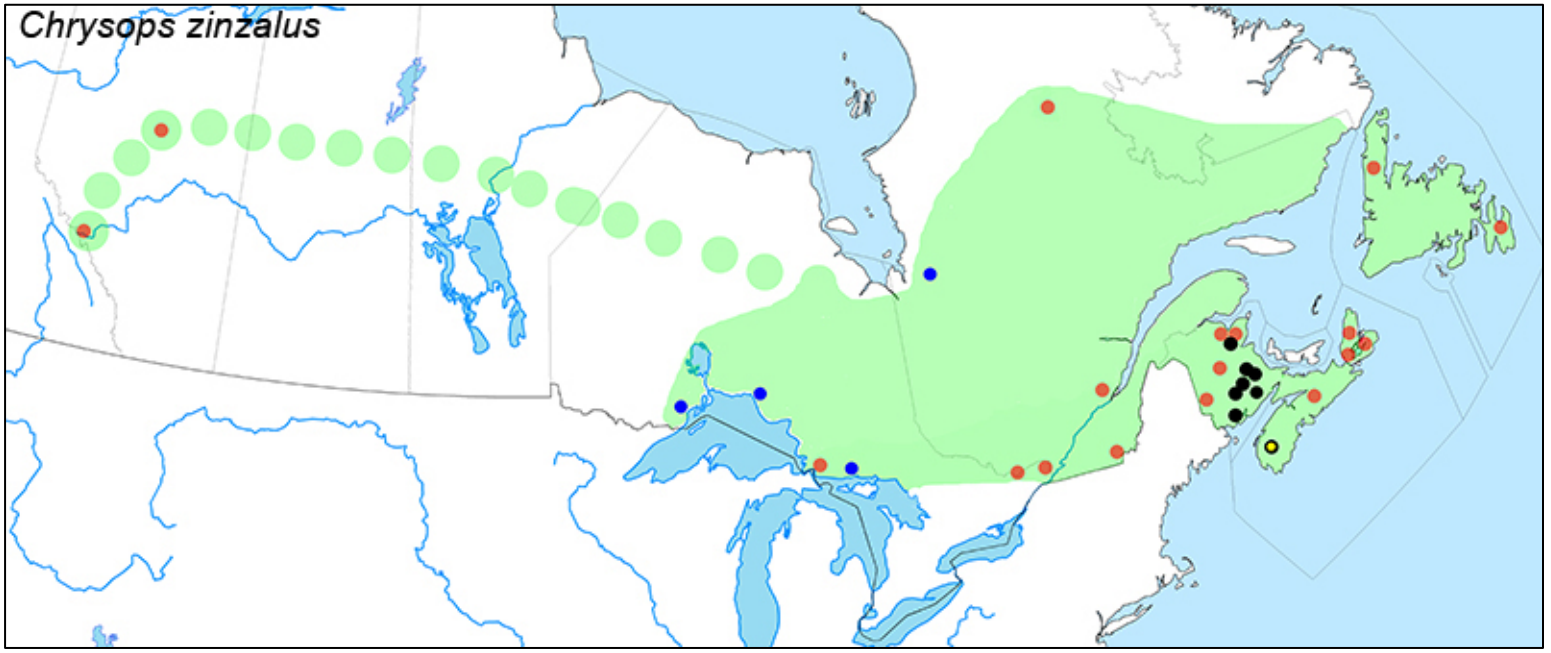


Map 20. *Chrysops zinzalus* (red dots -from Teskey (1990), black dots – AWT records, yellow in black dot - Hurlburt et al record, blue dots – DEBU records. Shaded green areas represent possible distribution. Note that there are no records for Sakatchewan, Manitoba or extreme northwestern Ontario.)

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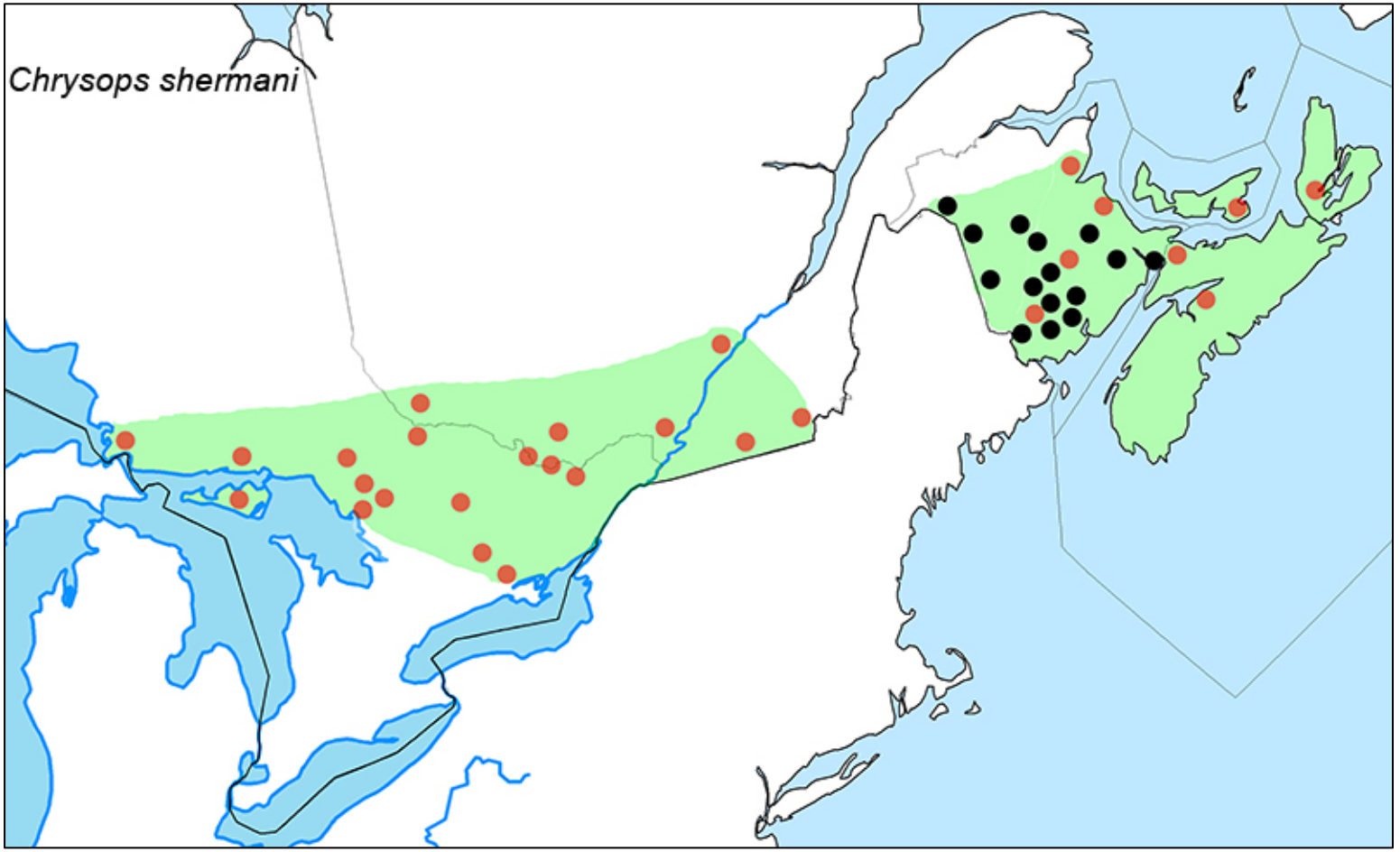


Map 21. *Chrysops shermani* (red – from Teskey (1990), black – AWT records).

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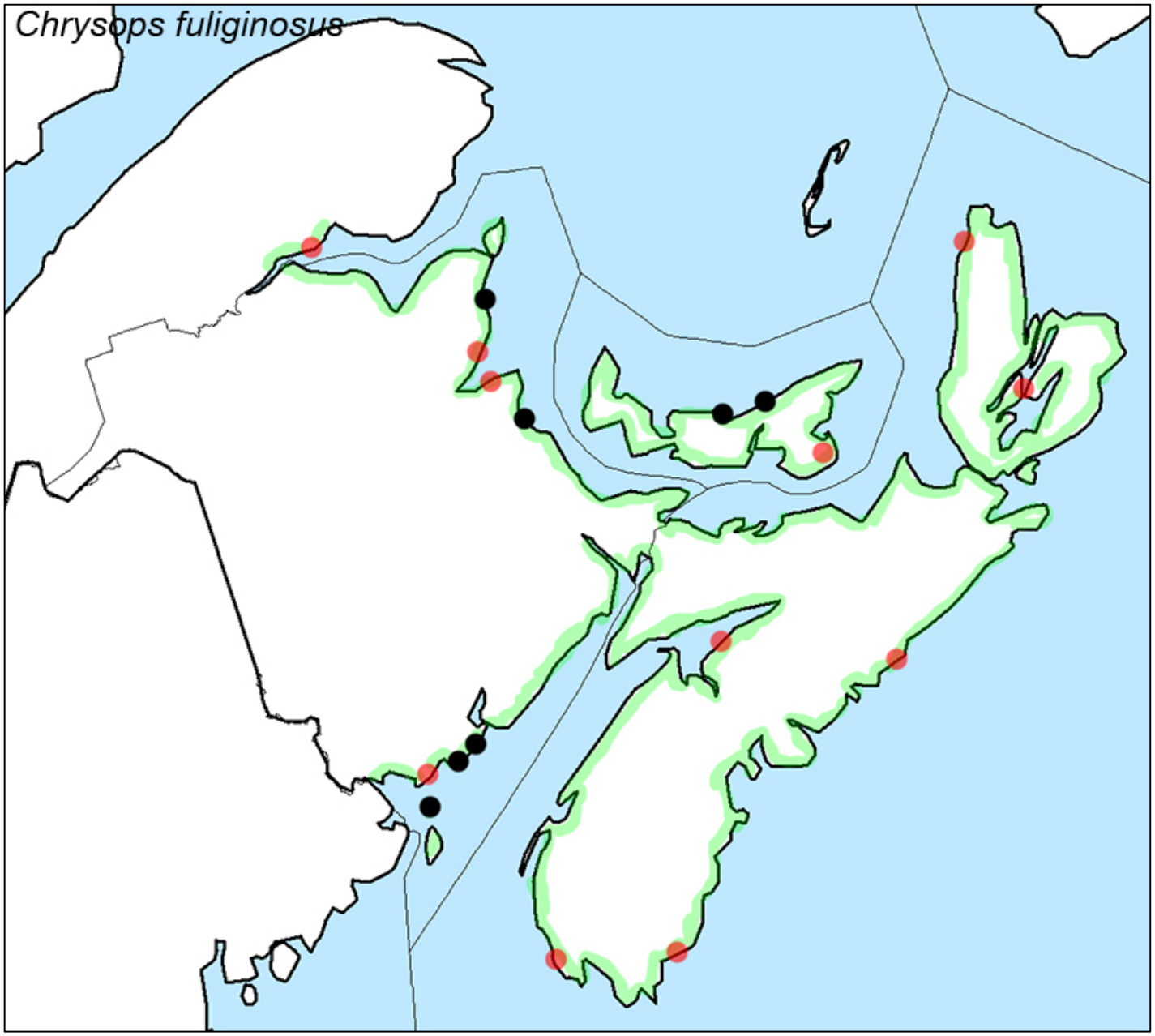


Map 22. *Chrysops fuliginosus*, (red – from Teskey (1990); black – AWT records).

