

# NEWSLETTER OF THE BIOLOGICAL SURVEY OF CANADA (TERRESTRIAL ARTHROPODS)

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## **General Information**

The Newsletter of the Biological Survey of Canada (Terrestrial Arthropods) appears twice yearly. All material without other accreditation is prepared by the Secretariat for the Biological Survey.

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**Queries, comments, and contributions to the Newsletter are welcomed by the editor. Deadline for material for the Fall 2000 issue is July 17, 2000.**

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## **Editorial Notes**

The Biological Survey of Canada (Terrestrial Arthropods) develops and coordinates national initiatives in taxonomic and ecological entomology on behalf of the Canadian Museum of Nature (formerly the National Museum of Natural Sciences) and the Entomological Society of Canada. This Newsletter communicates information about systematic and faunistic entomology that may be of interest in Canada, and reports especially on activities relevant to the Biological Survey.

## News and Notes

### Activities at the Entomological Societies' Meeting

The 1999 joint annual meeting of the Entomological Society of Canada and the Entomological Society of Saskatchewan took place in Saskatoon, 26-29 September 1999. The meeting was attended by more than 200 people. Many student members presented papers, with 33 entrants for the President's Prize student paper competition. Items in the program or associated with it included:

A plenary session on "Global and local perspectives on managing the millennium bug"

Symposia on "Insect population monitoring and forecasting" and "Biorational / biotechnological pest control"

Workshops on "Lygus bugs", "Preparing and assessing grant applications", "Internet resources for entomologists", and "Leafhoppers"

Submitted papers in four sessions.

A student paper competition, in four sessions, for the President's Prize of the Entomological Society of Canada.

The ESC Heritage Lecture, given by Dr. Paul Riegert, entitled "Entomology in Saskatchewan: the early years".

The ESC Gold Medal Address entitled "The role of taxonomists and natural history collections in biodiversity studies", given by Dr. Lubomir Masner.

Governing board and annual general meetings also took place, the gold medal and other honours were awarded, exhibits were displayed, and there were many opportunities for informal exchange of information, including an opening reception and a banquet.

#### Papers on systematics and related themes

The following titles include some of the papers of faunal interest that were presented in the various scientific sessions, including posters. (Interesting treatments on a range of other subjects also were presented in the various sessions).

Insects as ecological indicators of natural and modified landscapes in the Whangamata area, New Zealand. **J.A. McLean, D.C. Jones, S. Kilvert, C.E. Ecroyd, R. MacFarlane and J.S. Dugdale**

Lepidoptera diversity in mature and old growth aspen stands. **G.R. Pohl**

Tarsi across the water: Holarctic relationships in the chloropid genera *Dasyopa* and *Trachysiphonella*. **T.A. Wheeler**

Survey of thrips species associated with retail greenhouse operations in Edmonton, Alberta. **K.M. Fry**

Evolution of noctuid pests: a molecular perspective. **A. Mitchell**

Epigeaic arthropod succession in boreal forests: convergence, recovery, or both? **C.M. Buddle, J.R. Spence and D.W. Langor**

Habitat preferences of spiders along a gradient between a freshwater pond and a forest. **A. Graham**

Response of the natural enemy complex to epidemic bark and sawyer beetle populations. **K. Ryall and S. Smith**

Carabid beetles and riparian zones: the continuing story of forestry practices' influence on wildlife. **S. Lavallee**

Carabid beetle communities along an urban-rural gradient. **D.J. Hartley, J.R. Spence, E.D. Montes de Oca and G.E. Ball**

Boreal spiders and carabid beetles as bioindicators of forest disturbance and management. **D.P. Shorthouse and K.J. Cryer**

The implications of spruce budworm management for the species and ecosystem diversity of carabid beetles and moths in the boreal forest. **C.M. Wytrykush and N.J. Holliday**

A simple guide to forest defoliators. **L. Morneau, J.R. Spence and W.J.A. Volney**

Responses of insect communities to site preparation in jack pine plantations. **M.I. Bellocq, M. Doka and S.M. Smith**

Life history and seasonal dynamics of wolf spiders. **C.M. Buddle**

Carabid beetle assemblages of Elk Island National Park. **K.J. Cryer and J.R. Spence**

Hymenopterous parasitoids of filth fly (Diptera: Muscidae) pupae in cattle feedlots. **K.D. Floate, B.A. Khan and G.A.P. Gibson**

Shutterbugs of the past. Selected photos from the Spencer Entomological Museum, University of British Columbia. **S. Lavallee**

