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 ecoregions 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 ecoregion(s) (Fig. 1) in which it has been recorded. An ecoregion is an area with consistent climatic or oceanographic, topographic and geological history (Meidinger and Pajar 1991, Demarchi 1996). There are 10 ecoregions 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 ecoregions 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 ecoregions and if one of these ecoregions contains more than half the collection localities for that species, that ecoregion abbreviation is printed in bold font.

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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 provincial 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 pinetica Enderlein and Semicalais pseudouncinata Meinander) and one species of Hemerobiidae (Psectra alperta (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)**
- *Dysmicothermes disjunctus* (Walker). CI, CM, GD, SI, SIM.
- *Protochauliodes spencer* 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 rotunda* Banks. CI, GD, SI, SIM.

**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 fraterma* (Banks). SI.
- *Eremochrysa punctinervis* (MacLachlan). SI.
- *Meleoma dolicharthra* (Navas). CM, GD, SI, SIM.
- *Meleoma emuncta* (Fitch). CI, CM, GD, SI, SIM.
- *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.
- *Conventzia californica* Meinander. GD, SI. Saanichton, Victoria, Vancouver, Spahats Creek Park (Clearwater River Valley).
Table 1. (continued)

**Family Coniopterygidae (Dustywings) (continued)**

*Conventzia pinetica* Enderlein. Introduced. **GD**, SI. Duncan, Saanichton, Victoria, Salmon Arm.

*Helicocoris californica* Meinander. SI. Aspen Grove, Chase.

*Helicocoris similis* Meinander. SIM. Moyie Mountain.

*Semidalis angusta* (Banks). CI. Quesnel.

*Semidalis pseudouncinata* Meinander. Introduced. GD. Duncan.

**Family Hemerobiidae (Brown Lacewings)**

*Hemerobius histrigatus* 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 pinnatus* 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 & Kean. CI, CM, NBM, SI, SIM.

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


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

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

*Psectra diptera* (Burmester). Introduced. SI. White Lake (Okanagan Falls).

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

*Sympherobius barberi* (Banks). GD. Mohun Lake (Campbell River).

*Sympherobius californicus* Banks. SI. Oliver.

*Sympherobius killingtoni* Carpenter. SI. Osoyoos, Penticton, Vernon.

*Sympherobius perparvus* (MacLachlan). CI, **SI**. Riske Creek, Keremeos, Merrit, Vernon.

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

*Wesmaelius coloradensis* (Banks). CI, **GD**, NBM, **SI**.
collections and the higher diversity of species in the South. This trend is more obvious in the Megaloptera and Raphidiidae than in the Neuroptera. Table 2 shows that the latter order is distributed in all eco-provinces; the Raphidiidae are 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 *Protaulioptoides spenceri* are coastal as are 40 of 44 localities for *Dysmicohermes disjunctus*. The Raphidiidae is the most strongly southern of the orders; the most northerly records are of