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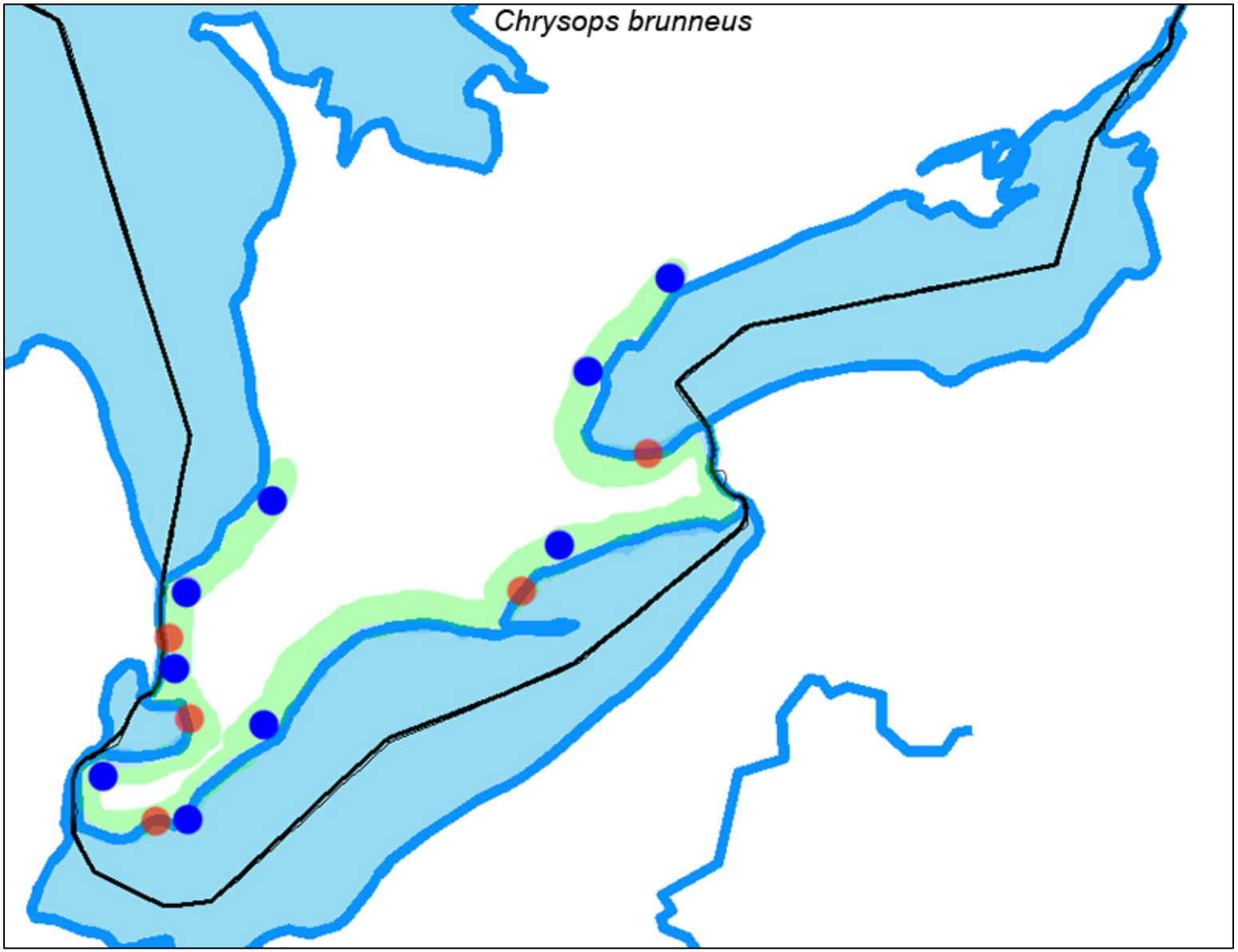


Map 23. *Chrysops brunneus* (red – from Teskey (1990), blue – DEBU records).

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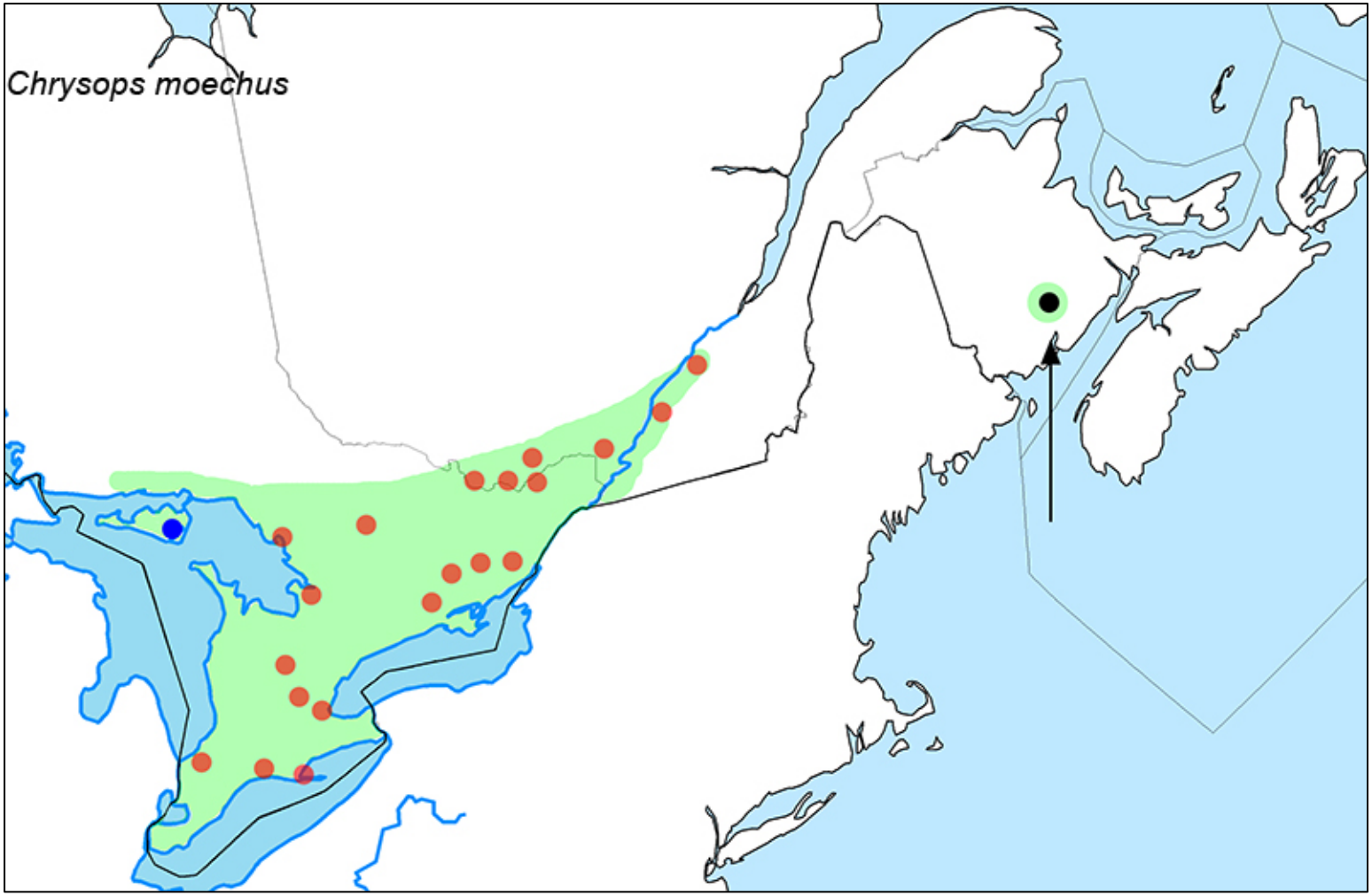


Map 24. *Chrysops moechus* (red – from Teskey (1990), black – AWT record, blue – DEBU record).

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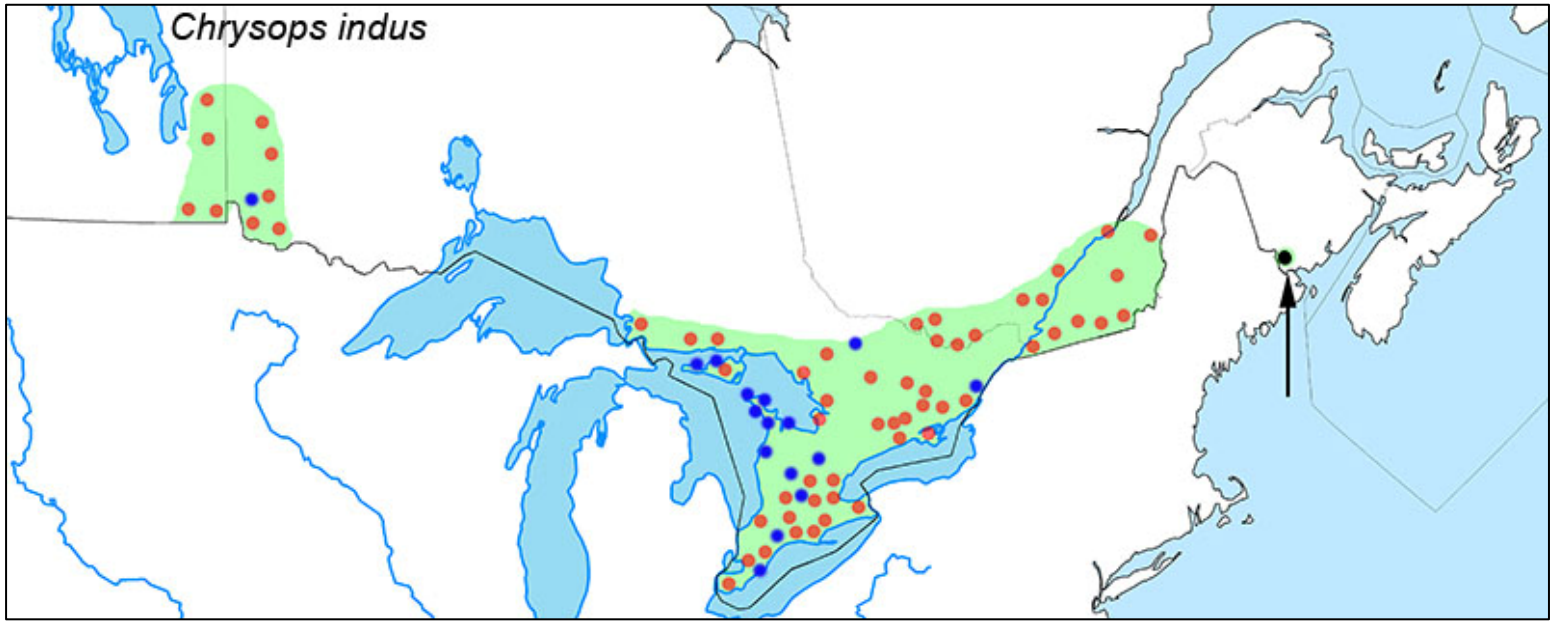


Map 25. *Chrysops indus* (red – from Teskey (1990), black – AWT record, blue – DEBU records).

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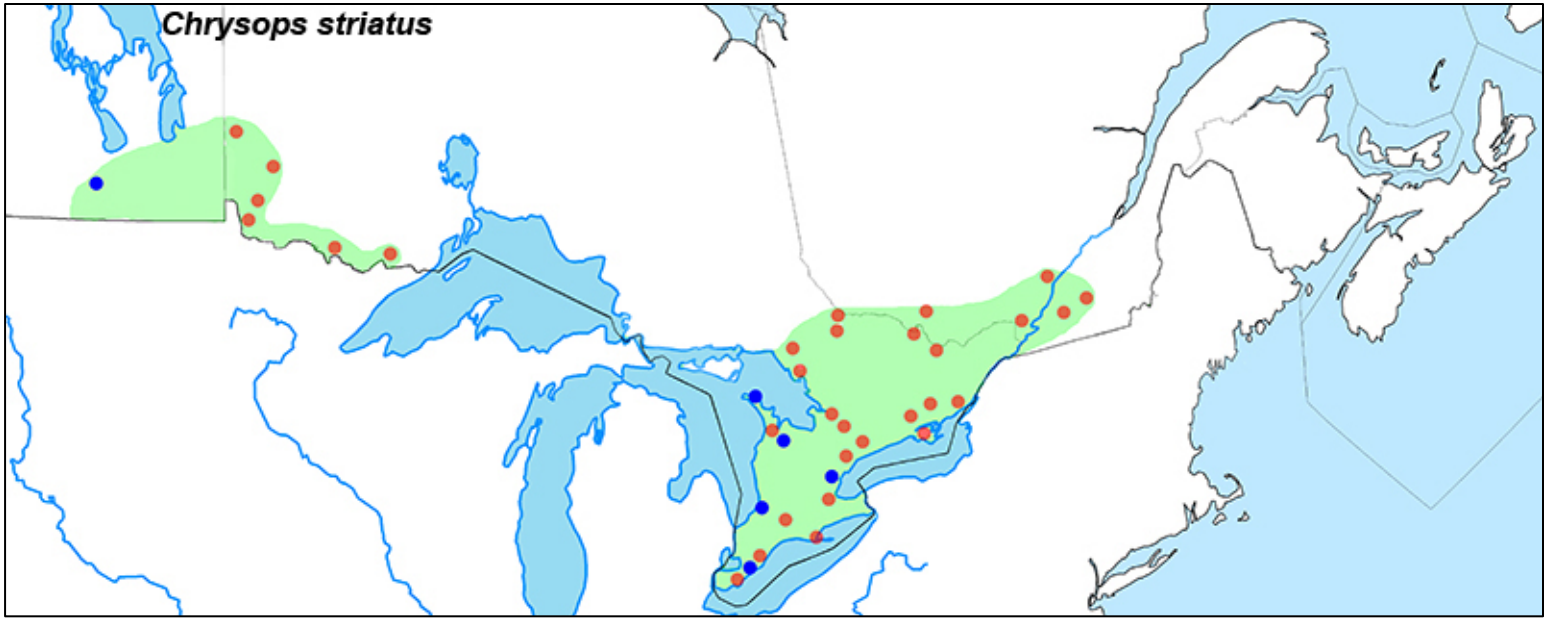


Map 26. *Chrysops striatus* (red – from Teskey (1990); blue – DEBU records).

