

# **An updated and annotated checklist of the thick-headed flies (Diptera: Conopidae) of British Columbia, the Yukon, and Alaska**

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## **ABSTRACT**

The thick-headed flies (Diptera: Conopidae) are rarely observed parasitoids. Confirmed hosts include many species of bees and wasps. Often collected from flowers, conopids may serve as either pollinators or pollinator predators. The last detailed checklist of the Conopidae of British Columbia was published in 1959. An updated checklist for British Columbia, the Yukon, and Alaska is presented based on over 1,000 specimens and specimen records. Geographical distribution, using an ecoprovince approach, is documented for each of 26 species in the region. Host, plant association, and hilltopping behavioural records based on past literature and new observations are also included. An identification key to all species recorded is included.

**Key words:** parasitoid, biogeography, plant associations, host associations, Nearctic

## **INTRODUCTION**

Conopidae (thick-headed flies) is a small, rarely collected family within the acaulprate Diptera. Many species are noted for their mimicry of wasps and bees. Adult female conopids deposit eggs within living hosts using modified abdominal structures, often in midflight. The larvae develop within the host, slowly consuming tissue, until the host succumbs. Pupation occurs inside the host. Adult eclosion from the host's corpse usually follows an overwintering period. Various species of Hymenoptera are reported as hosts, but confirmation of host status by rearing is rare (Gibson et al., 2014). The possible impact of Conopidae on pollinator communities has been the focus of some research (e.g., Schmid-Hempel and Schmid-Hempel 1996, Gillespie 2010, Malfi and Roulston 2013). Conopids are also regularly collected from flowers but their role as pollinators, or even their degree of plant specificity, is poorly documented. Studies investigating specific flower associations or possible roles as pollinators have been few and limited (Freeman 1966, Maeta and Macfarlane 1993).

Other aspects of Conopidae life history are understudied. Some species engage in hilltopping behaviour (Mei et al. 2010), where males gather on hilltops or other prominent geographical features to await females. The degree to which hilltopping strategies are used by different species of Conopidae is poorly known.

Worldwide, more than 800 species of Conopidae – organized into six subfamilies and 59 genera and subgenera – are currently described (Gibson and Skevington 2013). Species live in every region and continent except Antarctica and the Pacific Islands. Williston (1882, 1883, 1885) described a large number of the western Nearctic species and summarized the current knowledge in a series of papers. Later studies of Nearctic species include Van Duzee's (1927) review of California Academy of Sciences (CAS) specimens and Parsons' (1948) analysis of material from Harvard's Museum of Comparative Zoology (MCZ). The tireless work of Sid Camras includes revisions of

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individual North American genera (Camras 1943, 1944, 1953, 1955, 1957), regional analyses (Camras and Hurd 1957), and continental catalogues (Camras 1965).

The Canadian summary of insect diversity (McAlpine et al. 1978) lists 30 species of Conopidae, with fifteen more likely to be discovered or described. The most recent review of the Conopidae fauna of British Columbia was that of Smith (1959), whose checklist, based on 104 specimens from the Spencer Entomological Museum (University of British Columbia) collection, included eighteen species in six genera. Smith did not draw any conclusions about the intraprovincial distribution of each species. Neither *Insects of the Yukon* (Danks 1997), nor *Arctic Arthropods* (Danks 1981), mentions Conopidae. An updated list of conopid species in the northwestern Nearctic, along with a summary of all known host and plant associations is necessary to assess the true biodiversity and ecological impact of this family in the region.

## MATERIALS AND METHODS

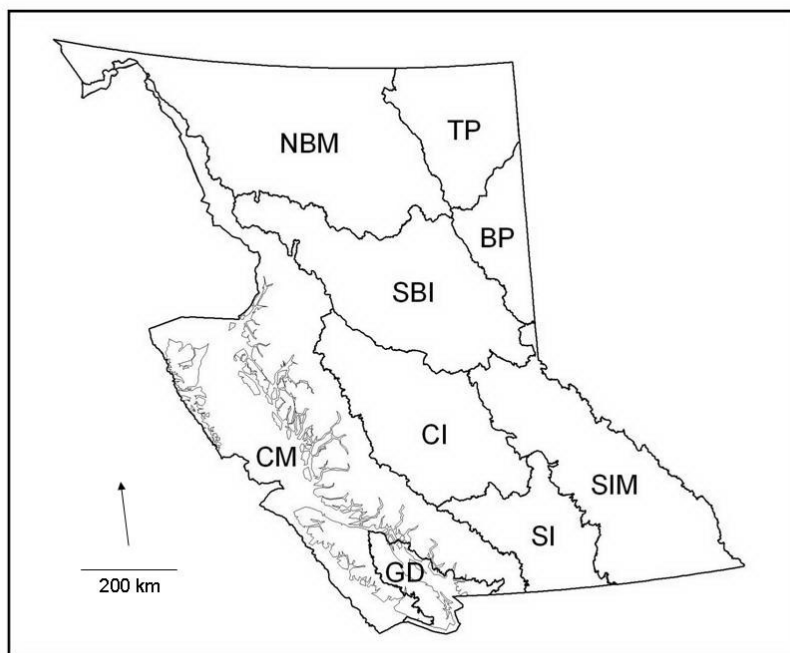
Taxonomic classification follows that of Gibson and Skevington (2013). Morphological features are as described in Gibson and Skevington (2013) and Gibson et al. (2013). Previous records of Conopidae confirmed from British Columbia, Alaska, and the Yukon are tallied. Records include specimens loaned to the author as well as digital databases of specimens with confirmed identifications. All notes regarding collection date, plant associations, rearing from hosts, or hilltop locations are recorded. Previous literature was examined to gather data on species range, host records, and plant associations. Specimens examined, or confirmed specimen records, are listed in each species account and are housed in the following collections: University of Calgary Museum of Zoology, Calgary, Alberta (BDUC); California Academy of Sciences, San Francisco, California (CAS); Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario (CNC); University of Guelph Insect Collection, Guelph, Ontario (DEBU); Essig Museum of Entomology, University of California, Berkeley, California (EMEC); Royal BC Museum, Victoria, British Columbia (RBCM); Royal Ontario Museum Entomology Collection, Toronto, Ontario (ROME); Royal Saskatchewan Museum, Regina, Saskatchewan (RSM); Spencer Entomological Collection (Beaty Biodiversity Museum), University of British Columbia, Vancouver, British Columbia (SEM); University of Alaska Museum Entomology Collection, Fairbanks, Alaska (UAM); National Museum of Natural History, Washington, D.C. (USNM); William F. Barr Entomological Collection, University of Idaho, Moscow, Idaho (WFBM); Wallis-Roughley Museum of Entomology, University of Manitoba, Winnipeg, Manitoba (WRME); James Entomological Collection, Washington State University, Pullman, Washington (WSU).

