

A checklist of the Neuropterid insects of British Columbia (Insecta: Megaloptera, Neuroptera and Raphidioptera) with a summary of their geographic distribution

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ABSTRACT

The Neuropterid orders in British Columbia consist of the Megaloptera, Neuroptera and Raphidioptera. Twelve families containing 89 species are represented. The distribution of these species is documented with reference to the 9 terrestrial ecoprovinces in British Columbia. Collection localities are given for species represented by 5 or fewer sites. Four species, 2 of Coniopterygidae and 2 of Hemerobiidae, are considered alien introductions.

INTRODUCTION

The first list of British Columbia (BC) neuropterid insects was published by Spencer (1942) at a time when the 3 orders in this group of insects that occur in the province (Megaloptera, Neuroptera and Raphidioptera) were considered as a single

order, the Neuroptera. Most of the more recent research on these 3 taxa in BC, which include both aquatic and terrestrial species, was summarized by Cannings and Scudder (2001) and Scudder *et al.* (2001).

MATERIALS AND METHODS

The list of species here considered as occurring in BC follows the classification of Oswald and Penny (1991) and Penny *et al.* (1997), with some nomenclature changes published since. In the recent literature, Garland and Kevan (2007) have discussed the Chrysopidae, and Cannings and Cannings (2006) the Mantispidae. Recent new additions to the provincial list are documented by Meinander *et al.* (2009).

A georeferenced distributional database for the provincial species of neuropterid insects has been maintained by Scudder, and this is used as the basis for the following summaries.

We have indicated the general geographic distribution of each species by listing alphabetically the abbreviations of the ecoprovince(s) (Fig. 1) in which it has been

recorded. An ecoprovince is an area with consistent climatic or oceanographic, topographic and geological history (Meidinger and Pojar 1991, Demarchi 1996). There are 10 ecoprovinces in BC; their size and broad internal uniformity make them ideal units for the general discussion of geographic distribution of organisms in the province. One of the ecoprovinces is completely marine and is omitted from this study.

In the list, collection localities are given for species known from 5 or fewer localities (39 species, 44% of total). If a species is found in two or more ecoprovinces and if one of these ecoprovinces contains more than half the collection localities for that species, that ecoprovince abbreviation is printed in bold font.

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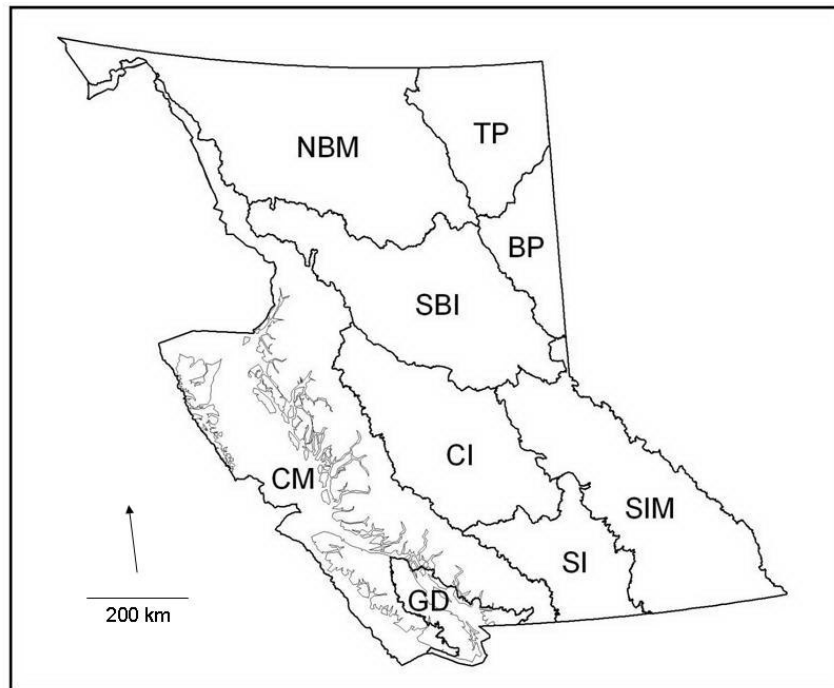


Figure 1. Map of British Columbia showing the nine terrestrial ecoprovinces: BP, Boreal Plains; CI, Central Interior; CM, Coast and Mountains; GD, Georgia Depression; NBM, Northern Boreal Mountains; SBI, Sub-boreal Interior; SI, Southern Interior; SIM, Southern Interior Mountains; TP, Taiga Plains.