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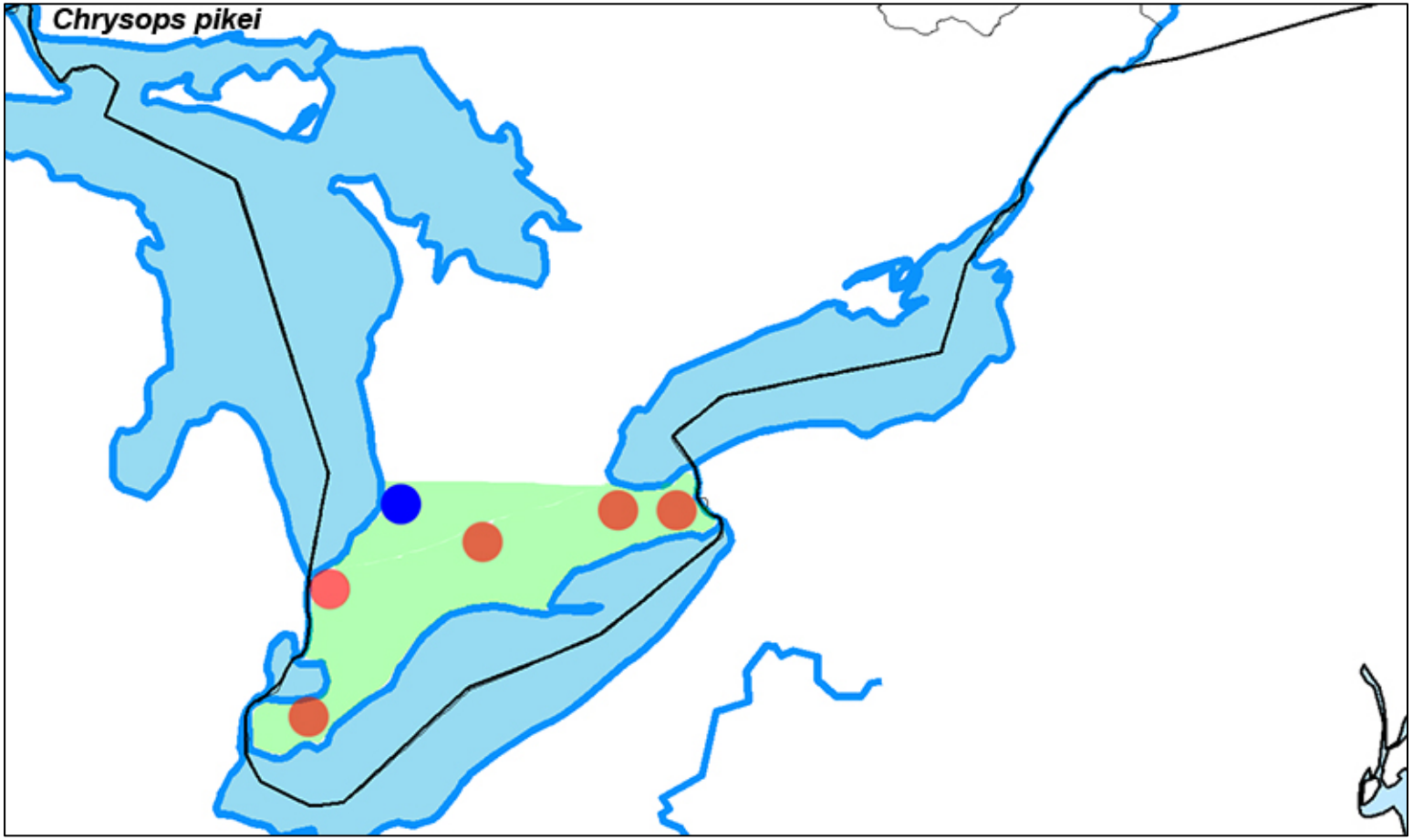


Map 27. *Chrysops pikei* (red – from Teskey (1990), blue - DEBU record).

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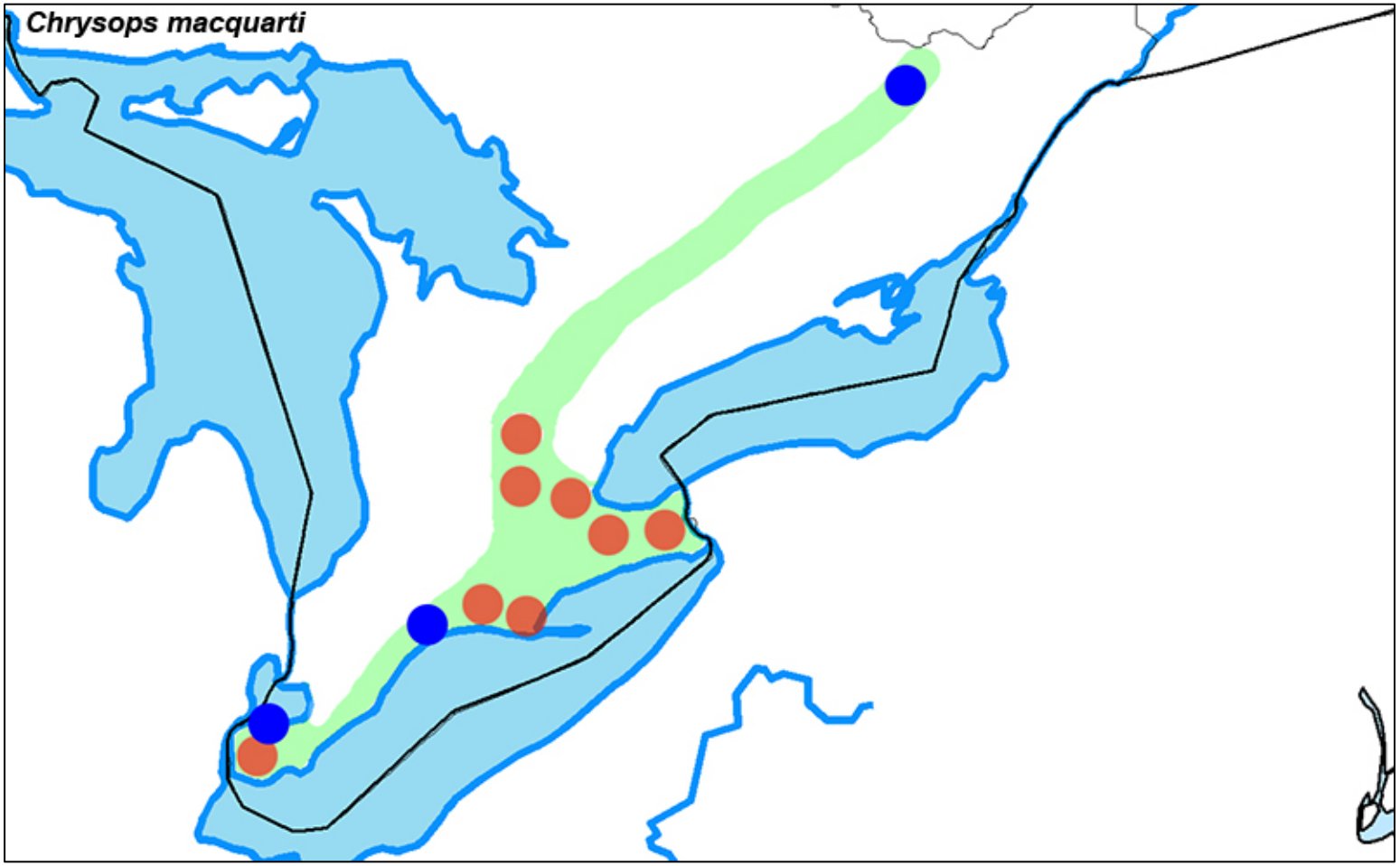


Map 28. *Chrysops macquarti* (red – from Teskey (1990), blue – DEBU records).

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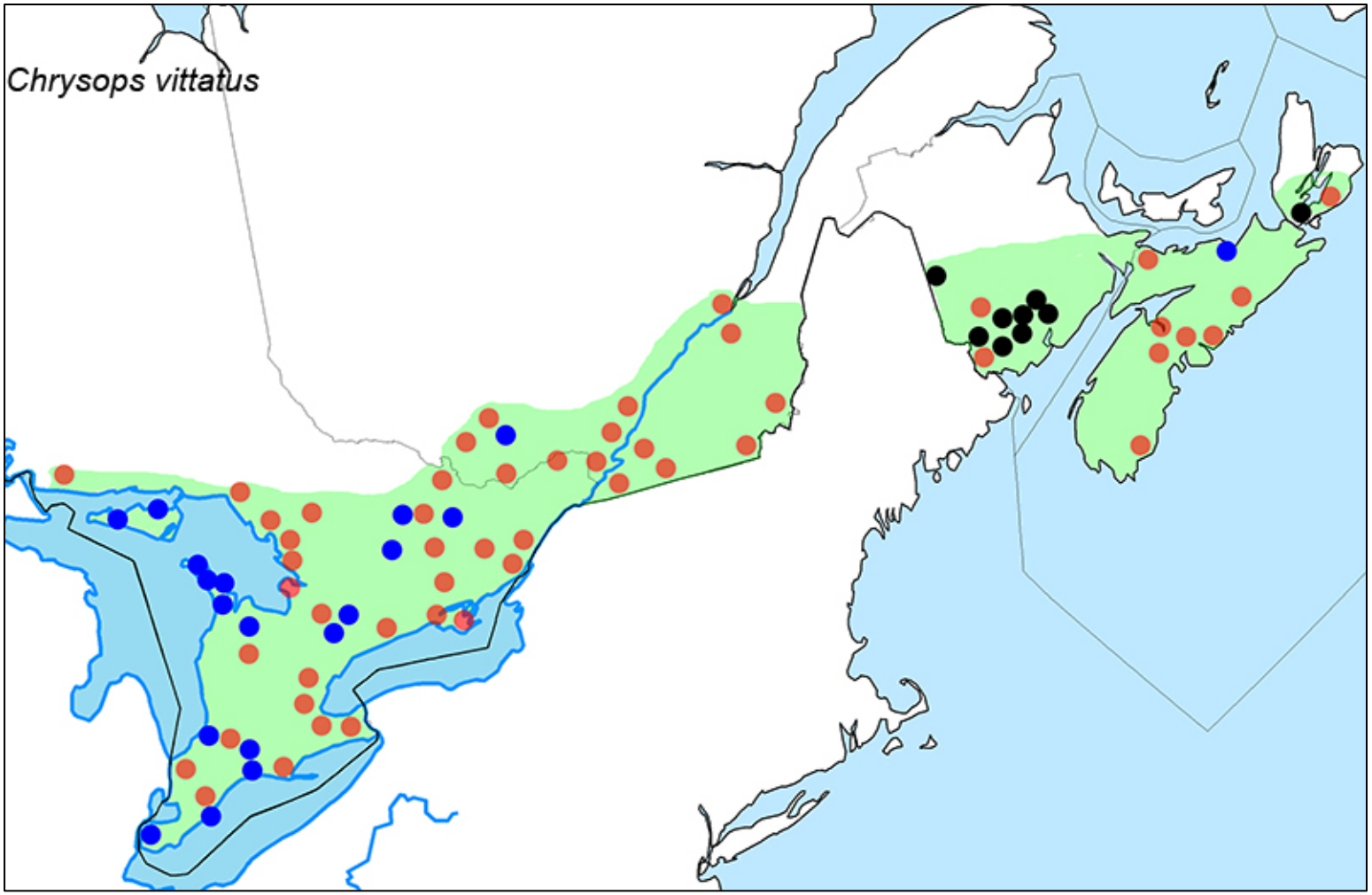


Map 29. *Chrysops vittatus* (red – from Teskey (1990), black – AWT records, blue - DEBU records).