Effects of insecticides and ground cover management on predatory ground beetles (Coleoptera: Carabidae) within an enhanced IPM apple orchard in Annapolis Valley, Nova Scotia (Canada). **C.P.S. O'Flaherty, S. Rigby, C. Sheffield, R. Smith and K.I.N. Jensen**

Saskatchewan aquatic insect web page. **D. Parker and D. Lehmkuhl**

Influence of orchard managements systems on abundance and diversity of Hymenoptera with emphasis on Chalcidoidea. **M. Trombley, R. Smith, C. Sheffield and S. Rigby**

Ephemeroptera of the South Saskatchewan River, SK. **J. Webb and D. Lehmkuhl**

Incomplete barriers to mitochondrial gene flow between pheromone races of the North American pine engraver, *Ips pini* (Say) (Coleoptera, Scolytidae). **A.I. Cognato, S.J. Seybold and F.A.H. Sperling**

Incidence of endoparasites in a population of bumble bees (*Bombus* spp.). **T.L. Whidden, M.C. Otterstatter and R.E. Owen**

The higher Diptera community associated with sedges (Cyperaceae: *Carex*) in southern Quebec. **F. Beaulieu**

Phylogenetic implications of male genitalia in the subfamily Dolichopodinae (Diptera: Dolichopodidae). **S. Brooks**

Leaf mining as an evolutionary innovation: a reassessment. **V. Crecco and T.A. Wheeler**

A North American grasshopper living in Eurasia after all? **G. Litzenberger and W. Chapco**

Systematics and phylogeny of *Lauxania* Latreille (Diptera: Lauxaniidae). **J. Pérusse and T.A. Wheeler**

Systematics of the genus *Thricops* (Diptera: Muscidae). **J. Savage**

The effects of grazing on ant biodiversity in the south Okanagan. **J. Heron and G.G.E. Scudder**

The effects of grazing on Orthoptera and Grylloptera biodiversity in the South Okanagan. **P. Liu and G.G.E. Scudder**

After the crash: monitoring endemic forest tent caterpillar populations and their parasitoids. **C. Schmidt, and J. Roland**

The effect of trap size on catch rates of spiders and beetles. **L.M. Korinus, C.M. Buddle and J.R. Spence**

## Summary of the meeting of the Scientific Committee for the Biological Survey of Canada (Terrestrial Arthropods), October 1999

The Scientific Committee met in Ottawa on 21-22 October 1999.

### Scientific Projects

Discussion about scientific projects of the Survey included the following information.

#### 1. Grasslands

Dr. Shorthouse reminded the Committee that the grasslands project will be one of the Survey's main priorities over the next few years. The grasslands subcommittee met immediately after the Committee meeting last April and since then the subcommittee, co-chaired by

Dr. Floate and Dr. Wheeler, has continued its work.

Dr. Wheeler reported on some the products envisaged from this project, based on the subcommittee report distributed after that meeting. One of the main priorities identified was to establish a baseline framework for grasslands, that is finding out what types of grasslands exist, especially in a botanical context. Such a baseline will be crucial to make sense of the ecological side of the project. Additional ways were discussed to find expertise for such an endeavour.

Another suggested product was an informal conference at the 2000 joint ESC/ESA/SEQ meeting, including presentations on recent and ongoing projects and on potential projects, as well as a discussion about future plans. Dr. Wheeler had submitted a proposal, and a potential list of speakers and an outline will soon be established. A revised Grasslands newsletter will also be implemented. Dr. Danks has undertaken to edit the newsletter and he requested submissions as well as further ideas.

Dr. Wheeler continued that one or two prospectuses are envisaged to support the project, providing the scientific outline and plans, including the scientific rationale with a summary of current projects and ongoing goals and also an item that could be used to attract potential funding partners. Dr. Shorthouse had been exploring potential contacts and ideas for funding, and other possibilities were discussed.

#### 2. *Seasonal adaptations* (and see p. 13)

Dr. Danks reported that a paper on life cycles in polar arthropods had been published and good progress had been made with various other papers on seasonal adaptations. A general paper on life cycles and a review on Dehydration in dormant insects are in press. An invited article on life cycles also appeared in the bulletin of the Société d'entomologie du Québec. Finally, Dr. Danks reported that he is cooperating with Dr. David Levin and Dr. Olga Kukal on cold-hardiness studies, and the project recently received NSERC funding.

#### 3. *Insects of Keewatin and Mackenzie*

Dr. Currie outlined this project focussed on the Keewatin and Mackenzie regions which have been relatively little surveyed. An expedition will be undertaken in July / August 2000 down a 700-km length of the Horton River. This will allow sampling not only the transect along the river but also riparian and other habitats along tributaries of various sizes. The project will go forward (6 participants are already in place) and complex matters related to permits, as well as additional funding, are being pursued.