RESULTS

Table 1 lists the 89 species of neuropterid insects known from BC. The Megaloptera is represented by 2 families, 4 genera and 9 known species, while the provin-

cial totals of the more diverse Neuroptera are 8 families, 25 genera and 73 species. The Raphidioptera in BC consists of 2 families, 2 genera and 7 known species.

DISCUSSION

The georeferenced distributional database for the neuropterid species in the province has been utilized in an assessment of the overall species richness in the province (Warman and Scudder 2007; Austin *et al.* 2008; Austin and Eriksson 2009).

Two species of Coniopterygidae (*Conwentzia pineticola* Enderlein and *Semidalis pseudouncinata* Meinander) and one species of Hemerobiidae (*Psectra diptera* (Burmeister)) are considered alien Palearctic introductions to BC, while a second hemerobiid (*Micromus variegatus* (Fabricius)) may have been introduced from

Japan (Klimaszewski and Kevan 1990; Penny *et al.* 1997). A fifth alien species, the coniopterygid *Conwentzia psociformis* (Curtis) was intercepted in Victoria in 1958 on a shipment of *Rhododendron* plants from Holland (Meinander 1972). In contrast to the other aliens, *C. psociformis* appears not to be established in BC and is omitted from our list.

The 3 neuropterid orders are found throughout much of BC. The majority of records of each order come from the southern half of the province, a bias that probably reflects both the greater intensity of

Table 1.

Checklist of the neuropterid species of British Columbia and their distribution in BC's eco-provinces.

Order Megaloptera (Dobsonflies and Alderflies)
Family Corydalidae (Dobsonflies)

Chauliodes pectinicornis (Linnaeus). GD. Cloverdale, Cowichan.

Dysmicohermes disjunctus (Walker). CI, CM, **GD**, SI, SIM.

Protochauliodes spenceri Munroe. GD.

Family Sialidae (Alderflies)

Sialis californica Banks. CM, **GD**, SI.

Sialis concava (Banks). Reported from BC by Whiting (1991); lacks locality data.

Sialis hamata Ross. SIM. Creston.

Sialis joppa Ross. GD, SI. Cowichan Lake, Vernon.

Sialis rotunda Banks. CI, **GD**, SI, SIM.

Sialis velata Ross. **SI**, TP. Osoyoos, Penticton, Salmon Arm, Petitot River.

Order Neuroptera (Lacewings, Mantidflies, Antlions and Relatives)**Family Berothidae (Beaded Lacewings)**

Lomamyia occidentalis (Banks). SI. Penticton, Lytton, McGillivray Creek (S of Lillooet).

Family Chrysopidae (Green Lacewings)

Chrysopa chi Fitch. BP, CI, CM, GD, NBM, SI, SIM, TP.

Chrysopa coloradensis Banks. CI, GD, **SI**, SIM.

Chrysopa excepta Banks. SI. Oliver, Penticton, Nicola.

Chrysopa nigricornis Burmeister. CI, CM, GD, SI, SIM.

Chrysopa oculata Say. BP, CI, CM, GD, NBM, SBI, SI, SIM, TP.

Chrysopa pleuralis Banks. CI, **SI**, SIM.

Chrysopa quadripunctata Burmeister. GD. Vancouver Island.

Chrysoperla carnea (Stephens). BP, CI, CM, GD, NBM, SBI, SI, SIM, TP.

Dichochrysa perfecta (Banks). SI. Oliver, Penticton, Summerland.

Eremochrysa canadensis (Banks). SI. Penticton.

Eremochrysa fraterna (Banks). SI.

Eremochrysa punctinervis (MacLachlan). SI.

Meleoma dolicharthra (Navas). CM, GD, SI, SIM.

Meleoma emuncta (Fitch). CI, CM, GD, SI, SIM.

Meleoma schwarzi (Banks). SI. Penticton.

Meleoma signoretti Fitch. CI, CM, **GD**, SIM.

Nineta gravida (Banks). GD.

Nothochrysa californica Banks. CM, **GD**.

Family Coniopterygidae (Dustywings)

Coniopteryx canadensis Meinander. SI. Mount Kobau.

Coniopteryx tineiformis Curtis. CI, SI. Quesnel, Cache Creek.