An ecoprovince approach, similar to that of Ratzlaff (2015), is employed. Ecoprovinces are defined as those in Demarchi (2011), Smith et al. (2004), and Gallant et al. (1995). Ecoprovinces have been used in other recent insect checklists for British Columbia (Scudder and Cannings 2009, Ratzlaff 2015) to summarize insect distributions. With this method, the province is divided into area based on climatic, topographic, and geological similarity (Demarchi 2011). There are ten ecoprovinces in BC (Fig. 1), each of which could be considered unique sets of habitats. The presence of each conopid species within these ecoprovinces has been recorded.

## RESULTS AND DISCUSSION

Analysis of 1,016 specimens and specimen records has produced a list of 26 species of Conopidae in British Columbia (Table 1). Six of these species also occur in Yukon, and three of them are known in Alaska. This represents nine species added to Smith's (1959) checklist and, for sixteen more species, geographical ranges in BC, Yukon, and Alaska are expanded. A complete list of all specimens included in the analysis –

including collection localities, collectors, dates, and repositories – has been uploaded to figshare (DOI: 10.6084/m9.figshare.5373361).



**Figure 1.** British Columbia ecoprovinces as adapted from Scudder and Cannings (2009). Ecoprovince abbreviations: GD – Georgia Depression; CM – Coast and Mountains; SI – Southern Interior; SIM – Southern Interior Mountains; CI – Central Interior; SBI – Southern Boreal Interior; NBM – Northern Boreal Mountains; BP – Boreal Plains; TP – Taiga Plains.

Say (1823) describes *Physocephala marginata* from Missouri. Parsons (1948) reports the range of this species as Kansas and Texas and East to Massachusetts, with isolated individual specimens from Quebec, Ontario, Wyoming, and the Nicola Valley, British Columbia. The inclusion of British Columbia in the range of *P. marginata* in this paper and inclusion in Smith's (1959) subsequent list is likely based on a single misidentified specimen. Analyses recovered no specimens from British Columbia, Yukon, Alberta, Saskatchewan, or Manitoba. This species likely does not occur in Canada west of Ontario. (Note – this species has not been included in the summary of species in Table 1). Confirmed rearing records from other regions were found for nine species. Plant associations were recorded for all but one species. Hilltopping behaviour, including observations of hilltopping in BC, was recorded for five species. Detailed discussion of patterns of distribution and ecological associations follows a complete species checklist.

#### Key to species of Conopidae found in British Columbia, Yukon, and Alaska

1. Labella subequal in length to prementum, filiform, at least partly fused, folded back along prementum; metatibia without apical shiny patch; vein  $CuA_2$  straight; female abdominal tergite and sternite 5 separate; male cerci broadly attached..... 2
- Labella, shorter than prementum, broad, separate for entire length, projecting forward from apex of prementum; shiny patch present near apex of metatibia;

- vein CuA<sub>2</sub> curved along its length; female abdominal tergite and sternite 5 fused; male cerci attached by narrow, sclerotized stalk .....16
2. Ocellar and postocellar bristles absent; basisternum broad; veins Sc and R<sub>1</sub> separate for entire length; female abdominal tergite and sternite 6 completely separate; female abdominal segment 7 laterally compressed along entire length; phallus visible, elongate, ribbon-shaped, setose along entire length.....  
.....*Dalmanniinae* ... *Dalmannia*...3
- Ocellar and postocellar bristles present; basisternum short, narrow, single sclerite; veins Sc and R<sub>1</sub> fused before reaching costa; female abdominal tergite and sternite 6 at least partly fused; female abdominal segment 7 rounded at least in basal half; phallus usually not visible externally ..... *Myopinae* ... 5
3. Small species; total body length <4mm. Scutellum and femora entirely black..... *Dalmannia vitiosa* Coquillet 1892
- Larger; total body length >6mm. Scutellum and femora with some yellow .....4
4. Dorsal hairs black. Wings smoky ..... *Dalmannia blaisdelli* Cresson 1919
- Dorsal hairs white. Wings hyaline ..... *Dalmannia picta* Williston 1883
5. Stout, reddish flies with a large white head; gena at least one third of total head height; anterior margin of subcranial cavity rounded; costa uniform thickness along entire length ..... *Myopa* ... 6
- Small (<10mm total length) black, shining flies; gena less than one third of head height; anterior margin of subcranial cavity straight; costa thickened at endpoint of Sc+R<sub>1</sub> .....*Thecophora* ... 12
6. Wings with spots or with cross-veins clouded ..... 7
- Wings completely hyaline ..... 8
7. Wings with only cross-veins clouded ..... *Myopa vicaria* Walker 1849
- Wings with distinct spots in addition to clouded cross-veins .....  
..... *Myopa willistoni* Banks 1916
8. Abdomen almost entirely black ..... 9
- Abdomen almost entirely red; with or without pollinosity ..... 10
9. Abdomen dorsally with long, black hairs ..... *Myopa longipilis* Banks 1916
- Abdomen dorsally with short, pale hairs ..... *Myopa vesiculosa* Say 1823
10. Abdomen with dense, long black hairs dorsally; (this species is easily confused with *M. clausa* and *M. rubida*) ..... *Myopa curticornis* Kröber 1916
- Abdomen with sparse, short black hairs dorsally ..... 11
11. Abdomen dorsally with extensive pollinosity; (this species is easily confused with *M. curticornis* and *M. rubida*) ..... *Myopa clausa* Loew 1866
- Abdomen dorsally without extensive pollinosity; (this species is easily confused with *M. clausa* and *M. curticornis*) ..... *Myopa rubida* (Bigot 1887)
12. Hind femora entirely black; abdomen with entirely pale hairs .....  
.....*Thecophora propinqua* (Adam 1903)
- Hind femora at least partly yellow; abdomen with at least some black hairs .. 13
13. Large species (total body length >6mm); hind femora almost entirely yellow .....  
..... *Thecophora modesta* (Williston 1883)
- Smaller species (total body length <6mm); hind femora partly yellow and partly black ..... 14
14. Less than one third of hind femora yellow; (this species is easily confused with *T. nigripes* and *T. occidentis*) ..... *Thecophora luteipes* (Camras 1945)
- One third to three quarters of hind femora yellow ..... 15
15. One third to one half of hind femora yellow; (this species is easily confused with *T. luteipes* and *T. occidentis*) ..... *Thecophora nigripes* (Camras 1945)
- More than one half of hind femora yellow (this species is easily confused with *T. luteipes* and *T. nigripes*) ..... *Thecophora occidentis* (Walker 1849)