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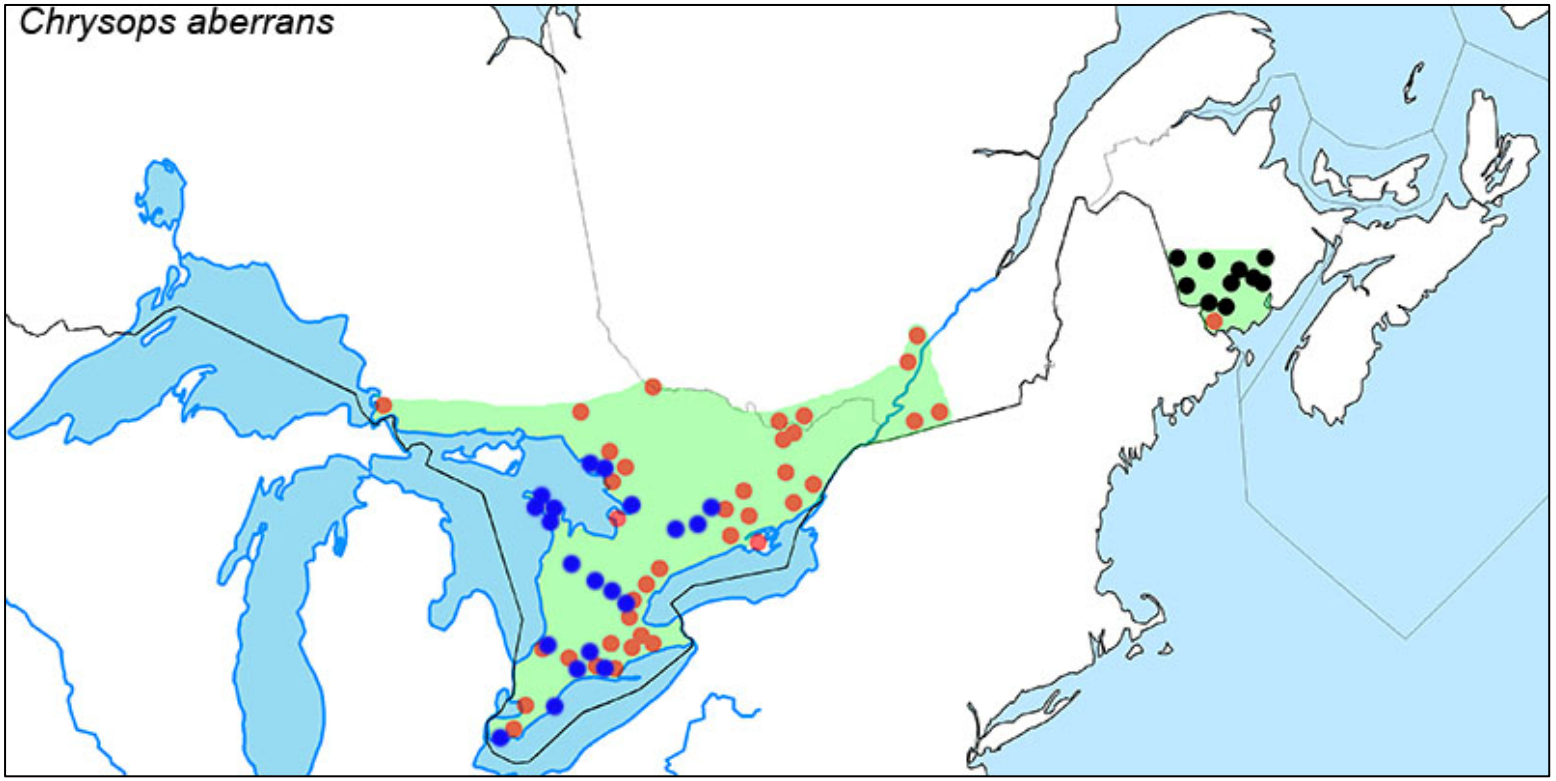


Map 30. *Chrysops aberrans* (red – from Teskey (1990), black – AWT records, blue - DEBU records)..

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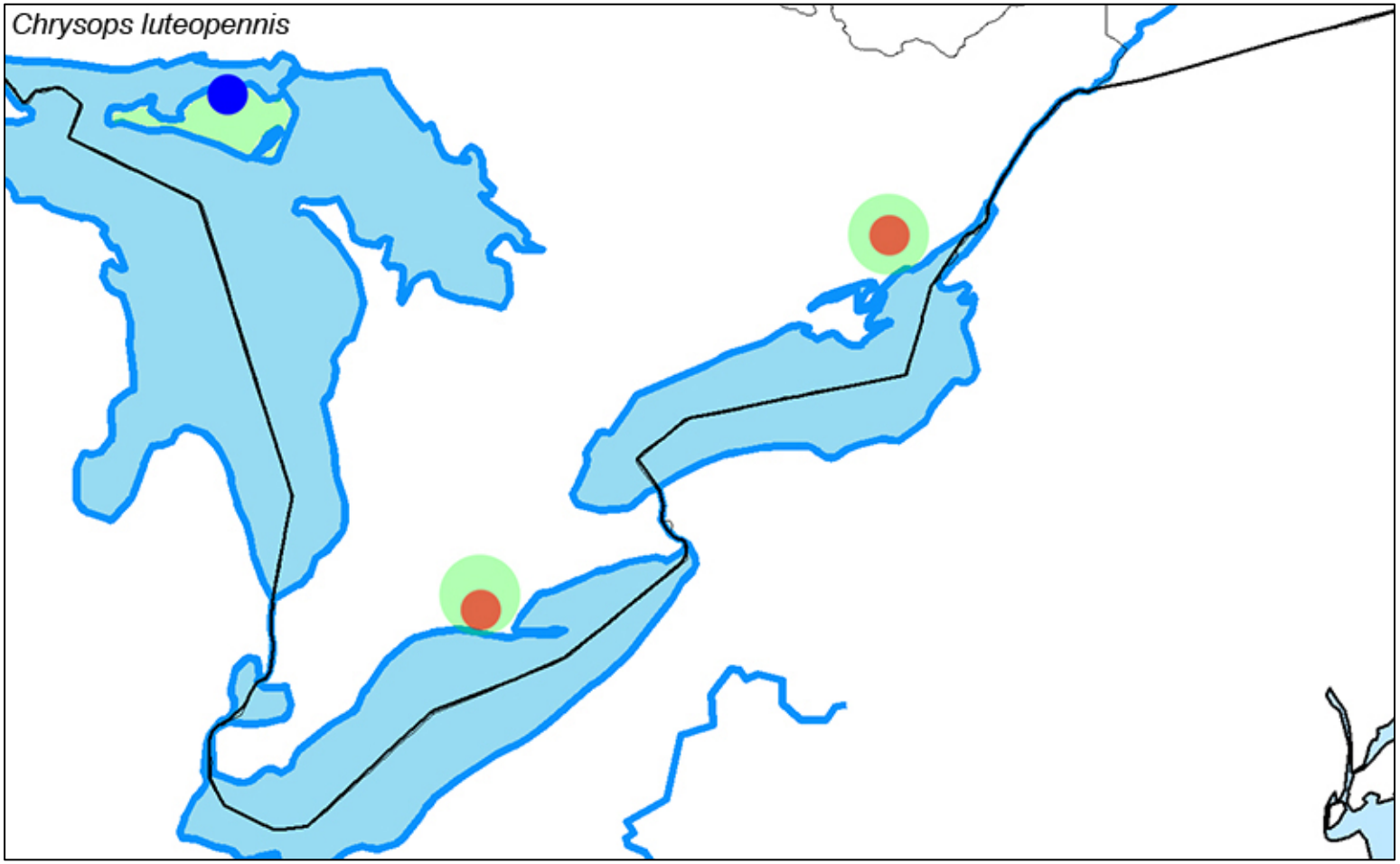


Map 31. *Chrysops luteopennis* (red – from Teskey (1990), blue – DEBU record).

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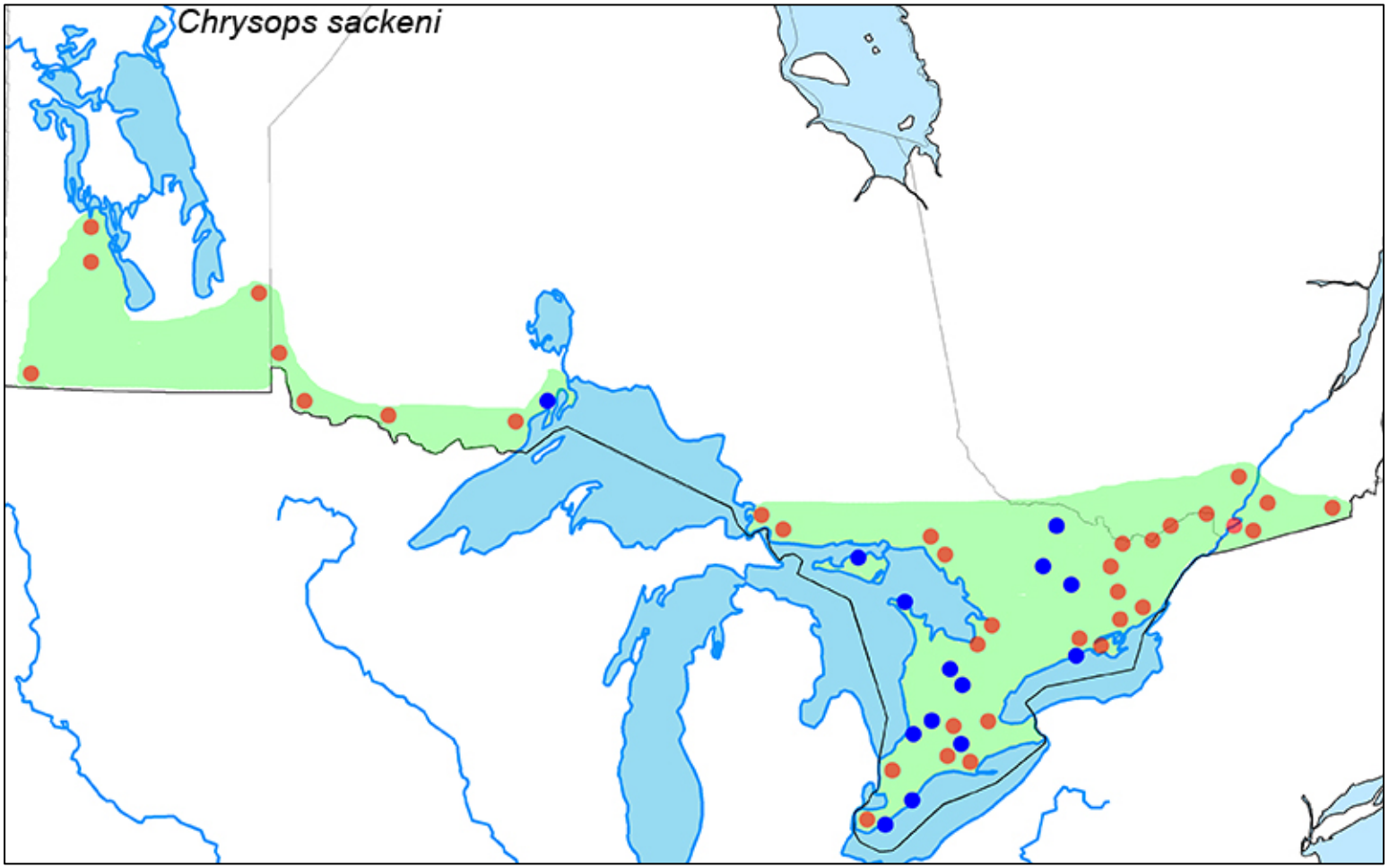


Map 32. *Chrysops sackeni* (red – from Teskey (1990), blue – DEBU records).