Conwentzia californica Meinander. **GD**, SI. Saanichton, Victoria, Vancouver, Spahats Creek Park (Clearwater River Valley).

Table 1. (continued)**Family Coniopterygidae (Dustywings)** (continued)

Conwentzia pineticola Enderlein. Introduced. **GD**, SI. Duncan, Saanichton, Victoria, Salmon Arm.

Helicoconis californica Meinander. SI. Aspen Grove, Chase.

Helicoconis similis Meinander. SIM. Moyie Mountain.

Semidalis angusta (Banks). CI. Quesnel.

Semidalis pseudouncinata Meinander. Introduced. GD. Duncan.

Family Hemerobiidae (Brown Lacewings)

Hemerobius bistrigatus Currie. CM, **GD**, SIM.

Hemerobius conjunctus Fitch. CI, CM, GD, NBM, SI, SIM.

Hemerobius costalis Carpenter. CM, CI, NBM, SI, TP.

Hemerobius discretus Navás. CI, CM, **GD**, NBM, SI, SIM.

Hemerobius dorsatus Banks. BP, CI, CM, GD, NBM, SI.

Hemerobius humulinus Linnaeus. CM, GD, NBM, SI, SIM.

Hemerobius kokaneeanus Currie. CI, CM, GD, NBM, SI, SIM.

Hemerobius nigrans Carpenter. CI, GD, NBM, **SI**, SIM.

Hemerobius ovalis Carpenter. CI, CM, GD, NBM, SI, SIM, TP.

Hemerobius pacificus Banks. BP, CM, **GD**, SI, SIM, TP.

Hemerobius pinidumus Fitch. BP, GD, NBM, SI, SIM.

Hemerobius simulans Walker. NBM, **SI**, SIM. Telegraph Creek, Tujony Lake, Salmon Arm, Vernon, Trinity Valley.

Hemerobius stigma Stephens. CI, CM, GD, NBM, **SI**, SIM.

Megalomus angulatus Carpenter. GD, SI. Galiano Island, Lillooet.

Megalomus fidelis (Banks). BP. Rolla.

Micromus angulatus (Stephens). BP, CI, CM, GD, NBM, SI, TP.

Micromus borealis Klimaszewski & Kevan. CI, CM, NBM, SI, SIM.

Micromus montanus Hagen. CI, CM, GD, SI, SIM.

Micromus posticus (Walker). BP. Pink Mountain.

Micromus subanticus (Walker). **GD**, SI. Galiano Island, Vancouver, Penticton.

Micromus variegatus (Fabricius). Probably introduced from Japan. **GD**, SI. Aldergrove, Vancouver, Galiano Island, Rocky Point (Victoria), Penticton.

Micromus variolosus Hagen. CI, GD, **SI**.

Psectra diptera (Burmeister). Introduced. SI. White Lake (Okanagan Falls).

Symphorobius angustus (Banks). CI, SI. Chilcotin, 100 Mile House, Penticton, West Bench (Penticton).

Symphorobius barberi (Banks). GD. Mohun Lake (Campbell River).

Symphorobius californicus Banks. SI. Oliver.

Symphorobius killingtoni Carpenter. SI. Osoyoos, Penticton, Vernon.

Symphorobius perparvus (MacLachlan). CI, **SI**. Riske Creek, Keremeos, Merritt, Vernon.

Wesmaelius brunneus (Banks). NBM, SI, SIM. Coal River (Alaska Highway), Silver Star Mt. (Vernon), Mt. Revelstoke.

Wesmaelius coloradensis (Banks). CI, GD, NBM, **SI**.

Table 1. (continued)