<table>
<thead>
<tr>
<th>Table 1. (continued)</th>
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<tbody>
<tr>
<td><strong>Family Hemerobiidae (Brown Lacewings)</strong> (continued)</td>
</tr>
<tr>
<td><em>Wesmaelius involutus</em> (Carpenter). CI, CM, GD, NBM, SI, SIM, TP.</td>
</tr>
<tr>
<td><em>Wesmaelius longifrons</em> (Walker). CI, CM, GD, NBM, SI, SIM.</td>
</tr>
<tr>
<td><em>Wesmaelius nervosus</em> (Fabricius). CM, GD, NBM, SI, SIM.</td>
</tr>
<tr>
<td><em>Wesmaelius pretiosus</em> (Banks). SI. Nicola, Oliver, Oliver Geology Camp, Penticton.</td>
</tr>
<tr>
<td><em>Wesmaelius yukonensis</em> Klimaszewski &amp; Kevan. CI. Riske Creek.</td>
</tr>
<tr>
<td><strong>Family Mantispidae (Mantidflies)</strong></td>
</tr>
<tr>
<td><em>Climaciella brunnea</em> (Say). GD, SI, SIM.</td>
</tr>
<tr>
<td><em>Leptomantispa pulchella</em> (Banks). SI.</td>
</tr>
<tr>
<td><strong>Family Myrmeleontidae (Antlions)</strong></td>
</tr>
<tr>
<td><em>Brachynemurus abdominalis</em> (Say). CI, CM, SI, SIM.</td>
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<tr>
<td><em>Brachynemurus ferox</em> (Walker). CI, SI.</td>
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<tr>
<td><em>Brachynemurus peregrinus</em> (Hagen). SI. Lytton, Oliver, Osoyoos Lake N end.</td>
</tr>
<tr>
<td><em>Dendroleon speciosum</em> Banks. CI, GD, SI, SIM.</td>
</tr>
<tr>
<td><em>Myrmeleon exitialis</em> Walker. CI, CM, GD, SI, SIM.</td>
</tr>
<tr>
<td><strong>Family Polystoechotidae (Giant Lacewings)</strong></td>
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<tr>
<td><em>Polystoechotus punctata</em> (Fabricius). CI, CM, GD, SBI, SI, SIM.</td>
</tr>
<tr>
<td><strong>Family Sisyridae (Spongillaflies)</strong></td>
</tr>
<tr>
<td><em>Sisyra fuscatus</em> (Fabricius). GD, SI, SIM.</td>
</tr>
<tr>
<td><em>Sisyra vicarius</em> (Walker). GD, SI, SIM. Agassiz, Cultus Lake, Lillooet, Oliver, Kaslo.</td>
</tr>
<tr>
<td><strong>Order Raphidiidae (Snakeflies)</strong></td>
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<tr>
<td><strong>Family Inocellidae</strong></td>
</tr>
<tr>
<td><em>Negha inflata</em> (Hagen). SI, SIM.</td>
</tr>
<tr>
<td><strong>Family Raphidiidae</strong></td>
</tr>
<tr>
<td><em>Agulla adnixa</em> (Hagen). CI, CM, GD, SI, SIM.</td>
</tr>
<tr>
<td><em>Agulla assimilis</em> (Albarda). CI, CM, GD, SI, SIM.</td>
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<tr>
<td><em>Agulla bicolor</em> (Albarda). SI.</td>
</tr>
<tr>
<td><em>Agulla crotchi</em> (Banks). SI. Summerland.</td>
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<tr>
<td><em>Agulla herbsti</em> (Esben-Petersen). GD, SI.</td>
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<tr>
<td><em>Agulla unicolor</em> Carpenter. CM, SI, SM.</td>
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Table 2.
Occurrence of neuropterid orders in the ecoprovinces of British Columbia.

<table>
<thead>
<tr>
<th>Code</th>
<th>Ecoprovince Name</th>
<th>Raphidoptera</th>
<th>Megaloptera</th>
<th>Neuroptera</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBM</td>
<td>Northern Boreal Mountains</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>Taiga Plains</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td>Boreal Plains</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SBI</td>
<td>Sub-boreal Interior</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CM</td>
<td>Coast and Mountains</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>GD</td>
<td>Georgia Depression</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CI</td>
<td>Central Interior</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SI</td>
<td>Southern Interior</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SIM</td>
<td>Southern Interior Mountains</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

_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 _Protochauliodes spenceri_ (Corydalidae), _Nineta gravida_ and _Nathochrysa 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).

ACKNOWLEDGEMENTS

We thank Launi Lucas for help in assembling the list and maintaining the database upon which it is based. The following colleagues identified specimens: U. Aspöck (Raphidoptera), J. Garland (Chrysopidae), J. Klimaszewski (Hemerobiidae), M. Meinander (Coniopterygidae), and M.F. Whiting (Sialidae).

REFERENCES