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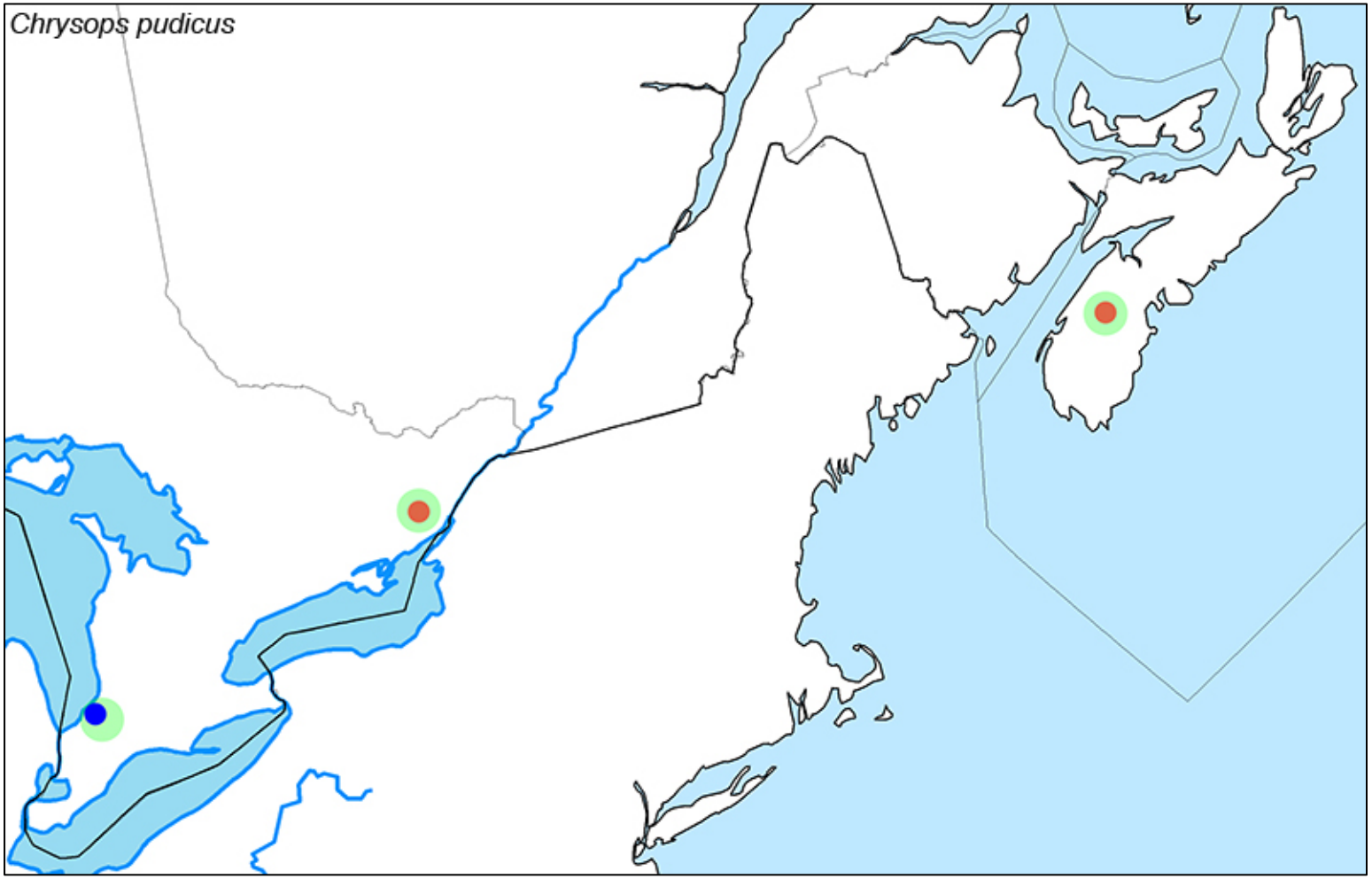
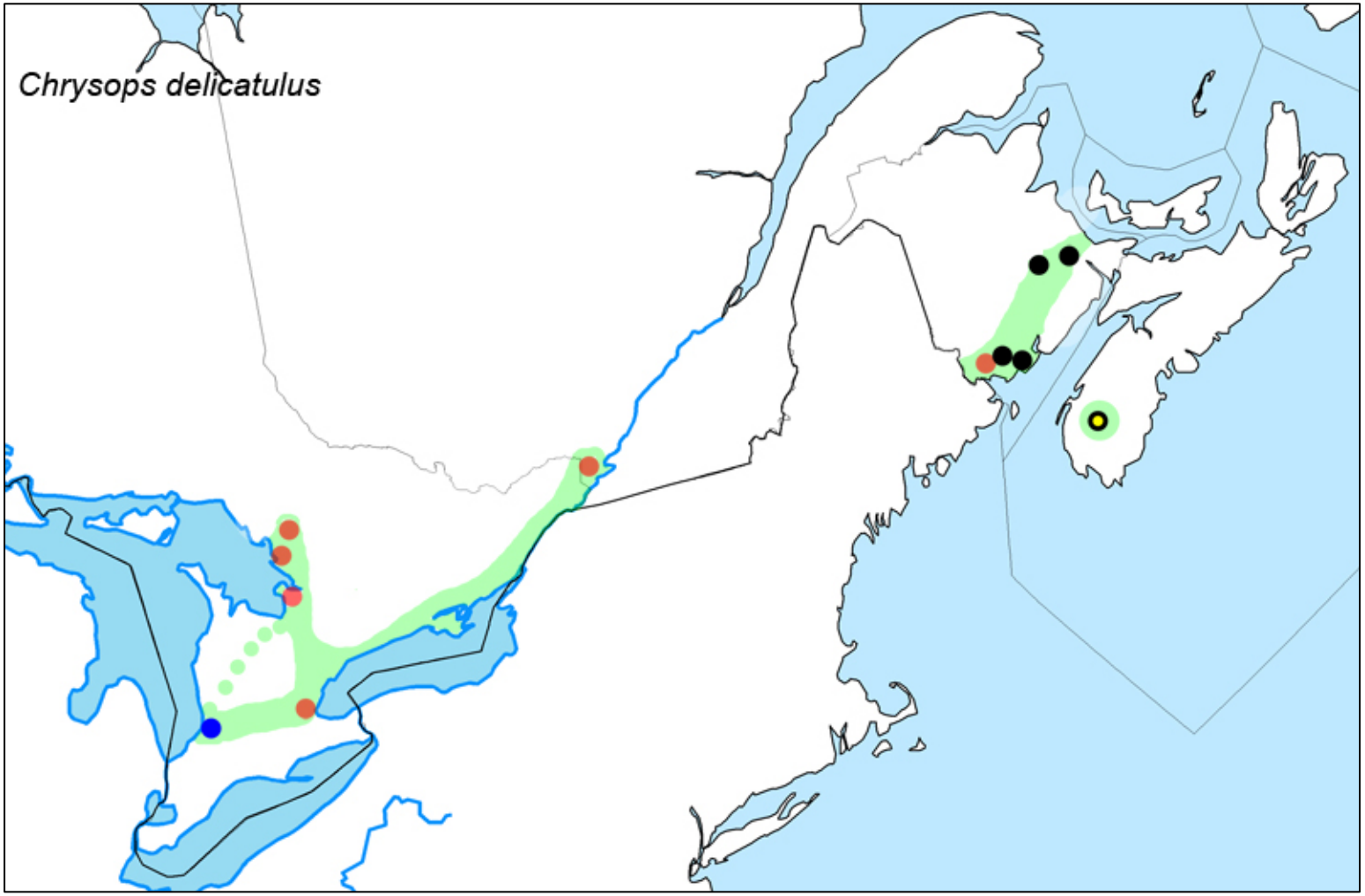


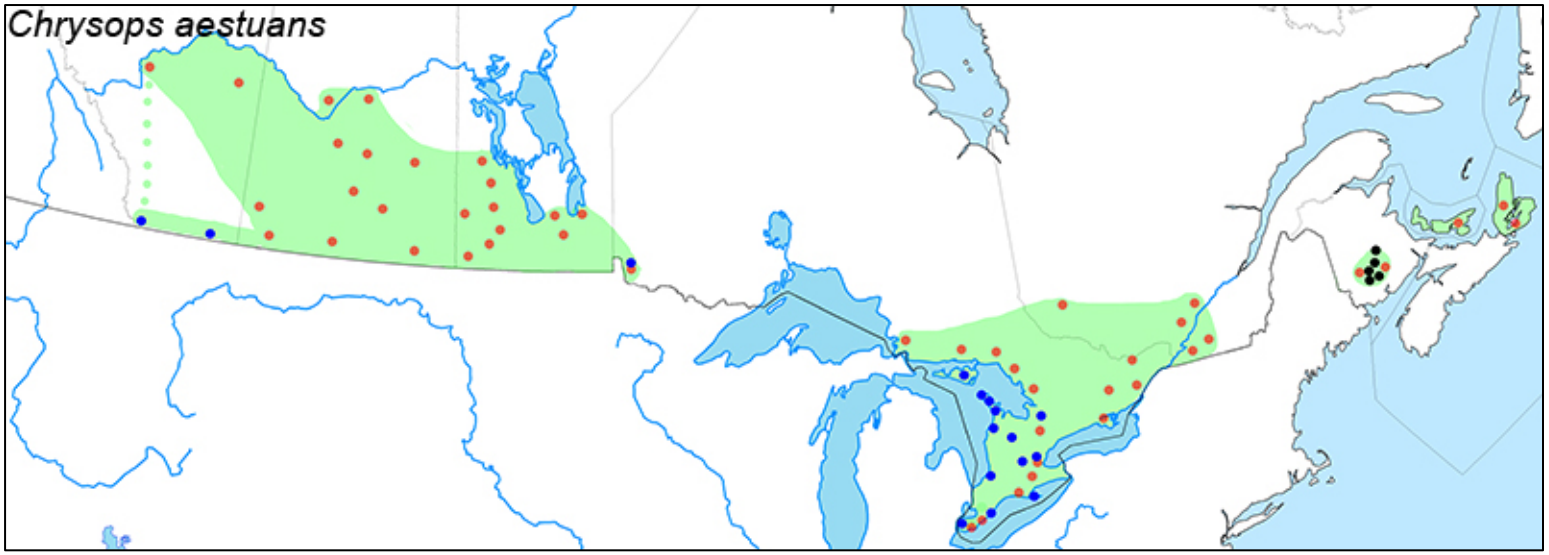

Map 33. *Chrysops pudicus* (red – from Teskey (1990), blue – DEBU record).

Previous map Next map Species page



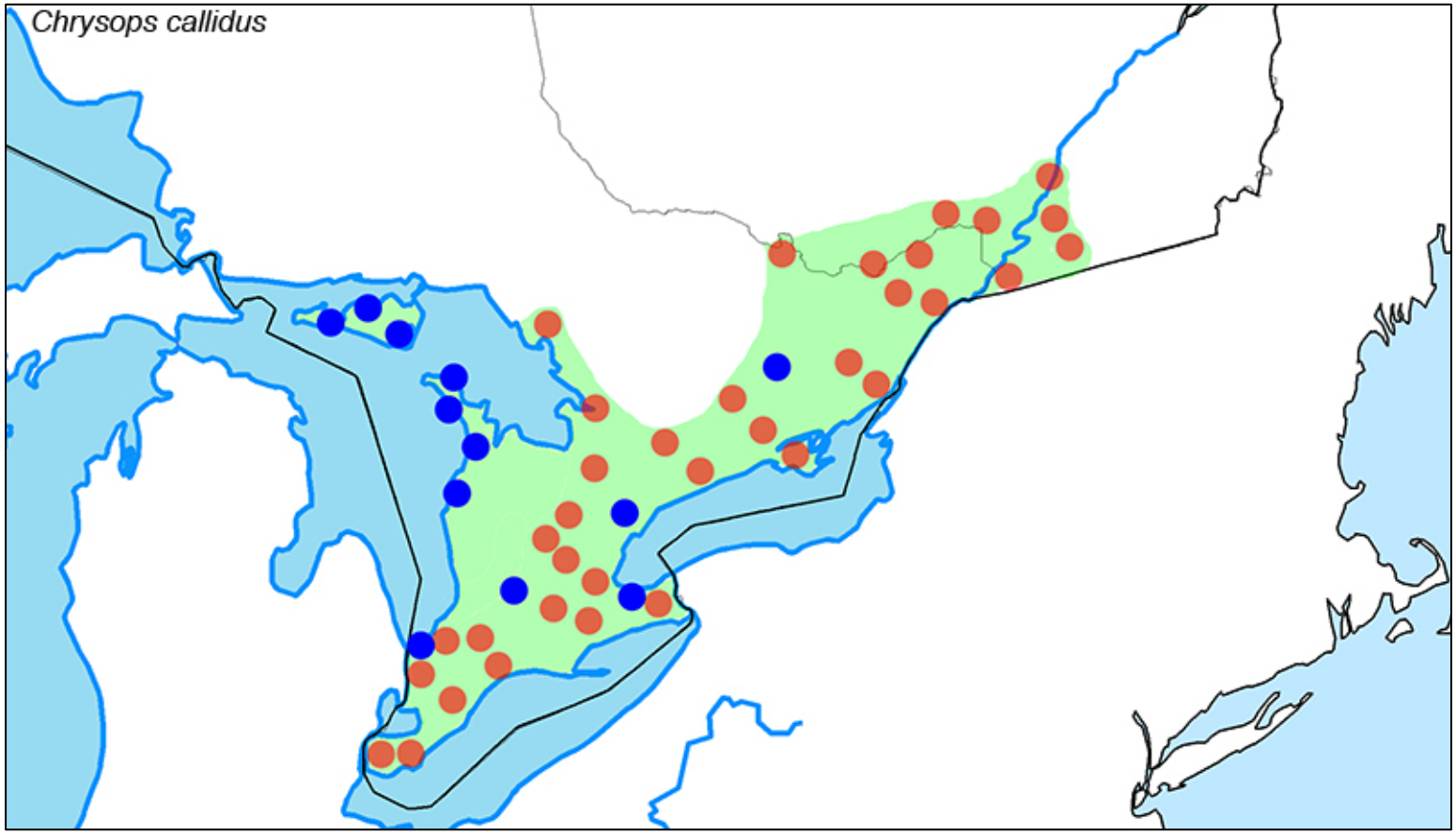

Map 34. *Chrysops delicatulus* (red – from Teskey (1990), black – AWT records, yellow in black – Hurlburt et al record, blue – DEBU record).