Family Hemerobiidae (Brown Lacewings) (continued)
<i>Wesmaelius furcatus</i> (Banks). NBM. Summit Lake (Alaska Highway), Toad River (Alaska Highway), Pleasant Camp, Atlin.
<i>Wesmaelius involutus</i> (Carpenter). CI, CM, GD, NBM, SI, SIM, TP.
<i>Wesmaelius longifrons</i> (Walker). CI, CM, GD, NBM, SI, SIM.
<i>Wesmaelius nervosus</i> (Fabricius). CM, GD, NBM, SI, SIM.
<i>Wesmaelius pretiosus</i> (Banks). SI. Nicola, Oliver, Oliver Geology Camp, Penticton.
<i>Wesmaelius yukonensis</i> Klimaszewski & Kevan. CI. Riske Creek.
Family Mantispidae (Mantidflies)
<i>Climaciella brunnea</i> (Say). GD, SI, SIM.
<i>Leptomantispa pulchella</i> (Banks). SI.
Family Myrmeleontidae (Antlions)
<i>Brachynemurus abdominalis</i> (Say). CI, CM, SI, SIM.
<i>Brachynemurus ferox</i> (Walker). CI, SI.
<i>Brachynemurus peregrinus</i> (Hagen). SI. Lytton, Oliver, Osoyoos Lake N end.
<i>Dendroleon speciosum</i> Banks. CI, GD, SI, SIM.
<i>Myrmeleon exitialis</i> Walker. CI, CM, GD, SI, SIM.
Family Polystoechotidae (Giant Lacewings)
<i>Polystoechotes punctata</i> (Fabricius). CI, CM, GD, SBI, SI, SIM.
Family Sisyridae (Spongillaflyies)
<i>Sisyra fuscatus</i> (Fabricius). GD, SI, SIM.
<i>Sisyra vicarius</i> (Walker). GD, SI, SIM. Agassiz, Cultus Lake, Lillooet, Oliver, Kaslo.
Order Raphidioptera (Snakeflies)
Family Inocellidae
<i>Negha inflata</i> (Hagen). SI, SIM.
Family Raphidiidae
<i>Agulla adnixa</i> (Hagen). CI, CM, GD, SI, SIM.
<i>Agulla assimilis</i> (Albarda). CI, CM, GD, SI, SIM.
<i>Agulla bicolor</i> (Albarda). SI.
<i>Agulla crotchi</i> (Banks). SI. Summerland.
<i>Agulla herbsti</i> (Esben-Petersen). GD, SI.
<i>Agulla unicolor</i> Carpenter. CM, SI, SM.

collections and the higher diversity of species in the South. This trend is more obvious in the Megaloptera and Raphidioptera than in the Neuroptera. Table 2 shows that the latter order is distributed in all eco-provinces; the Raphidioptera is not recorded in the 4 most northerly eco-provinces and the Megaloptera is found in only 1 of these 4 (a single record of *Sialis velata* in the Taiga Plains). All but 6 of the 84 localities (some localities have multiple records)

of Megaloptera are from south of 51°N and all but 12 are from coastal environments. Although 2 of the 6 species of *Sialis* are known only from east of the Coast Mountains, the other megalopteran species are mostly coastal. All records of *Chauliodes pectinicornis* and *Protochauliodes spenceri* are coastal as are 40 of 44 localities for *Dysmicohermes disjunctus*. The Raphidioptera is the most strongly southern of the orders; the most northerly records are of

Table 2.

Occurrence of neuropterid orders in the ecoprovinces of British Columbia.

Code	Ecoprovince Name	Raphidoptera	Megaloptera	Neuroptera
NBM	Northern Boreal Mountains			X
TP	Taiga Plains		X	X
BP	Boreal Plains			X
SBI	Sub-boreal Interior			X
CM	Coast and Mountains	X	X	X
GD	Georgia Depression	X	X	X
CI	Central Interior	X	X	X
SI	Southern Interior	X	X	X
SIM	Southern Interior Mountains	X	X	X

Agulla adnixa from Quesnel and Tete Jeune Cache, both approximately 53°N. However, all but 5 localities are from the warm southern valleys and coastal areas south of about 51°N.

Our analysis herein shows that the two regions most threatened by habitat modification, Southern Vancouver Island/ Fraser Valley and the Okanagan Valley also support the most diverse faunas of neuropterid insects (Austin *et al.* 2008). Five species are known only from the former region – *Chauliodes pectinicornis* and *Proto-*

chauliodes spenceri (Corydalidae), *Nineta graviga* and *Nothochrysa californica* (Chrysopidae) and the introduced *Semidalis pseudouncinata* (Coniopterygidae). The Okanagan Valley has 10 species not recorded elsewhere – *Dichochrysa perfecta*, *Eremochrysa canadensis* and *Meleoma schwarzi* (Chrysopidae), *Coniopteryx canadensis* (Coniopterygidae), *Psectra diptera* (introduced), *Sympherobius californicus* and *S. killingtoni* (Hemerobiidae), *Leptomantispa pulchella* (Mantispidae), *Agulla bicolor* and *A. crotchi* (Raphidiidae).

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