16. First abdominal segment as broad as thorax; arista mid-dorsal; second aristomere equal in length to first; scape quadrate; ocellar tubercle well-developed; ocellar and postocellar bristles present; anterior margin of subcranial cavity rounded; maxillary palpal length at least equal to prementum width; basisternum narrow, divided posteriorly, with elongate and narrow posterolateral extensions; more than two pairs of scutellar bristles usually present; vena spuria absent; epandrium separate beyond cerci ..... *Zodioninae* ... *Zodion* ... 17
- First abdominal segment narrow and thread-like; arista stylate and apical; second aristomere usually expanded ventrally; scape at least twice as long as wide; ocellar tubercle reduced or absent; ocellar and postocellar bristles absent; anterior margin of subcranial cavity projecting forward at junction with medial carina; maxillary palpi reduced or absent; basisternum broad, posterolateral extensions short and blunt; zero or one pair of scutellar bristles; vena spuria present; epandrium fused beyond cerci ..... *Conopininae* ... 22
17. Thorax dark with white or golden stripes .....  
 ..... *Zodion obliquefasciatum* (Macquart 1846)
- Thorax either entirely dark or lighter with darker spots or stripes ..... 18
18. Small species (total body length <5mm); thorax pale grey or green with dark markings ..... *Zodion americanum* Wiedemann 1830
- Larger species (total body length >5mm); thorax variable, but usually dark, sometimes with darker markings ..... 19
19. Smaller species (total body length <6mm); almost entirely grey with some darker markings ..... 20
- Larger species (total body length >6mm); grey to dark grey with some reddish colouration in the abdomen; with or without darker stripes ..... 21
20. Third tergite of female abdomen longer than all other tergites; (males may be indistinguishable from *Z. cinereiventre*) ..... *Zodion perlongum* Coquillet 1902
- Third tergite of female abdomen equal in length or shorter than at least one other tergite; (males may be indistinguishable from *Z. perlongum*) .....  
 ..... *Zodion cinereiventre* Van Duzee 1927
21. Abdomen with extensive red colouration; (this species is easily confused with *Z. intermedium*) ..... *Zodion fulvifrons* Say 1823
- Abdomen without red colouration or with red limited to outer margins; (this species is easily confused with *Z. fulvifrons*) .....  
 ..... *Zodion intermedium* Banks 1916
22. Ocelli and ocellar tubercle absent; ventral half of proepisternum bare; prominent row of setae on posterior surface of mesofemur absent; metafemur expanded proximally ..... *Physocephala* ... 23
- Three ocelli present; ocellar tubercle present; ventral half of proepisternum with setae and/or bristles; prominent row of setae on posterior surface of mesofemur present; metafemur parallel-sided along entire length ..... *Physoconops* ... 25
23. Colouration dark to black throughout, especially on frontal markings ..... *Physocephala furcillata* (Williston 1882)
- Colouration reddish throughout, especially on frontal markings ..... 24
24. Black markings on scutum limited to a single central stripe; gena uniformly dark ..... *Physocephala burgessi* (Williston 1882)
- Black marking on scutum broad; forming either three stripes or else covering the entire dorsal surface; gena with paler central spot (this character often difficult to see) ..... *Physocephala texana* (Williston 1882)
25. Frons, second abdominal tergite, and all of the scutum very dark to black ..... *Physoconops (Physoconops) obscuripennis* (Williston 1882)

- Frons, second abdominal tergite, and at least part of the scutum reddish or light brown ..... *Physoconops (Physoconops) fronto* (Williston 1885)

**Table 1**

Species of Conopidae recorded in British Columbia, Yukon, and Alaska by Smith (1959) and the present study.

Species	British Columbia							Yukon	Alaska
	GD	CM	SI	SIM	CI	SBI	NBM		
<b>Conopinae</b>									
<i>Physocephala burgessi</i>	S,G	S,G	S,G	G	S,G				
<i>Physocephala furcillata</i> *								G	
<i>Physocephala texana</i>			S,G	G	S,G				
<i>Physoconops fronto</i> *			G						
<i>Physoconops obscuripennis</i>			S,G	G					
<b>Dalmanniinae</b>									
<i>Dalmannia blaisdelli</i>			S,G						
<i>Dalmannia picta</i> *			G	G					
<i>Dalmannia vitiosa</i> *				G					
<b>Myopinae</b>									
<i>Myopa clausa</i>	G		S,G	G	S,G				
<i>Myopa curticornis</i> *	G		G	G				G	G
<i>Myopa longipilis</i>	S,G		G	G					
<i>Myopa rubida</i>	S,G		S,G	G				G	
<i>Myopa vesiculosa</i>			S,G	G	S			G	
<i>Myopa vicaria</i>	S,G		G	G	G		G	S,G	G
<i>Myopa willistoni</i> *	G		G						
<i>Thecophora luteipes</i>	S,G		G	G	G				
<i>Thecophora modesta</i>	S,G	G	S,G	G	S				
<i>Thecophora nigripes</i>	G		G		S,G	G			
<i>Thecophora occidentalis</i>	G	G	G	G	S,G			G	G
<i>Thecophora propinqua</i>	S,G		S,G	G	S				
<b>Zodioninae</b>									
<i>Zodion americanum</i> *			G	G					
<i>Zodion cinereiventre</i> *			G	G					
<i>Zodion fulvifrons</i>	G	G	G	G	S,G				
<i>Zodion intermedium</i>		G	G	G	S,G		G	G	
<i>Zodion obliquefasciatum</i> *			G						
<i>Zodion perlongum</i>	G		G		S				

\* - species recorded in British Columbia for the first time. S – species recorded in each region by Smith 1959. G – Species recorded in each region by the present study. Ecoprovince abbreviations: GD – Georgia Depression; CM – Coast and Mountains; SI – Southern Interior; SIM – Southern Interior Mountains; CI – Central Interior; SBI – Southern Boreal Interior; NBM – Northern Boreal Mountains; BP – Boreal Plains.