#### 4. *Other*

Other projects were reviewed, including those on keys to the families of Canadian arthropods and arthropods of the boreal zone.

### Other scientific priorities

#### 1. *Arthropod fauna of soils*

Dr. Behan-Pelletier reported that she had attended the Soil Ecology Society Conference held in Chicago last May. Papers were presented on mites, spiders, and isopods. A Scientific Committee on Problems of the Environment (SCOPE) workshop that Dr. Behan-Pelletier attended in August also focussed on how biodiversity impacts on ecosystem processes, notably the critical transition zones between atmosphere, soil, groundwater, streams, rivers and marine systems. Dr. Behan-Pelletier anticipates that papers from the meeting will point out the need for studies of the roles of Diptera in this context. Every SCOPE workshop also demonstrates the need for more systematists. The deadline for a report on biodiversity in Canadian agricultural soils (for SBSTTA), mentioned at previous meetings, has been delayed to December 1999.

A soil microarthropod key to the order level on CD has been developed by Dr. Dave Walter with the software package LUCID at the University of Queensland in Brisbane. It is hoped that the CD will be published in the next year. Dr. Behan-Pelletier reviewed other publications and presentations, as well as current graduate studies on soil arthropods. She continues to work in collaborative studies in forest canopy and other sites. Dr. Behan-Pelletier also drew the Committee's attention to the newsletters *Quaternary Entomology Dispatch*, and *The Network News*, newsletter of the Long Term Ecological Research Network.

#### 2. *Old-growth forests*

Dr. Scudder reported that discussion continues among researchers about organizing a symposium on old-growth forests. Several studies would be completed within the next two years, and perhaps a Survey project should concentrate only on certain types of work, although

comparative studies on the canopy and comparative studies on chronosequences as well as the effects of forest practices on the fauna are all in progress. Discussions about the nature and timing of the symposium will continue.

### 3. *Invasions and reductions*

Dr. Scudder reminded the Committee that he and Dr. Foottit have submitted a preliminary proposal for a symposium on this subject at the joint meeting in 2000 and they are continuing to develop a list of speakers. However, it is difficult to define further long-term projects because most of the information available is anecdotal and solid databases are required. He emphasized that long-term research is needed with younger people involved. Unfortunately there are few resources for this because the federal government has stopped assessing invasions. The Survey needs to provide influence here. The Survey's current approach might best be to define the context for some of the well-known documented cases and seek any common theme. Longer-term objectives would be to produce a publication, and to support long-term initiatives.

### 4. *Endangered species*

A paper by Dr. Scudder commenting unfavourably about Canada's endangered species protection had recently been published in a special issue of *Conservation Biology*. The same issue includes three other papers on endangered species acts in the United States, Australia and Europe, which convincingly demonstrate how poorly Canada does compared to these other jurisdictions. For example, Australia – with some similar features of size, population, and so on – is far ahead of Canada.

Dr. Scudder noted that in the British Columbia forest practices code wildlife is broadly identified as all living organisms and now there is an identified wildlife management strategy. An endangered species symposium was held last February in Kamloops at which the identified species list was announced. A second list is now being developed (including some insects) and a technical advisory team has been set up,

giving an opportunity for action if potential areas and impacts are identified.

### 5. *Survey web site*

Dr. Danks explained that the main need to permit a redesigned and expanded Survey web site was a person to do this work. The Survey was able recently to hire Ms. Agnes Bonk for this role through a six-month internship under the Youth International Internship Program.

Therefore, work is being done on the site, and the input of the Committee was sought as to priorities. This included more actual faunal data including scientific projects. However content (as opposed to web design) would have to be provided for this purpose. More minor features, such a site map and links, could be implemented more easily.

It was agreed that the grasslands project would be a feature project for the web site. Dr. Wheeler would be responsible for coordinating content. The Survey's database of personnel, Yukon book data, and faunal analysis information would also be given priority. Committee members agreed to send ideas and materials (such as photographs of habitats or people) to the Secretariat to help in the web site update.

### 6. *Funding for Biodiversity Projects*

Dr. Wheeler distributed a draft of the information on funding sources for biodiversity projects in entomology, especially systematics, that he had assembled. This information is aimed at graduate and senior undergraduate students including general advice on preparing applications, how to find sources of funding, and a list of funding sources divided by category including some suggestions for non-traditional sources of funding. It is anticipated that this information or the way to access it will be posted relatively soon on the Biological Survey's web site with a link on the ESC's student affairs web page.