Previous map Next map Species page



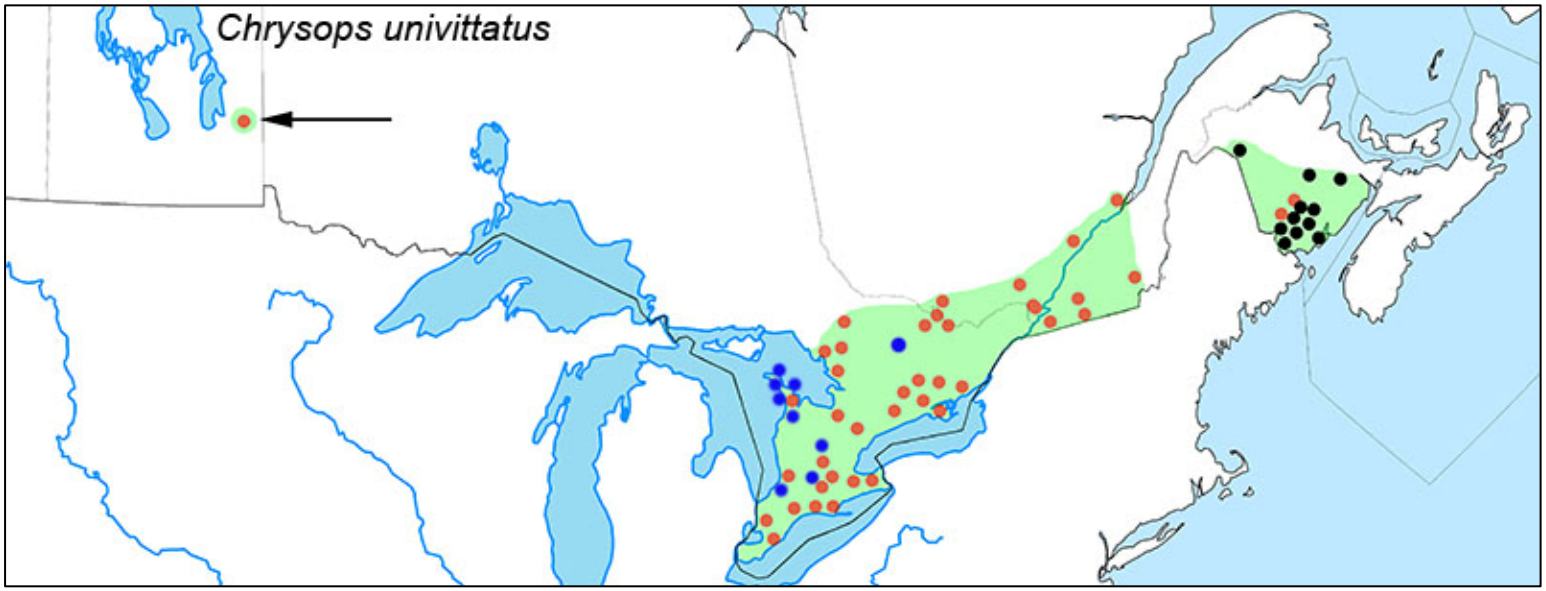

Map 35. *Chrysops aestuans* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

Previous map Next map Species page




Map 36. *Chrysops callidus* (red – from Teskey (1990), blue – DEBU records).

Previous map Next map Species page




Map 37. *Chrysops univittatus* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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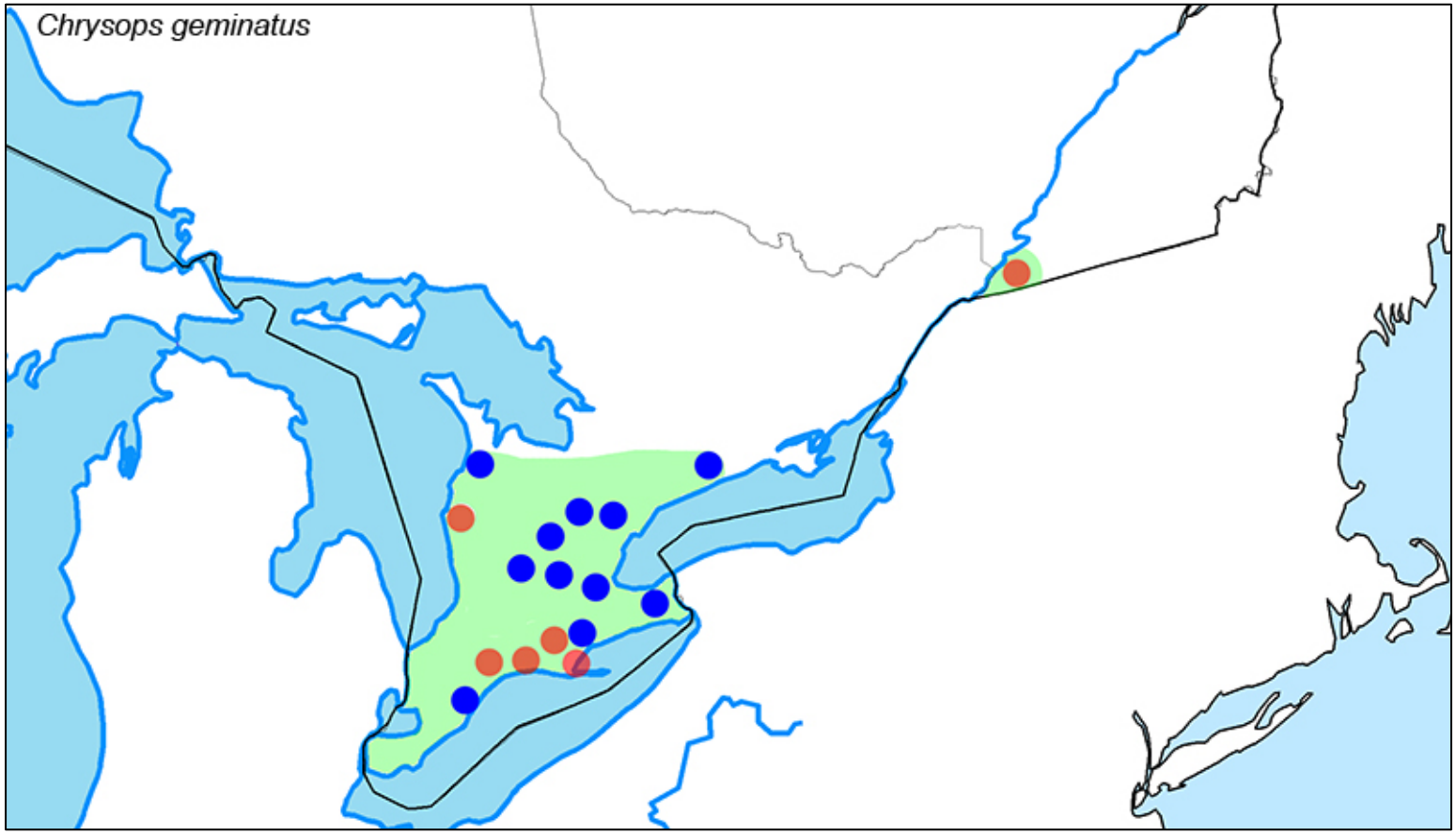
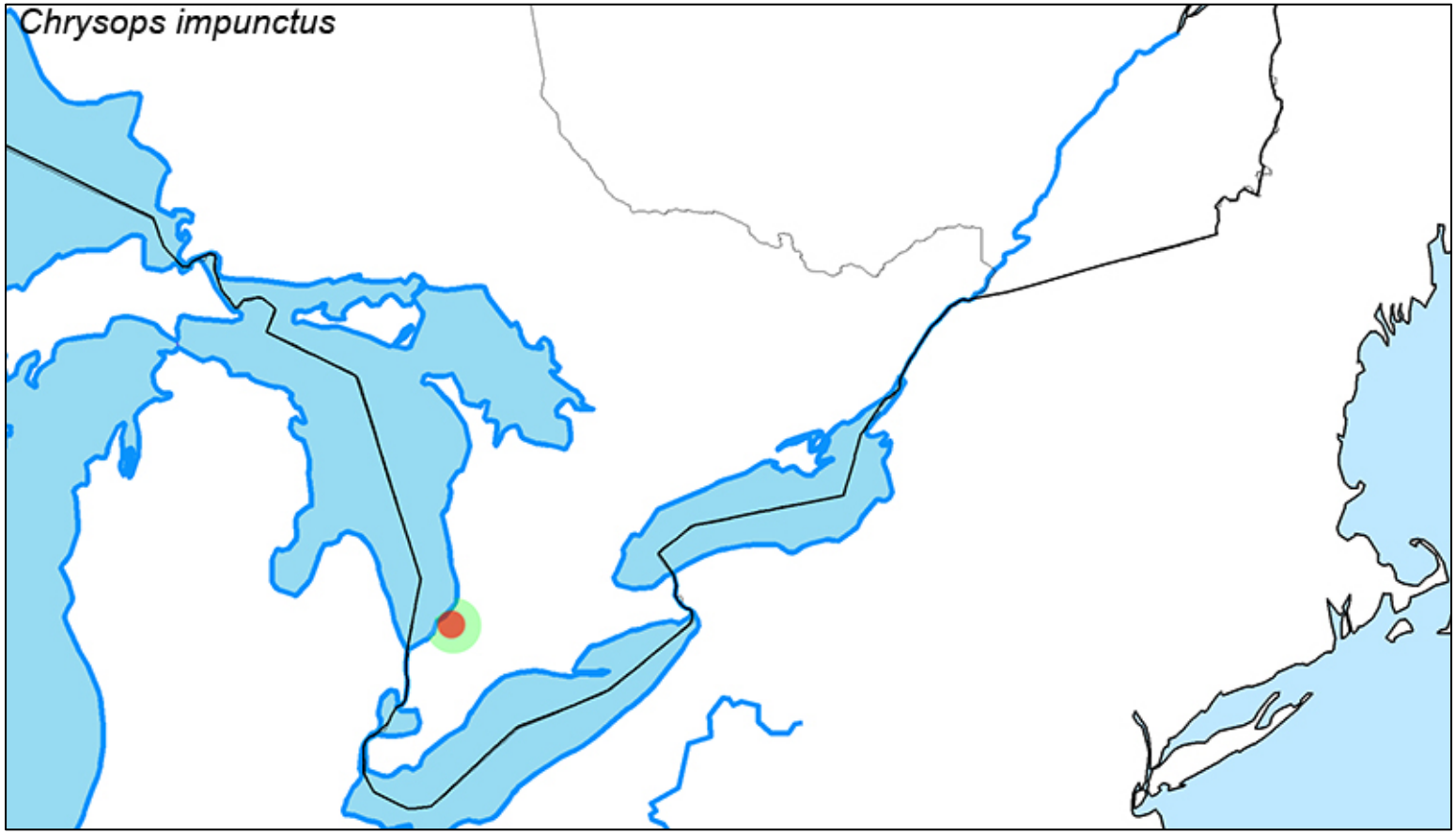


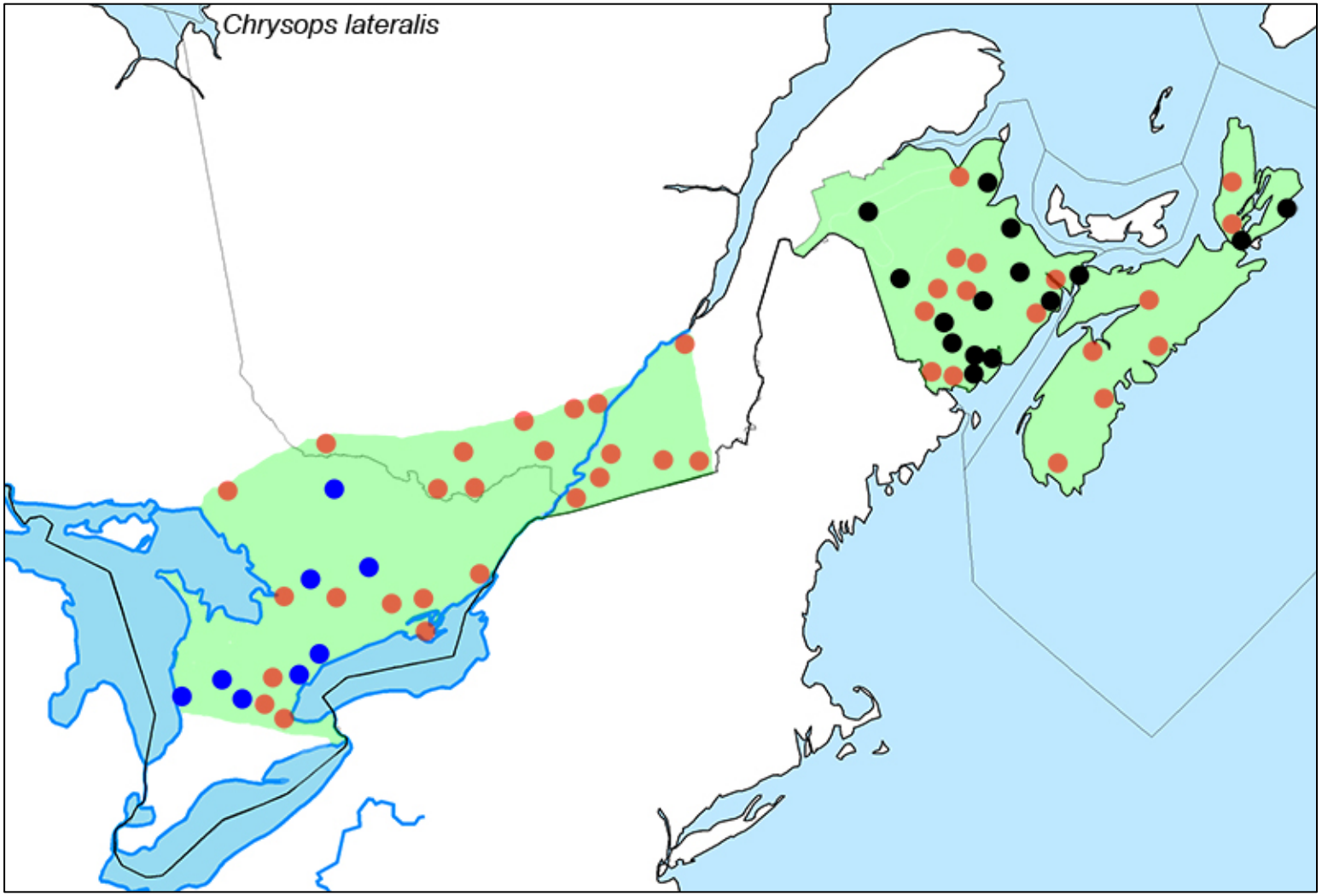

Map 38. *Chrysops geminatus* (red – from Teskey (1990), blue – DEBU records).