**Species Checklist**

CONOPINAE

*Physocephala burgessi* (Williston 1882)

Specimens or records observed: CAS, CNC, DEBU, EMEC, RBCM, RSM, SEM, WRME, WSU. BC: Alta Lake, Apex Mountain, Bamberton Provincial Park, Clinton, Cobble Hill, Courtenay, Cranbrook, Crowsnest Pass, Errington, Fitzgerald, Flathead, Fort Langley, Forward Harbour, Gang Ranch Junction, Goldstream, Hope, Jesmond, Kaslo, Keremeos, Kishinena Creek, Kleena Kleene, Maple Bay, Mount Alava, Mount Cain, Mount Kobau, Mount Seymour, Nanaimo, Nelson, Ocean Falls, Osoyoos, Pemberton, Qualicum, Quesnel, Revelstoke, Robson, Saanich, Salmon Arm, Salvus, Savary Island, Sayward, Seton Lake, Shawnigan, Sidney, Squamish, Stagleap Provincial Park,

Strathcona Provincial Park, Terrace, Tulameen, Upper Carmanah Valley, Vancouver, Vaseux Lake, Vernon, Victoria, Walhachin, Wellington, Whistler.

Distributional notes: Williston's (1882) description is based on type specimens from Colorado and California. Parsons (1948) records the range as Montana to New Mexico and west to California. Camras and Hurd (1957) and Camras (1957, 1965) list the range for this species as Alberta to Texas and West to the Pacific Ocean. Smith (1959) includes this species in his list for British Columbia. Analyses of other specimens indicate that within Canada, *P. burgessi* has only been detected in British Columbia and Alberta.

Flight period: June - August

Ecological associations: In California, *P. burgessi* has been collected from *Prunus* sp. (Rosaceae) and *Ceanothus* sp. (Rhamnaceae) (Bohart 1941). Camras and Hurd (1957) report *Bombus sonoratus* Say 1837 (Apidae) as a host. Males were collected from the summits of Mount Kobau, Mount Cain, and Mount Finlayson.

#### *Physocephala furcillata* (Williston 1882)

Specimens or records observed: CNC, RBCM. BC: Chetwynd, Fort St. John, Hudson's Hope, Rolla.

Distributional notes: Williston (1882) describes the species from New Hampshire. Parsons (1948) records it from Wisconsin to Atlantic Canada, south to New Jersey, but also in Mexico and California. Camras and Hurd (1957) and Camras (1957, 1965) report this species as found from Atlantic Canada, south to Pennsylvania and West to Alberta, but also possibly in California and Mexico. Analyses of other specimens indicate that *P. furcillata* is present in every Canadian province except Newfoundland and Labrador.

Flight period: June

Ecological associations: One specimen observed from Manitoba was reared from *Bombus terricola* Kirby 1837. MacFarlane and Pengelly (1975) reared this species from *Bombus vagans* Smith 1854 in Ontario. Specimens were collected from *Solidago* sp. (Asteraceae), *Arctium* sp. (Asteraceae), and *Chamerion angustifolium* (Onagraceae) flowers. Mei et al. (2010) suggested that this species is a likely hilltopper based on specimens collected in the Ottawa area.

#### *Physocephala texana* (Williston 1882)

Specimens or records observed: CNC, DEBU, RBCM, ROME, RSM, WRME. BC: Ashcroft, Cascade, Castlegar, Chilcotin, Chopaka, Christina Lake, Clinton, Cranbrook, Dog Lake, Edgewood, Fairview, Farwell Canyon, Flathead Valley, Gang Ranch Junction, Inkaneep Provincial Park, Kamloops, Keremeos, Lillooet, Midway, Mount Kobau, Nicola River, Oliver, Osoyoos, Penticton, Robson, Soda Creek, Summerland, Vaseux Creek, Vaseux Lake, Vernon, Walhachin.

Distributional notes: Williston (1882) describes the species based on specimens from California, Texas, and Kansas. Parsons (1948) documents the range of *P. texana* as California to Georgia, with an additional specimen from Quebec. Camras and Hurd (1957) list it throughout the USA, but rare in the west; and Camras (1957, 1965) reports it occurring throughout the USA, Canada, and into Mexico. Smith (1959) includes *P. texana* in his list for British Columbia and other data indicate that it ranges east to Quebec and Nova Scotia.

Flight period: June - September

Ecological associations: This is one of the few species confirmed as a parasitoid of honey bees (*Apis mellifera* Linnaeus 1758 (Apidae)). It has been reared from commercial bees in Wyoming and Washington (Van Duzee 1934, Riedel and Shimanuki 1966). In California, it has been seen to attack, oviposit in, and emerge from *Bembix occidentalis buettenmuelleri* Fox 1901 (Crabronidae) and *B. comata* Parker 1917 (Bohart and MacSwain 1939, 1940). It was reared from *Nomia melanderi* Cockerell 1906 (Halictidae) in Idaho (Foote and Gittins 1961). Hobbs (1965, 1966) also reported this species as "killing" queens of *Bombus rufocinctus* Cresson 1863 and *B. fervidus* (Fabricius 1798) in

southern Alberta. It was also reared from *B. bifarius* Cresson 1878, *B. californicus* Smith 1854, *B. flavifrons* Cresson 1863, and *B. occidentalis* Greene 1858 in Alberta (Otterstatter et al. 2002). In California, *P. texana* frequents and mates on flowers of *Eriogonum* sp. (Polygonaceae) and *Heliotropium* sp. (Boraginaceae) (Bohart and MacSwain 1939). Freeman (1966) reports an association between this species and flowers of *Asclepias fascicularis* (Apocynaceae), *Achillea millefolium* (Asteraceae), *Melilotus alba* (Fabaceae), *Mentha* sp. (Lamiaceae), and *Chrysothamnus* sp. (Asteraceae). It hilltops in Quebec (Mei et al. 2010).

*Physoconops (Physoconops) fronto* (Williston 1885)

Specimens or records observed: CAS, BC: Vernon.

Distributional notes: Williston (1885) describes this species from Kansas. Parsons (1948) lists the range as Nebraska to Texas, west to California, with a single specimen from Massachusetts. Camras and Hurd (1957) and Camras (1955, 1965) describe the range as Massachusetts to Florida, west to California and Washington, south to Mexico. Other specimens indicate that *P. fronto* occurs in British Columbia, Alberta, and Manitoba.

Flight period: August

Ecological associations: Bohart and MacSwain (1940) reared a specimen of *Conops argentifacies* VanDuzee (a synonym of *P. fronto*) from *Megachile (Xanthosaurus) perihirta* Cockerell 1898 (Megachilidae). Foote and Gittins (1961) reared it from a nesting site of *Nomia melanderi*. Freeman (1966) lists the following plant associations for *P. fronto*: *Asclepias fascicularis*, *Chrysothamnus* sp., *Daucus carota* (Apiaceae), *Melilotus alba*, and *Solidago* sp.

*Physoconops (Physoconops) obscuripennis* (Williston 1882)

Specimens or records observed: CNC, RBCM, SEM. BC: Kamloops, Oliver, Osoyoos, Penticton, Robson.