### 7. *Geographic data standards for specimen labels*

Dr. Wheeler reported that a brief on label data standards is in progress, considering label preparation standards, label information

standards, and perhaps data retrieval standards. The final brief should be available for review in April 2000.

8. *Potential brief on the value of proper biodiversity studies*

A draft brief – showing that the Survey’s “prescriptions” published in earlier briefs on how to do biodiversity studies properly are effective – was reviewed. The general message and approach of the brief were deemed appropriate and a final draft will be prepared for April 2000.

9. *Monitoring of continuing priorities*

The Committee reviewed many completed or less active Survey projects to expose updated information, including items about arthropods of peatlands, aquatic insects of freshwater wetlands, arthropod fauna of springs, arthropod ectoparasites of vertebrates, arthropods of the Yukon, arthropods of the Queen Charlotte Islands (Haida Gwaii), arthropods of alvars, climatic change, environmental appraisal, agroecosystems, and some other topics such as aspects of insect trapping.

10. *Information technology*

Mr. Larry Speers, Agriculture and Agri-Food Canada, reminded the Committee that he has been involved with the field of bioinformatics for several years and he sees it having a significant impact on research. He believes that a number of trends will have a major impact on the ability to obtain funding but it will take a cultural change on how people view work and data generated. There is tremendous potential to use electronic management tools to reverse fragmentation of the study of biology.

Bioinformatics is the application of information technology to biology with the emphasis on *persistent data stores*, and natural history collections are the main source of persistent data stores. At present, however, they are scattered and not electronically accessible. Therefore, a distributed internet-based network of persistent, searchable, documented inter-operable databases is being developed. A core requirement is accessing correct names.

Agriculture and Agri-Food Canada is now working with the U.S. on an integrated taxonomic information system for North America (see <http://res.agr.ca/itis>) to make accessible authoritative nomenclature. There is a need for experts to take stewardship responsibility for many invertebrate groups.

Mr. Speers noted that electronic tools can show or compare any competing classification system, allowing an internet search portal for biological data mining. Eventually the system will be able to search natural history collections. Some breakthroughs have been made at the specimen level, modelled after Z39.50 protocol developments for distributed searching in the library community, which allow simultaneous searching of multiple catalogues. Work is proceeding on a similar system to query natural history collections. A prototype at the University of Kansas has been funded by NAFTA and is now on line.

Dr. Floate wondered whether – once all the collection information is available electronically – there would be sufficient money to maintain the collections themselves. Mr. Speers did not see this as potential problem, but more professional credit will have to be provided for data-management activities. Dr. Scudder thought that such database development is the correct direction, but he provided relevant examples where funding was made available to develop databases but not to do proper identifications or to correct the information in the databases. Dr. Smith and Mr. Speers stated that, in a broader context, systematics support must be in place to ensure that the databases will have authoritative content and the ability to develop and maintain that content.

Dr. Danks wondered whether there is any evidence that the support currently being received for databasing and distributed information systems is being reflected in the necessary systematics infrastructures. Mr. Speers and Dr. Smith agreed that it is important to point out to decision makers that if there is no assurance that the quality of the existing information will be upgraded nor that new information will be added there is no point in developing any of these tools.

## Liaison and exchange of information

### 1. *Canadian Museum of Nature*

Ms. Joanne DiCosimo, President, Canadian Museum of Nature, reminded the Committee that the Museum had held national consultations in the fall of 1997. From that work strategic directions were set and published in a document called Focus and Renewal. The Museum is currently developing the third year of that plan and simultaneously considering long-term planning. National consultations with museums and the academic community are again being considered. The Museum is currently undertaking a renewal plan for the Victoria Memorial Museum Building in Ottawa, as well as a major private-sector fund-raising campaign targeted for three specific gallery-development projects, the creation of a nature access fund (to support digitizing the collection records) and programming support for the Canadian Centre for Biodiversity. A second proposal is being prepared for submission to Treasury Board to fund the staged replacement of scientific equipment.

Dr. Mark Graham, Director of Research Services, reported on progress from the Federal Biosystematics Partnership, including evaluating the large scale international proposal for a Global Biodiversity Information Facility. The FBP will be coordinating to some extent the project formerly known as CanBII, now known as the Biota of Canada, examining what components should go into that database and how museums and other collections facilities can contribute. A workshop on this topic is planned.