Previous map Next map Species page




Map 39. *Chrysops impunctus* (red – from Teskey (1990)).

Previous map Next map Species page




Map 40. *Chrysops lateralis* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

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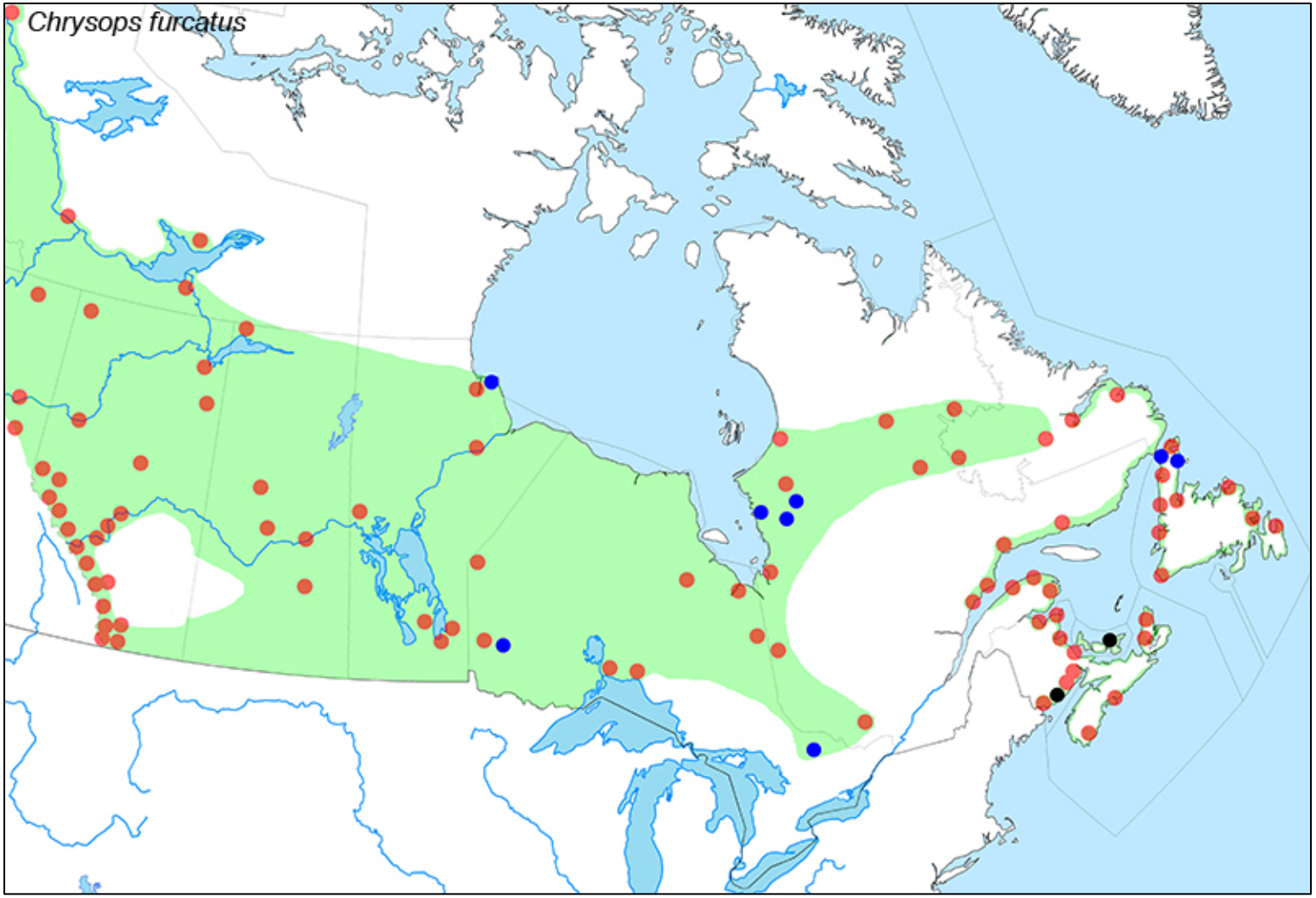
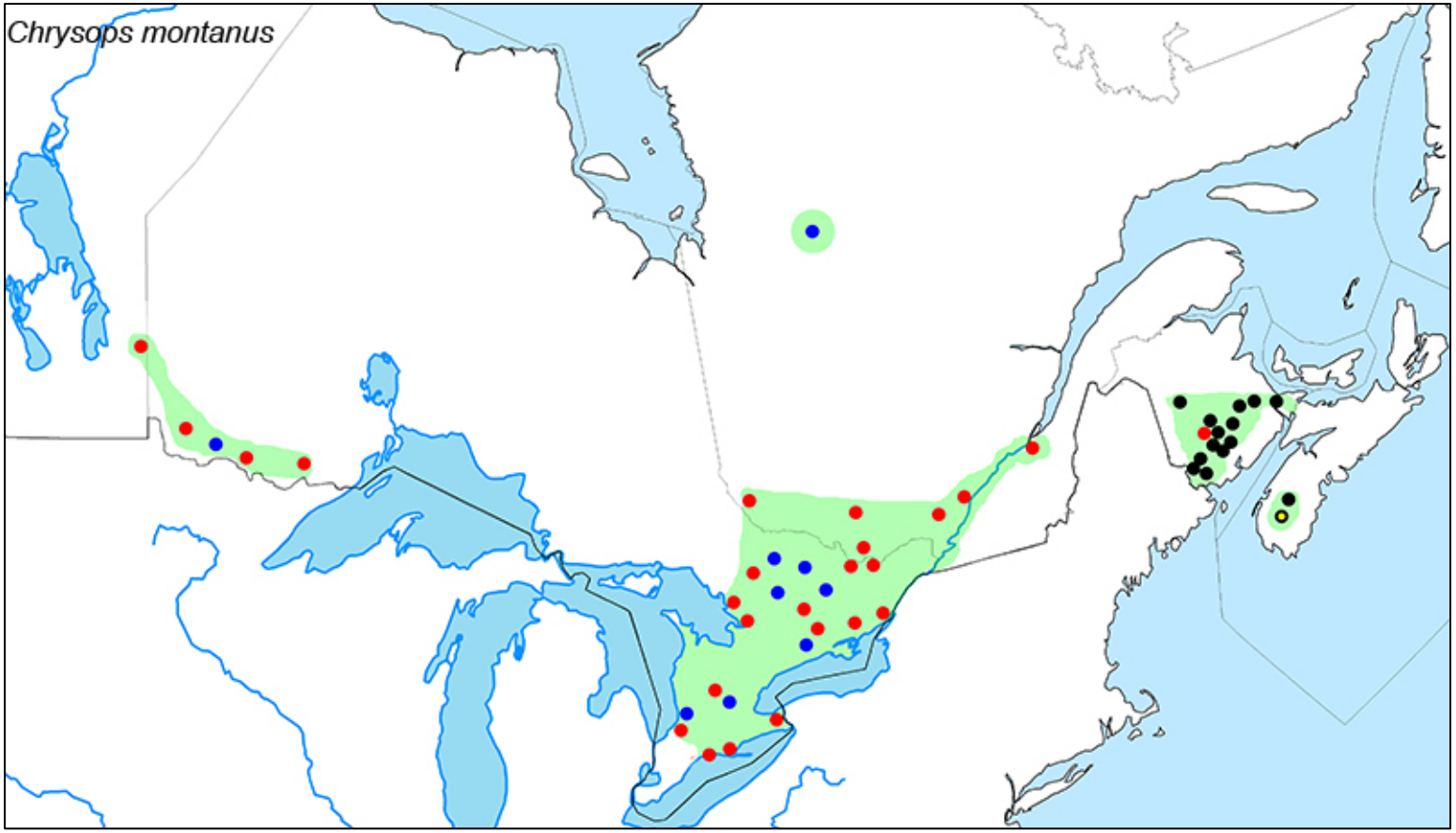


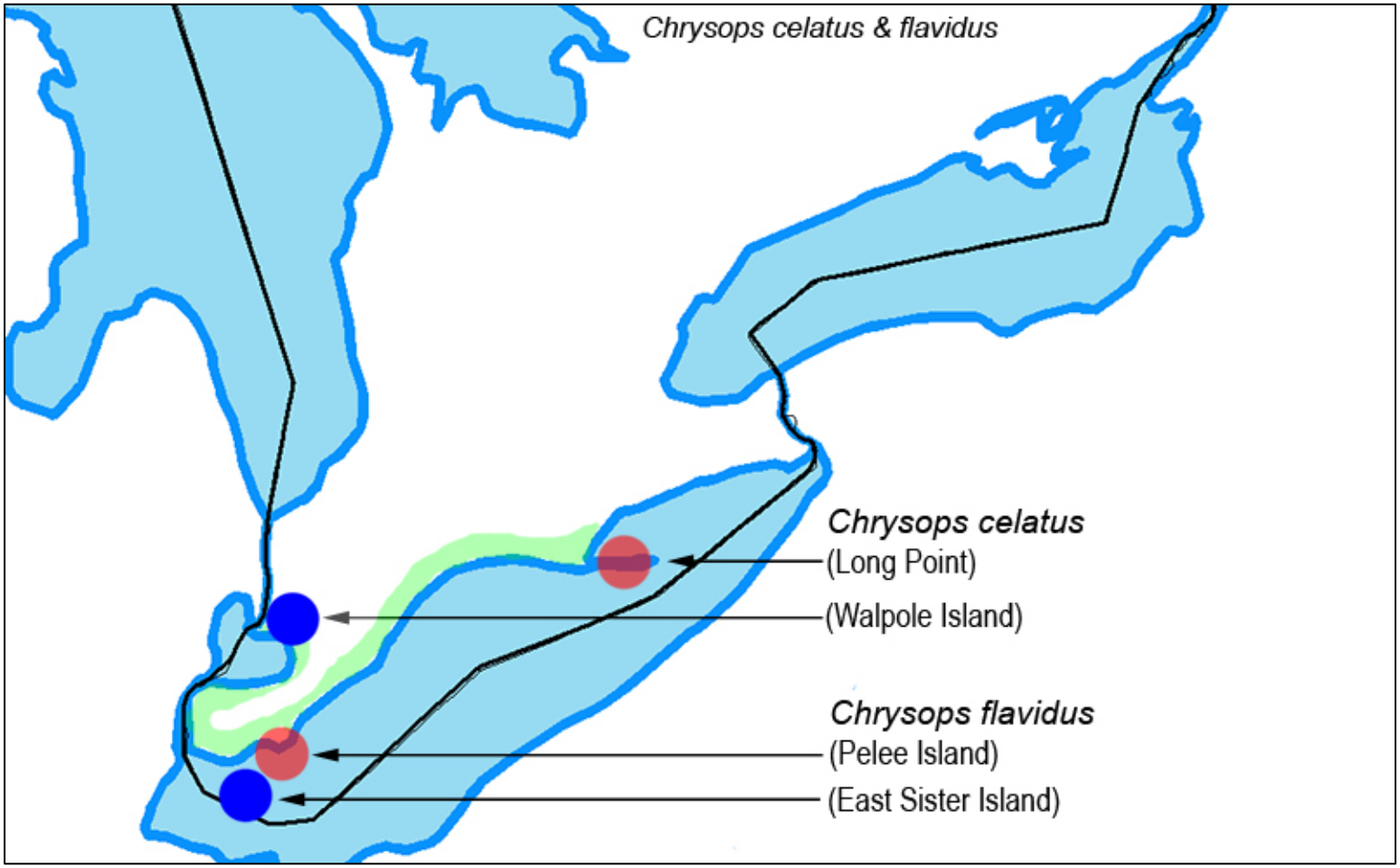

Map 41. *Chrysops furcatus* (red – from Teskey (1990), black – AWT records, blue – DEBU records).