Distributional notes: Williston (1882) describe this species from South Carolina. Parsons (1948), Camras and Hurd (1957), and Camras (1955, 1965) give its range as Massachusetts to Florida, west to Alberta, British Columbia and Washington, likely in California. Smith (1959) includes this species in his list for British Columbia. Other Canadian specimens of *P. obscuripennis* are from British Columbia, Alberta, Manitoba, and Ontario.

Flight period: June - July

Ecological associations: Freeman (1966) reports this species on flowers of *Cirsium arvense* (Asteraceae), *Melilotus alba*, and *Solidago* sp.

#### DALMANNIINAE

*Dalmannia blaisdelli* Cresson 1919

Specimens or records observed: CNC, RBCM, SEM. BC: Kilpoola Lake, Old Hedley Road, Oliver, Penticton, Vaseux Creek, Vernon.

Distributional notes: The original description by Cresson (1919) lists Colorado as the type locality with paratypes from California. Bohart (1938) only reported specimens from California. Camras and Hurd (1957) and Camras (1965) list the range as Colorado and Wyoming, west to Oregon and California. Analyses of other Canadian specimens indicate that *D. blaisdelli* has only been detected in British Columbia.

Flight period: May

Ecological associations: Bohart (1938) mentions that the species is associated with heavily wooded areas.

*Dalmannia picta* Williston 1883

Specimens or records observed: CNC, SEM. BC: Oliver, Robson.



Distributional notes: In the original description, Williston (1883) lists the type locality as New Mexico. Bohart (1938) and Parsons (1948) record specimens from Arizona and California. Camras and Hurd (1957) and Camras (1965) list the range for this species as British Columbia to New Mexico, west to California. Smith (1959) includes this species in his list for British Columbia. Analyses of other specimens indicate that it occurs nowhere else in Canada.

Flight period: May - June

Ecological associations: Bohart (1938) notes that specimens in the Mojave Desert, California were collected near large aggregations of *Diandrena* sp. (Andrenidae) bees. Freeman (1966) mentions *Brassica nigra* (Brassicaceae) as a plant association.

#### *Dalmannia vitiosa* Coquillet 1892

Specimens or records observed: CNC, BC: Robson.

Distributional notes: Coquillet (1892) describes the species based on a specimen from Los Angeles, California. Bohart (1938) gives it a wide range (California, Virginia, Kansas) and Parsons (1948) lists specimens from New Hampshire to Virginia, plus California, Kansas, Arizona, and Nevada. Camras and Hurd (1957) and Camras (1965) list the distribution as patchy across North America from Atlantic to Pacific. Analyses of other specimens indicate that *D. vitiosa* has been collected in all Canadian provinces except Manitoba, Prince Edward Island, and Newfoundland and Labrador.

Flight period: May - June

Ecological associations: Specimens were observed on *Cornus* sp. (Cornaceae) blossoms in Alberta. This species might demonstrate hilltopping behaviour based on observations from Ontario and Quebec (Mei et al. 2010).

### MYOPINAE

#### *Myopa clausa* Loew 1866

Specimens or records observed: CNC, RBCM, SEM. BC: Agassiz, Aspen Grove, Bowser, Chilcotin, Courtenay, Creston, Kamloops, Kelowna, Keremeos, Oliver, Penticton, Quesnel, Robson, Saanich, Sorenson Lake, Summerland, Vancouver, Victoria, Yale.

Distributional notes: Loew's (1866) type specimen is from Maine. Williston (1885) lists the range as New England. Banks (1916) records it only in the East. Parsons (1948), as well, limits the range from Maine to North Carolina, and possibly from Iowa, Arizona, Washington, Wyoming, and California. However, Camras and Hurd (1957) and Camras (1953, 1965) give the distribution of *M. clausa* as Maine to Georgia, west to British Columbia and California. Smith (1959) includes it in his list for British Columbia. Analyses of other specimens indicate that *M. clausa* occurs in all Canadian provinces except Manitoba, Prince Edward Island, and Newfoundland and Labrador.

Flight period: April - June

Ecological associations: Specimens from Quebec have been collected from *Viburnum acerifolium* (Adoxaceae) flowers. Mei et al. (2010) concluded that this species may be an exclusive hilltopper based on specimens observed in the Ottawa region.

#### *Myopa curticornis* Kröber 1916

Specimens or records observed: RBCM, SEM, UAM. AK: Fairbanks; BC: Cranbrook, Hatzic, Penticton, Robson, Salmon Arm, Vancouver, Vaseux Lake, Vernon, Wellington; YT: Ross River.

Distributional notes: Kröber's (1916) type specimens are from Colorado and California. Parsons (1948) mentions specimens from Washington, Oregon, California, Utah, Colorado, and Maine. Camras and Hurd (1957) and Camras (1953, 1965) list the range as Wyoming to Arizona, west to Washington and California. Analyses of other specimens indicate that, in Canada, *M. curticornis* only lives in British Columbia and Yukon.

Flight period: April - June

Ecological associations: Specimens from Alaska have been collected from *Prunus padus* and *Salix alaxensis* (Salicaceae) flowers.

*Myopa longipilis* Banks 1916

Specimens or records observed: CNC, RBCM, SEM. BC: Agassiz, Kamloops, Oliver, Osoyoos, Penticton, Robson, Vancouver, Vernon.

Distributional notes: Banks' (1916) original types are from Washington State. Parsons (1948) mentions specimens from Oregon and California. Camras and Hurd (1957) and Camras (1953, 1965) list the range as British Columbia to Utah, west to California. Smith (1959) includes this species in his list for British Columbia. Analyses of other specimens indicate that *M. longipilis* is known in Canada from only British Columbia and Alberta.

Flight period: April - May

Ecological associations: Freeman (1966) reports this species from *Prunus subcordata*.

*Myopa rubida* (Bigot 1887)

Specimens or records observed: CAS, RBCM, SEM. BC: Highlands, Robson, Saanich, Vernon, Victoria; YT: Stewart Crossing.

Distributional notes: Bigot's (1887) types are from Colorado. Banks (1916) records the species from Oregon and Washington. Camras and Hurd (1957) and Camras (1953, 1965) list the range as west of the Rocky Mountains. Smith (1959) includes this species in his list for British Columbia. In Canada, *M. rubida* occurs in British Columbia, Alberta, and Yukon.

Flight period: May - July

Ecological associations: MacSwain and Bohart (1947) successfully reared this species from *Andrena vierecki* Cockerell 1904 (Andrenidae) in California. Smith (1959) reports it from *Capsella bursa-pastoris* (Brassicaceae). Freeman (1966) lists additional plants visited by this species: *Brassica campestris*, *Prunus* sp., and *Ranunculus californicus* (Ranunculaceae). A male was collected from the summit of Lone Tree Hill (Highlands, BC).