The Museum hopes soon to have 400,000 of its 2.1 million collections records available electronically in a metadata format through the Museum's web site. The CMN has started an interest group amongst the museum community to look at how natural history collections are developed in Canada and at the research expertise that resides at those natural history museums. A full survey of those institutions will be conducted next year. Discussions are underway with the Natural Sciences and Engineering Research Council of Canada (NSERC) about the maintenance of natural history collections at universities. Dr. Graham

added that if orphaned collections are not catalogued it is logistically difficult to make them available subsequently in a meaningful way. Members of the Committee noted that NSERC had been made aware of concerns about collections in the past.

The Museum continues to have an interest in joint positions - the joint appointment of Dr. André Martel with the CMN and as Assistant Director at Bamfield Marine Station was recently renewed. The Museum will be providing office facilities for the Executive Secretary of the IUCN Species Survival Commission's Medicinal Plant Specialist Group, Dr. Danna Leaman.

Dr. Graham spoke about Environment Canada's environmental effects monitoring program, which recently has considered the requirements for metal mines to monitor their impacts on the aquatic environment, including diversity monitoring with a requirement to retain voucher specimens (mostly aquatic insects) from all of the monitoring stations. The mines may be looking for advice on how to identify and store these samples.

Dr. Graham noted that the Council of Science and Technology Advisors has produced a report called Science Advice for Government Effectiveness, stating how the government should receive scientific advice. This report was published in draft form with outside input requested. It can be viewed at: [http://csta-cest.gc.ca/csta/website/sage\\_e.html](http://csta-cest.gc.ca/csta/website/sage_e.html).

### 2. *Biological Resources Program, ECORC*

Dr. Jean-Marc Deschênes, Director, ECORC, reported that the reorganization of the Biological Resource unit is now complete. He reminded the Committee that it is made up of three sections: entomology, biodiversity, and mycology and botany.

Dr. Deschênes explained that the Global Biodiversity Information Facility (GBIF) was initiated under the major science forum for the Organisation for Economic Co-operation and Development (OECD). A meeting was held in March in Paris. A follow-up meeting was held in September in Washington to review the

founding documents including agreements, intellectual property issues, and business plans. The FBP felt that the cost of the original business plan was too high and the structure needs to be re-examined. Dr. Deschênes announced that Agriculture and Agri-Food Canada has re-established procedures to evaluate donations of private collections so that the donor can receive a tax credit. A new scanning electron microscope will be obtained this year for BRP. Plans are proceeding to upgrade collection facilities, especially storage areas, cabinets, laboratories and offices. The Canadian version of ITIS (Integrated Taxonomic Information System) – to develop an on-line, scientifically credible, list of biological names focusing on the biota of North America – has now been launched on the internet (<http://res.agr.ca/itis/>).

Dr. Smith explained that the federal partnership formerly known as CANBII is becoming stronger. Cooperative activity with the CMN and Forestry continues to further develop the idea of an online biota of Canada based on data captured from specimens in their collections. The initial module is the butterflies of Canada, which has been in process for almost two years, involving all of the major collections in Canada as well as some smaller ones. Dr. Smith emphasized that such a project works only if everyone contributes and participates, which has been the case. It is hoped that the next phase will be additional modules. Dr. Smith added that a proposal has been submitted to the natural resources departments (5NR) for a 3-year project to focus resources in the federal system in a more methodical fashion on the Biota of Canada initiative. Dr. Smith also mentioned that he and Mr. Larry Speers are now involved with the North American Biodiversity Commission, working to propose a number of North American ventures in bioinformatics. A meeting is planned for January 2000.

### 3. *Entomological Society of Canada*

Dr. Hugh Danks, past-president, reported on behalf of Dr. Dan Johnson, the current president. The annual meeting of the Society was held in Saskatoon and was very well attended with an excellent scientific program.

Dr. Danks reported that the Society has returned into the black after a number of years of difficult finances. In 1999 the ESC was even able to place some funds back into investment accounts as a buffer for the future. The reasons for such an improvement include mainly the revised publication and other avenues that the Society implemented following its strategic review a couple of years ago; and also the fact that the book on Diseases and Pests of Vegetable Crops in Canada continues to sell steadily (returning more of that substantial past expenditure). The Society is considering details of electronic publishing of the *Canadian Entomologist* (in consultation with the NRC Research Press). A report and recommendations will be available next year for potential action. A new Editor for the ESC *Bulletin* will be required next year as Dr. Hugh Barclay will be stepping down by the end of the year.

Dr. Danks reported that the key item in the shorter term is the matter of the year 2000 joint annual meeting with the Entomological Society of America (ESA) and the Société d'entomologie du Québec (SEQ) (Montreal, December 2-7). The ESC believes that it will be an excellent scientific meeting, but some financial issues remain to be resolved with the ESA.