Previous map Next map Species page




Map 42. *Chrysops montanus* (red – from Teskey (1990), black – AWT records, yellow in black – Hurlburt et al record, blue – DEBU records).

Previous map Next map Species page




Map 43. *Chrysops celatus & Chrysops flavidus* (red – from Teskey (1990), blue – DEBU records).

Previous map *C. flavidus* species page *C. celatus* species page

# COMPARISON OF *CHRYSOPS* ABDOMENS

LIST OF PLATES

**Black spp.** 1: *calvus*; 2: *niger*; 3: *carbonarius*; 4: *ater*; 5: *mitis*; 6*: cincticornis*

**Dark spp.** 1: *sordidus*; 2*: excitans*; 3: *cuclux*; 4: *dawsoni*; 5: *nigripes*; 6: *zinzalus*

**Black & yellow, non-striped abdomen spp**. !: *venus*; 2: *frigidus*; 3: *delicatulus*; 4: *callidus*; 5: *pudicus*; 6: *geminatus*; 7: *sackeni*; 8*: indus*.

**Black & yellow spp**. 1: *lateralis*; 2: *pikei*; 3: *furcatus*; 4: *luteopennis*; 5*: impunctus*; 6: *macquarti.*

**Dark and pale spp**. 1: *univittatus*; 2: f*uliginosus*; 3: *aestuans*; 4: *discalis*; 5: *brunneus*; 6*: flavidus*; 7: *celatus*; 8: *fulvaster.*

**4-striped abdomen spp**. 1: *shermani*; 2*: montanus*; 3: *aberrans*; 4: *striatus*; 5: *vittatus*; 6: *moechus*.

Checklist

# COMPARISON OF *CHRYSOPS* FACES

LIST OF PLATES

**1**. 1:*calvus*; 2: *niger*; 3: *cincticornis*; 4: *carbonarius* 5*: ater*; 6: *mitis*.

**2**. 1: *sordidus*; 2*: excitans*; 3*: cuclux*; 4: *nigripes* ; 5: *dawsoni*; 6: *frigidus*; 7: *zinzalus*; 8: *venus*.

**3**. 1: *delicatulus*; 2: *pudius*; 3: *sackeni*; 4: *geminatus*; 5: *callidus*; 6: *indus*

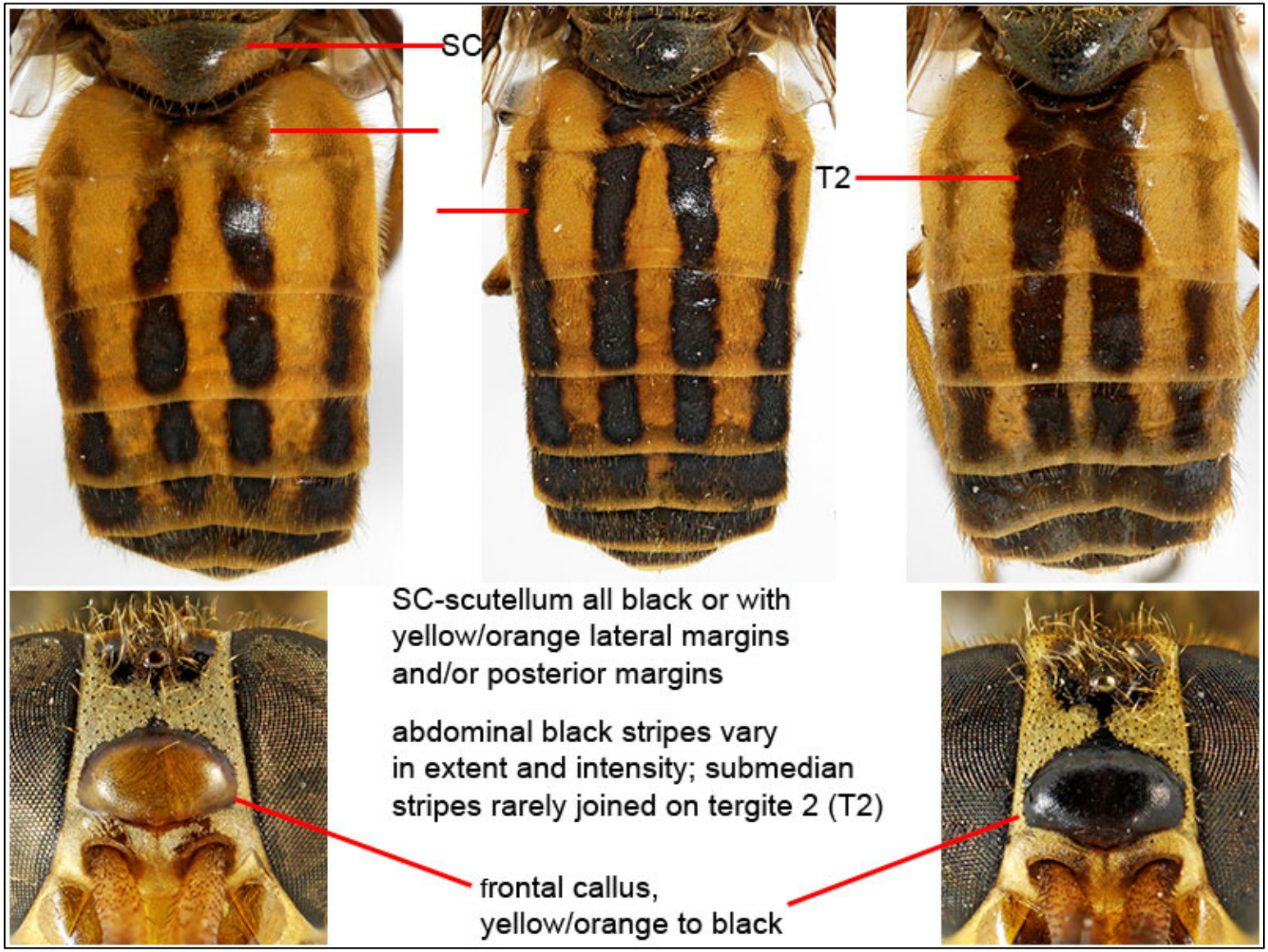
**4**. 1: *lateralis*; 2: *moechus*; 3*. montanus*; 4: *pikei*; 5: *furcatus*; 6: *macquart*i

**5**. 1: *univittatus*; 2: *fuliginosus*; 3*: aestuans*; 4: *discalis*;5: *brunneus*; 6*: flavidus*; 7*: clelatus*; 8: *fulvaster*

**6**. 1: *striatus*; 2: *aberrans (*2 flies*)*; 3*: shermani*; 4: *vittatus*

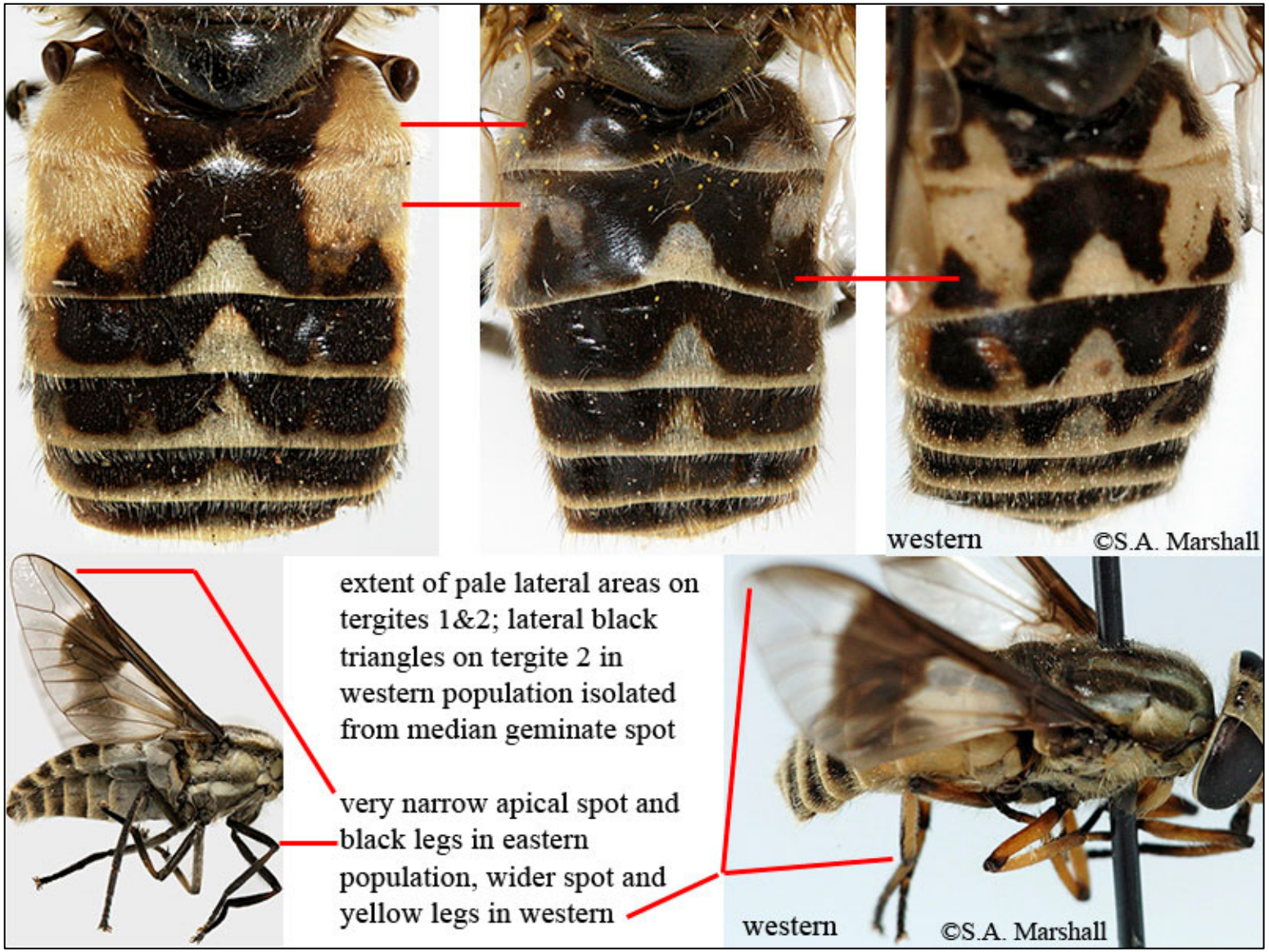
Note: no face views of *C. impunctus* and *C. luteopennis*

Checklist




*Chrysops aberrans*. Variations in frontal callus, scutellum, lateral and submedian black abdominal stripes.

Species page




*Chrysops aestuans*. Variations in pattern on tergites 1, 2, and 3; apical spot on wing and leg colour. The western population was described by Philip (1941) as *C. aestuans* subsp. *abaestuans*.

Species page

*Chrysops celatus*. Variations in intensity of dark markings on tergites

Species page

*Chrysops dawsoni*. Variations in extent of yellow lateral spots. The apparent pale triangle midline of tergite 2 on the left image is a reflection from the flash.

Species page

*Chrysops excitans*. Variations in extent of yellow lateral spots.

Species page

*Chrysops flavidus*. Variations in intensity of dark markings

Species page

*Chrysops frigidus*. Variations in extent of dark makings

Species page

*Chrysops furcatus*. Variations in extent of black on tergites

Species page

*Chrysops indus*. Variations in extent of black on tergites 3, 4, and 5.

Species page

*Chrysops lateralis*. Variations in extent of black on tergites 3 and 4.

Species page

*Chrysops  moechus*. Variations in extent of black on tergites 1-4.

Species page

*Chrysops pudicus*. Variations in extent of hyaline triangle (at apex), and width and extent of apical spot.

Species page

*Chrysops striatus*. Scutellum varies from all black to mostly reddish; submedian black stripes either joined/not joined on tergite 2; sublateral dark stripes weak or absent on tergite 2.

Species page

*Chrysops univittatus*. Scutellum varies from all black to all yellow; median yellow stripe either narrow or wide; variable amount of yellow laterally on tergites 1 and 2.

Species page

*Chrysops vittatus*. Abdominal tergites typically with 4 dark longitudinal stripes, very rarely not striped as in specimen on right that has the unique *vittatus* wing pattern.

Species page

*Chrysops zinzalus*. Variation in extent of yellow on tergites 1 and 2.

Species page

**Acknowledgements**

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**1] For the image of *Merycomyia whitneyi* we thank Sturgis McKeever (image citation: Sturgis McKeever, Georgia Southern University, Bugwood.org), image used under a Creative Commons Attribution-Noncommercial 3.0 United States License: http://www.insectimages.org/browse/detail.cfm?imgnum=1487008**
**2] For the images of *Goniops chrysocoma* we thank Troy Bartlett. Images used under permission granted on this page: http://bugguide.net/user/view/7**
**3] For the images of *Chrysops brunneus*, *Chrysops callidus*, we thank Gayle and Jeanell Strickland.**

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