*Myopa vesiculosa* Say 1823

Specimens or records observed: CAS, RBCM, SEM, CNC. BC: Cranbrook, Grand Forks, Grindrod, Kamloops, Osoyoos, Penticton, Robson, Salmon Arm, Vernon; YT: Ross River, Stewart Crossing.

Distributional notes: Say (1823) describes the species based on specimens from Pennsylvania. Williston (1885) lists the species only in the eastern United States. Banks (1916) records a specimen from Nebraska. Parsons (1948) mentions specimens from New Hampshire to Virginia, west to Washington, while Camras and Hurd (1957) and Camras (1953, 1965) list the range for this species as Quebec to Florida, west to Washington and California. Smith (1959) includes *M. vesiculosa* in his list for British Columbia and analyses of other specimens indicate that it lives in the Yukon and all Canadian provinces except Prince Edward Island and Newfoundland and Labrador.

Flight period: April - June

Ecological associations: Specimens from British Columbia were collected from flowers of *Sorbus* sp. (Rosaceae). This species may be an occasional hilltopper in Ontario and Quebec (Mei et al. 2010).

*Myopa vicaria* Walker 1849

Specimens or records observed: CAS, CNC, RBCM, SEM, UAM. AK: Fairbanks; BC: Atlin, Chilcotin, Cranbrook, Kamloops, Lavington, Nelson, Oliver, Peace River, Penticton, Robson, Vancouver, Vernon; YT: Rampart House.

Distributional notes: The type for this species, described by Walker (1849), is from Nova Scotia. Parsons (1948) gives the range as Nova Scotia to Virginia, west to Illinois, plus specimens from Washington, Oregon, Wyoming, and Arizona, while Camras and Hurd (1957) and Camras (1953, 1965) list it as Nova Scotia to Georgia, west to Alaska and California. Smith (1959) includes this species in his list for British Columbia; it occurs in the Yukon and all Canadian provinces except Prince Edward Island and Newfoundland and Labrador.

Flight period: April - May

Ecological associations: This species has been collected from various species of willow (*Salix alaxensis*, *S. arbusculoides*, *S. planifolia*, *S. pulchra*, *S. scouleriana*) in Alaska and also *Salix* sp. in Alberta. In their study in the Ottawa region, Mei et al. (2010) did not find this species on hilltops.

#### *Myopa willistoni* Banks 1916

Specimens or records observed: CNC, RBCM, SEM. BC: Caulfield, Summerland, Vancouver, Vaseux Lake, Vernon.

Distributional notes: Williston (1885) originally describes this species as *M. pictipennis*, which is a preoccupied name, from Arizona and California; Banks (1916) provided the new species name and saw specimens from Oregon and California. Camras and Hurd (1957) and Camras (1953, 1965) list the range as west of the Rocky Mountains, south into Mexico. Analyses of other specimens indicate that *M. willistoni* has only been found in Canada in British Columbia.

Flight period: May

Ecological associations: None noted.

#### *Thecophora luteipes* (Camras 1945)

Specimens or records observed: CAS, DEBU, RBCM, SEM. BC: Hell's Gate, Penticton, Robson, Sparwood, Thetis Lake, Vernon, Westwick Lake.

Distributional notes: Camras (1945) describes this species based on specimens from Colorado, Washington, Idaho, Utah, and California. Camras and Hurd (1957) and Camras (1965) record the range as British Columbia to Colorado, west to California. Smith (1959) includes this species in his list for British Columbia and examination of other specimens shows that, in Canada, it only occurs in that province.

Flight period: June - September

Ecological associations: Freeman (1966) summarizes plant associations for this species as: *Crepis virens* (Asteraceae), *Daucus carota*, *Eriogonum elatum*, and *Trifolium repens* (Fabaceae).

#### *Thecophora modesta* (Williston 1883)

Specimens or records observed: CAS, CNC, RBCM, SEM. BC: Agassiz, Chase, Clearwater, Comox, Creston, Hope Mountains, Kootenay Lake, Lillooet, Metchosin, Midday Creek, Mount Kobau, Newgate, Okanagan, Oliver, Robson, Salmo, Vancouver, Vernon, Victoria, Walhachin; YT: Dawson.

Distributional notes: Williston (1883) describes this species based on specimens from California and Washington. Camras and Hurd (1957) and Camras (1945, 1965) record the range of this species as Saskatchewan to New Mexico, west to the Pacific Ocean. Smith (1959) includes this species in his list for British Columbia; it also occurs in Yukon and Alberta.

Flight period: June - September

Ecological associations: Cole and Lovett (1921) report *Halictus ligatus* Say 1837 (Halictidae) as a host for this species in Oregon. Freeman (1966) includes: *Anaphalis* sp. (Asteraceae), *Brassica rapa*, *Cirsium* sp., *Solidago* sp., and *Trifolium hybridum* as plant associations. Individuals have been observed on the summits of Mount Tolmie and Camas Hill (BC: Victoria region).

*Thecophora nigripes* (Camras 1945)

Specimens or records observed: CNC, RBCM, SEM. BC: Australian, Burton, Clinton, Merritt, Mount Kobau, Oliver, Penticton, Prince George, Saanich, Vancouver, Westwick Lake.

Distributional notes: Camras (1945) describes this species based on a specimen from Thunder Bay, Ontario, but mentions 132 paratypes from across Canada, USA, and Guatemala. All subsequent works (Parsons 1948, Camras and Hurd 1957, Camras 1965) record the range as Nova Scotia to Georgia, west to British Columbia and California, south to Guatemala. Smith (1959) includes this species in his list for British Columbia. *T. nigripes* has been found in all Canadian provinces except New Brunswick, Prince Edward Island, and Newfoundland and Labrador.

Flight period: July - August

Ecological associations: Plant associations for this species (Freeman 1966) include *Chrysothamnus* sp., *Crepis virens*, *Chamerion augustifolium* (Onagraceae), *Prunus* sp., and *Solidago* sp. Mei et al. (2010) are unsure if the species hilltops in the Ottawa area.

*Thecophora occidentalis* (Walker 1849)

Specimens or records observed: BDUC, CAS, CNC, RBCM, SEM, UAM. AK: Fairbanks, Matanuska; BC: Agassiz, Burton, Chilcotin, Cowichan, Cottonwood River, Crowsnest, Flathead Valley, Galiano Island, Hedley, Hope Mountains, Kalamalka Lake, Kootenay, Langford, Lytton, Mahoney Lake, Mount Kobau, Nanaimo, Nicola, Oliver, Osoyoos, Penticton, Quesnel, Robson, Salmo, Sheep Lake, Soda Creek, Sparwood, Strathcona Provincial Park, Thetis Lake, Vancouver, Vernon, Victoria, Walhachin, Westwick Lake; YT: Carmacks, Dawson, Lone Tree Creek, Old Crow, Starr Creek, Tagish, Whitehorse.