### 4. *Canadian Wildlife Service / Committee on the Status of Endangered Wildlife in Canada*

Dr. Theresa Fowler, CWS, reminded the Committee that she reported about pending endangered species legislation a few years ago. The new minister is interested in the legislation and soon drafting the legal terminology of the act should begin. Its name is now the Species at Risk Act.

Dr. Fowler explained that COSEWIC has new terms of reference. The vote has been restored to the species specialists groups. Because of the new terms of reference, Dr. Fowler is working on a new organization and procedures manual. As chair of the Lepidoptera and Mollusca subcommittee, she now looks after the Lepidoptera while her co-chair handles the Mollusca. COSEWIC is changing with a view to pending legislation and because there is a

need to better justify the listings of species. After a long and elaborate process of evaluating various assessment criteria COSEWIC has decided to adopt criteria that are almost identical to those used by the World Conservation Union (IUCN). As a result of the new listings and the pending legislation, the focus of COSEWIC in the near future will be to reassess all the species it has assessed to date using the new criteria. New listings will be limited to species expected to be at a relatively high risk. Last April two butterfly species, the Island Marble and the Frosted Elfin, were newly listed as extirpated.

#### 5. *Ecological Monitoring and Assessment Network*

Dr. Peter Hall, Partnerships Coordinator, Environment Canada, reported that the EMAN recently published the vegetation monitoring protocols and is now trying to make them better known to groups around the country. The objective is to have biological diversity monitoring groups using similar methods and protocols for making biodiversity assessments. A "core variables" project has been completed to the point that EMAN has a proposal and can conduct consultations. Another EMAN initiative is the topic of advisories to senior management in the bureaucracy. EMAN envisages two types of advisory: an early warning ecosystem change advisory, which points out to policy makers the risks in ecosystem changes, with recommendations on how they might be addressed; and a state of the ecosystem advisory.

#### 6. *MAB/Canada*

Dr. Patricia Roberts-Pichette, MAB/Canada, stated that the Canadian Biosphere Reserves Association is active and has a number of ongoing interesting projects. She circulated the first volume of the new edition of Ecotours of the Trans-Canada Highway. This is a Canadian contribution to MAB and all the biosphere reserves will be mentioned in the text. Other volumes are in preparation. Dr. Roberts-Pichette noted a report being finalized to propose the development of a terrestrial climate observing system for Canada.

#### 7. *Parasitology module, Canadian Society of Zoologists*

Dr. David Marcogliese, Parasitology module, reported that monitoring protocols for parasites of freshwater fish have been submitted to EMAN and should be posted on their web site soon. Protocols for parasites of birds, of amphibians and reptiles and of mammals are in progress. The parasitology directory remains on the parasitology module web site (<http://www.biology.ualberta.ca/parasites/indexen/modulei.htm>).

The perch project continues with new data being added. A project on Biodiversity of Stickleback Parasites was accepted by DIVERSITAS (though without funding) as one of the Canadian projects for the International Biodiversity Observation Year (IBOY). Dr. Marcogliese also reported on a number of recent developments in parasitology, and noted many projects and publications related to biodiversity.

### **Other items**

#### 1. *Regional developments*

Members of the Committee summarized relevant information from various regions. For example, in British Columbia the University of Victoria's Department of Biology is steering more towards the areas of bioinformatics, structural biology (= proteins), genomics, and integrated biology, and away from systematics and taxonomy. The Entomological Society of British Columbia is healthy and held its annual meeting in October. Dr. Scudder reported that his last four students are completing their degrees. He retired last spring. When these students have finished there will be no more invertebrate biodiversity studies in the Zoology Department at the University of British Columbia because there will be no replacement to teach the entomology and the evolution courses, which have been cancelled. The University of British Columbia has not yet found a way to support its collections. The Osoyoos Desert Centre has opened, a grassland area where ecosystem restoration is being done. There is re-

search there and also a public interpretation program. The new Minister of the Environment has toured the south Okanagan area where a conservation plan is being developed, which calls for 40% of the area to be maintained in its original state, so that the area is not destroyed from a biological viewpoint by overdevelopment. The focus of entomological work at the Royal British Columbia Museum has been on databasing with a concentration on the dragonfly database. There has also been work with the Conservation Data Centre to establish lists of threatened and endangered terrestrial arthropods.