Distributional notes: Walker (1849) describes the species based on a specimen from Ohio. Camras (1945), Parsons (1948), and Camras and Hurd (1957) describe the range of *Occemyia loraria*, a synonym of *T. occidentalis*, as throughout the USA and southern Canada. Camras (1965) records the range of *T. occidentalis* as Quebec to Georgia, west to the Yukon and California, south to Mexico. Smith (1959) includes *O. loraria* Loew 1866 in his list for British Columbia. It also lives in Yukon, Northwest Territories, and all Canadian provinces except New Brunswick and Prince Edward Island.

Flight period: June - September

Ecological associations: This species has been reared from *Halictus confusus* Smith 1853, *H. ligatus*, *H. rubicundus* (Christ 1791), *Lasioglossum cinctipes* (Provencher 1888), *L. forbesii* (Robertson 1890), *L. imitatum* (Smith 1853), *L. laevissimum* (Smith 1853), and *L. lineatulum* (Crawford 1906) in Ontario (Smith 1966, Knerer and Atwood 1967). In his list, Freeman (1966) lists plant associations for *T. loraria* as: *Brassica campestris*, *Chrysothamnus* sp., *Daucus carota*, *Hypericum perforatum* (Hypericaceae), *Melilotus* sp., and *Solidago* sp. This species may or may not demonstrate hilltopping behaviour in Ontario and Quebec (Mei et al. 2010).

*Thecophora propinqua* (Adams 1903)

Specimens or records observed: CAS, CNC, RBCM, SEM. BC: Cranbrook, Erickson, Kamloops, Lytton, Midway, Mount Kobau, Osoyoos, Penticton, Robson, Saanich, Saturna Island, Vernon.

Distributional notes: Adams (1903) does not provide a locality for the type. Parsons (1948), Camras and Hurd (1957), and Camras (1965) record the range as Nova Scotia to Alabama, west to British Columbia and California. Smith (1959) includes this species in his list for British Columbia. Analyses of other specimens indicate that *T. propinqua* occurs in all provinces from British Columbia to Quebec.

Flight period: May - September

Ecological associations: Specimens were collected on *Mentha* sp. from Vernon, British Columbia. Freeman's (1966) plant association list for this species includes: *Achillea millefolium*, *Amaranthus* sp. (Amaranthaceae), *Asclepias fascicularis*, *Brassica nigra*, *Chrysothamnus* sp., *Cleome lutea* (Cleomaceae), *C. serrulata*, *Daucus carota*, *D. pusillus*, *Eriogonum elatum*, *Grindelia* sp. (Asteraceae), *Medicago sativa* (Fabaceae), *Melilotus alba*, *Phacelia* sp. (Boraginaceae), *Solidago* sp., *Solanum tuberosum* (Solanaceae), *Triticum aestivum* (Poaceae). Mei et al. (2010) does not record any hilltopping in the Ottawa area.

#### ZODIONINAE

##### *Zodion americanum* Wiedemann 1830

Specimens or records observed: CNC, RBCM, SEM. BC: Burton, Creston, Dog Creek, Mount Kobau, Robson, Salmon Arm.

Distributional notes: Wiedemann's (1830) type specimen is from Uruguay. Camras, (1944, 1965), Parsons (1948), and Camras and Hurd (1957) list the range for this species as throughout Canada, USA, central America, and into South America and the Caribbean Islands. *Zodion americanum* has been recorded in all provinces except New Brunswick and Newfoundland and Labrador.

Flight period: June - September

Ecological associations: Freeman (1966) reports possible plant associates as *Melilotus alba* and *Solidago* sp. Mei et al. (2010) does not give evidence for hilltopping behaviour for this species in the Ottawa area.

##### *Zodion cinereiventre* Van Duzee 1927

Specimens or records observed: CAS, CNC, RBCM. BC: Fernie, Mahoney Lake, Nicola, Osoyoos, Pavilion Lake, Penticton.

Distributional notes: The type specimen of Van Duzee (1927) is from California. Parsons (1948), Camras (1944), and Camras and Hurd (1957) give the range as throughout the USA, west of Illinois. Camras (1965) lists the range as Atlantic Canada to North Carolina, west to British Columbia and California. Other specimens indicate that *Z. cinereiventre* lives in all provinces from British Columbia to Ontario.

Flight period: June - August

Ecological associations: Freeman (1966) reports that possible plant hosts for this species include *Helenium tenuifolium* (Asteraceae) and *Senecio* sp. (Asteraceae).

##### *Zodion fulvifrons* Say 1823

Specimens or records observed: CNC, DEBU, RBCM, SEM, USNM, WFBC. BC: Bear Lake, Chilcotin, Cranbrook, Grand Forks, Hell's Gate, Jesmond, Junction Provincial Park, Kamloops, Kaslo, Kelowna, Lillooet, Lytton, Midway, Mount Kobau, Nelson, Nicola, Okanagan Falls, Oliver, Osoyoos, Penticton, Quesnel, Robson, Rock Creek, Royal Oak, Salmon Arm, Savary Island, Summerland, Vancouver, Victoria, Walhachin, Dog Creek.

Distributional notes: Say (1823) describes this species from Maryland and Pennsylvania. Camras (1944), Parsons (1948), and Camras and Hurd (1957) list the range as Atlantic Canada to Florida, west to Washington and California, south to Mexico. Smith (1959) includes this species in his list for British Columbia and other specimens show that *Z. fulvifrons* occurs in all Canadian provinces except Newfoundland and Labrador.

Flight period: May - August

Ecological associations: Severin (1937) reared this species from honey bees (*Apis mellifera*) from South Dakota. Foote and Gittins (1961) report it from flowers of *Asclepias* sp., *Aster* sp. (Asteraceae), *Brassica* sp., *Chaenactis* sp. (Asteraceae), *Chrysothamnus* sp., *Eriogonum* sp., and *Trifolium repens* in Idaho. In Alberta it has been

collected from *Solidago* sp. flowers. Mei et al. (2010) suggest that this species might hilltop in the Ottawa area.

*Zodion intermedium* Banks 1916

Specimens or records observed: CAS, CNC, DEBU, SEM, RBCM. BC: Boswell, Dog Creek, Enderby, Fort Steele, Hudson's Hope, Kamloops, Kinbasket Reservoir, Lillooet, Mount Kobau, Nicola, Oliver, Osoyoos, Penticton, Quesnel, Robson, Rock Creek, Sorrento, Telegraph Creek, Terrace, Vernon, White Lake.

Distributional notes: Banks (1916) describes this species from Pennsylvania. Camras (1944), Parsons (1948), and Camras and Hurd (1957) list the range as Atlantic Canada to Florida, west to Washington and California, south to Mexico. Smith (1959) includes this species in his list for British Columbia; *Z. intermedium* has been collected in all provinces except Newfoundland and Labrador.

Flight period: May - August

Ecological associations: Freeman (1966) summarizes plant associations for this species as: *Chrysothamnus* sp., *Brassica rapa*, *Erigeron canadensis* (Asteraceae), *E. linearis*, *Lupinus* sp. (Fabaceae), and *Solidago* sp. Specimens were observed from *Achillea* sp. in Alberta and a *Potentilla* (Rosaceae) meadow in British Columbia. Mei et al. (2010) suggests that this species might be a hilltopper in the Ottawa area.

*Zodion obliquefasciatum* (Macquart 1846)

Specimens or records observed: CNC. BC: Penticton.

Distributional notes: Macquart's (1846) type specimen is from Texas. Parsons (1948), Camras (1965), and Camras and Hurd (1957) list the range as Wisconsin to Louisiana, west to Alberta, Washington, and California, south to Mexico. *Zodion obliquefasciatum* has been recorded from British Columbia to Manitoba.

Flight period: July - August

Ecological associations: Freeman (1966) summarizes plant associations for this species as: *Chrysothamnus* sp., *Baileya pleniradiata* (Asteraceae), *Veronica* sp. (Plantaginaceae), *Centaurea repens* (Asteraceae), *Cirsium arvense*, *C. vulgare*, *Eriogonum* sp., *Gaillardia pulchella* (Asteraceae), *Grindelia* sp., *Gutierrezia microcephala* (Asteraceae), *Helianthus annuus* (Asteraceae), *H. petiolaris*, *Hemizonia fasciculata* (Asteraceae), *Heterotheca subaxillaris* (Asteraceae), *Medicago sativa*, *Melilotus alba*, *M. officinalis*, *Lupinus* sp., *Bahia absinthifolia* (Asteraceae), *Verbena enceliodes* (Asteraceae), *Sphaeralcea angustifolia* (Malvaceae), *Asclepias* sp., *Solidago canadensis*, and *S. occidentalis*.

*Zodion perlongum* Coquillet 1902

Specimens or records observed: CNC. BC: Lillooet, Royal Oak.

Distributional notes: Coquillet (1902) describes this species from Colorado specimens. Camras (1944), Parsons (1948), and Camras and Hurd (1957) list the range as Maine to North Carolina, west to California, south to Mexico. Specimens examined indicate that *Z. perlongum* lives in British Columbia, Alberta, Saskatchewan, Ontario, Quebec, and Nova Scotia.

Flight period: June - August

Ecological associations: Freeman (1966) reports this species from flowers of *Chrysothamnus* sp.

**Patterns of Distribution.** Smith's (1959) checklist is limited in its data – only 104 specimens from a single collection (SEM) – and he drew no conclusions regarding provincial distributions of Conopidae. The present data, including many more records from more sources, allows some conclusions to be drawn. Nevertheless, most of the records and specimens examined are from a subset of locations within the region. In British Columbia, the Georgia Depression, Southern Interior, Central Interior, and

Southern Interior Mountains ecoprovinces are relatively well-collected (Table 1). Few specimens or records were noted from north of 53°N or from the coastal regions, including the western coast of Vancouver Island, the Gulf Islands, or Haida Gwaii. In Yukon, specimens or records from both the Boreal Cordillera and Taiga Cordillera are reported, but not in any other ecoprovinces. Specimens from Alaska are limited to the Cook Inlet and Interior Bottomlands ecoprovinces.

Based on recorded conopid distributions in British Columbia, Yukon, and Alaska, a few general geographical distribution patterns are evident. Some species can be best described as widespread, occurring in many regions of the northwestern Nearctic as well as across the continent. Such species include: *Physocephala texana*, *Dalmannia vitiosa*, *Myopa clausa*, *M. vesiculosa*, *M. vicaria*, *Thecophora nigripes*, *T. occidentis*, *T. propinqua*, *Zodion americanum*, *Z. cinereiventre*, *Z. fulvifrons*, *Z. intermedium*, and *Z. perlongum*. Other species appear to be limited to west of the Rocky Mountains: *Physocephala burgessi*, *Dalmannia blaisdelli*, *D. picta*, *Myopa curticornis*, *M. longipilis*, *M. rubida*, *M. willistoni*, *Thecophora luteipes*, and *T. modesta*. A few species are southern in distribution with only a limited incursion into British Columbia, mostly in warm Southern Interior valleys: *Physoconops fronto*, *P. obscuripennis*, *Zodion obliquefasciatum*. *Physocephala furcillata* occurs throughout Canada, but, in British Columbia, only east of the Rockies in the Peace region. Conopid species apparently able to tolerate conditions north of 60°N are *Myopa curticornis*, *M. rubida*, *M. vesiculosa*, *M. vicaria*, *Thecophora modesta*, and *T. occidentis*, although further collecting in these regions may add to this list. Present records are insufficient to determine if any conopid species are truly cordilleran or coastal in distribution.

**Ecological Associations.** Host records are scarce. However, some generalizations regarding ecological roles can be drawn. Hosts appear to be determined roughly along generic lines within Conopidae. Large species, especially those of *Physocephala* and *Physoconops*, parasitize larger bees and wasps as hosts such as Apidae (*Apis*, *Bombus*) and Crabronidae (*Bembix*). Smaller conopids, including *Dalmannia*, *Myopa*, and *Thecophora*, are possibly limited to smaller bees as hosts (Andrenidae, Halictidae). There are not enough host records to estimate host patterns for *Zodion* species.

*Dalmannia* and *Myopa* appear to be the early emerging genera within Conopidae as adult records are limited to April through June. For all other genera, adults emerge from June to September. There evidently are no phenological differences among species within a given genus, but more records are necessary to clarify this point.

Plant associations as recorded may be a by-product of conopid phenology. Most species of Conopidae frequent many different families of plants. The only discernible pattern appears to be the early emergence of *Myopa* coordinated with some early-blooming plants including willows (Salicaceae). Of course, these plant associations do not necessarily indicate that the flies are pollinating the plants visited.

Hilltopping is observed in all genera of Conopidae. Whether this behaviour is obligate, facultative, or geographically determined in any species requires further observations. Accessible hilltop locations may provide valuable data on this question.

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