In the prairies, the Entomological Society of Alberta held its annual meeting in October. The Society is strong, and approximately 80 of 150 members attended. A great deal of attention had been generated by an article published in the *Lethbridge Herald* announcing that a beetle representing a major threat to hardwood forests had been recovered in Alberta, although in fact the specimens were a common species of longhorn beetle. Dr. Kevin Floate declared that this story demonstrates both the importance of accurate identifications and how quickly electronic media operate. Dr. Dale Wrubleski reported on the second Manitoba biodiversity field inventory workshop held in the spring by the Manitoba Conservation Data Centre with the wildlife branch of the Department of Natural Resources, and intended to foster cooperation and information exchange. Projects included a Manitoba dragonfly survey, a lady beetle survey, an atlas of the ants of Manitoba and a book on tiger beetles of Manitoba. Dr. Wrubleski reviewed various other projects based in Manitoba. Dr. Richard Westwood is now at the University of Winnipeg. The annual meeting of the Entomological Society of Manitoba was held in November with the theme of recent human activity in agriculture and the environment affecting insects. Dr. David Larson observed how tidy and managed the prairies seem to be, especially along the roadways where there are now no refuges for wildlife, in contrast to the habitat in other jurisdictions.

In Ontario, two new students are working on entomology projects at the Royal On-

tario Museum for a total of seven students. There has been good progress on the databasing of the Walker odonates. Lepidoptera specimens are being moved into new cabinets as information is being captured for the Butterflies of Canada project. A book on special habitats in natural environments in the greater Toronto area was recently published and it includes a chapter by Dr. Glenn Wiggins on arthropods. Dr. Steve Marshall received an NSERC grant to hire a curator for the collection at the University of Guelph. The Canadian National Collection of insects and arachnids now has a bilingual web site with links to the developing type catalogues and to systematics workers at ECORC [<http://res.agr.ca/ecorc/cnc/index.htm>]. Other reports were made about students and researchers in entomology in Ontario.

In Quebec, a 15-page supplement on entomology was published in *Quebec Science*. The annual meeting of the Société d'entomologie du Québec was held in October in Hull, Quebec. The theme of the meeting was biodiversity, including an all-day symposium. Planning continues for the joint ESA/ESC/SEQ meeting in 2000. A book on the histerid beetles of Quebec has been published. A book on the butterflies of Quebec has also been published. A CD on invertebrates of freshwater habitats is being published in 2000. Dr. Vickery has retired from the Lyman Museum and moved to the east coast. Five graduate students, as well as a number of undergraduate students and volunteers, are working on systematics and biodiversity projects at McGill University.

In Newfoundland and the Maritimes, the Newfoundland insectarium has celebrated its first anniversary and has apparently been successful. Dr. Roger Pickervance has started research on Newfoundland spiders. Mr. Paul-Michael Brunelle discovered a new dragonfly species. A book on butterflies has been produced by Mr. Bernard Jackson, former director of the Memorial University botanic garden. Dr. Donna Giberson announced that as of September the University of Prince Edward Island Faculty of Science can offer a graduate program, and students should start in January. Recently the Environmental Protection Act (in-

cluding the province's endangered species legislation) has been amended and a forest practices code implemented. Several entomological projects are underway on P.E.I.

For the Arctic, Dr. Richard Ring noted that he, Dr. Olga Kukal, Mr. Tom Allen and a student from Dr. Rick Lee's laboratory in Ohio had worked in the high arctic in summer 1999. These places are receiving increased ecotourism. The Polar Continental Shelf Project is keen on supporting university research as much as possible in terms of logistic support. However, the Polar Continental Shelf Project base at Tuktoyuktuk is theoretically still open but was not open last year. Because it will open only if there is demand, he doubts that will happen, because those making plans will tend to avoid the uncertainty of an opening based on demand. The University of the Arctic has an increasing profile including a recent editorial in the last issue of *Arctic*. This will be a virtual

university, organized by 8 circumpolar nations, and will include some field courses in central locations. The Canadian Committee for Antarctic Research has released a discussion paper on a strategic plan for Canada for Antarctic and Biplar Science. The annual meeting of the Association for Canadian Universities for Northern Studies in November in Ottawa addresses the importance of arctic research.

## 2. *Other matters*

The Committee also considered other recent information, including international and national liaisons, membership of the Scientific Committee, the need to urge selected scientific journals to publish faunistic papers, sales of the book *Insects of the Yukon*, operations of the Biological Survey Secretariat, damaged ecosystems and Survey publicity.

## Symposium on biodiversity at the 1999 Annual Meeting of the Entomological Society of Quebec

The entire second day of the 1999 Annual Meeting of the Société d'entomologie du Québec was devoted to a symposium on biodiversity, within the context of the overall meeting, organized by Gabriel Guillet (Université de Montréal), François Lorenzetti (Université de Montréal), Bernard Philogène (Université d'Ottawa) and John Arnason (Université d'Ottawa). The program also included a full scientific program on the first day, as well as social events and local visits.

The Symposium on Biodiversity on October 26 was organized by François Lorenzetti and chaired by Hugh Danks (Canadian Museum of Nature). It comprised 7 scientific presentations, and a concluding panel discussion and question period with all speakers. Also printed in the meeting program was the abstract of a further paper that had to be cancelled at the last moment but is included below. Topics covered a deliberately wide range of approaches and perspectives:

***The geographical variation in biodiversity: patterns, mechanisms and dead-ends.*** David J. Currie. An approach was described that suggests that climatic factors (rather than loss of habitats, for example) explain a large fraction of the large-scale geographical variability observed in the species richness of many groups, including insects.

***Insect biodiversity of a tropical archipelago: Galapagos Islands, Ecuador; Evolution, ecology, and distribution.*** Stewart B. Peck. At least 1850 insect species are now known from the Galapagos Islands, and the fauna of individual islands depends on island area, elevation and ecological complexity. Indigenous species arrived mostly by air and on the sea surface, but a growing number of species is introduced.

***The primacy of the species level in biodiversity studies.*** Pierre Paquin. The various levels of biodiversity were defined and illustrated: species diversity is suggested as the focal point, which depends on taxonomic knowledge. Various alternatives were defined and illustrated, and data

from a boreal forest site used to show that only species-level studies, and not the alternatives, provide sufficient precision and confidence.

***The contribution of genomic sequencing to the systematics of Lepidoptera.*** Bernard Landry. The technique of genomic sequencing greatly helps the study of biodiversity in the context of evolution, and can be used to generate novel phylogenetic hypotheses at all levels of classification, as illustrated by specific examples for the Lepidoptera.

***The Canadian Museum of Nature is a centre for natural science collections, systematics research and a window to the natural world.*** Mark S. Graham. The regional, national and international activities of the Canadian Museum of Nature were reviewed, including the large and important collections of natural history items and the work of the Canadian Centre for Biodiversity.

***Is there a future for insects in forest biodiversity research projects?*** Agathe Cimon and Danièle Pouliot. [Abstract only] Knowledge of insects in forest habitats is fragmentary, despite the potential value of insects to characterize and monitor forest systems. However, to permit such uses re-

sources must be invested in such necessities as taxonomic training, collections, databanks and the acquisition of basic knowledge.

***Using insects in the process of determining criteria and indicators of sustainable development in forestry.*** Christian Hebert. The Canadian Forest Service has developed a Forest Biodiversity Network to provide the scientific foundation to monitor and report on the status of forest biodiversity, to improve understanding of human and other impacts on that diversity, and to develop means to preserve it. Recent work that addresses these objectives for insects was outlined.

***Concluding remarks: Biodiversity - some current themes and requirements.*** Hugh V. Danks. An overview of selected themes highlights the importance of considering information at a range of spatial and temporal scales, the need for proper procedures for studying biodiversity, and the need for long-term systematics infrastructures to support such work.

Extended abstracts of the presentations will be published in the winter issue of the SEQ Bulletin, *Antennae*.

## Yukon book well received

The book *Insects of the Yukon*, published by the Biological Survey in late 1997, has been very well received. Several newspaper, radio and other general accounts were prepared (e.g. Globe and Mail, Yukon outlets), and reviews have so far been published in three scientific journals.

John Edwards' review (*Quarterly Review of Biology* 74(2): 234-235, 1999) reads in part: "This monumental volume is a prodigious achievement in welding the work of 35 authors into a coherent whole of over a thousand pages. Bounded by introductory sketches of present and past Yukon environments, and a valuable concluding overview and synthesis, the bulk of this book presents annotated species lists of arachnids and insects, together with commentary on their distribution and biogeographical significance. . . . This volume . . . is a mine of data for the systematist, ecologist, and biogeographer, and it may well be an important base line for the future evaluation of consequences of

global warming. One can only hope that those concerned with the Alaskan and Siberian sectors of Beringia will in due course emulate the splendid example set by the Canadians."

Richard Zack's review (*Annals of the Entomological Society of America* 91(6): 893-894, 1998) included a similar theme: "To their credit, the Canadian entomologists appear to have developed an ability to work cooperatively to accomplish projects of substantial magnitude; they are a group to be studied and imitated. . . . I was impressed by the quality of each of the chapters and their overall similarity without being repetitive. For instance, as one might expect, numerous maps are used by several of the authors to indicate items such as collection sites and routes of dispersal. While the maps are not of a consistent size or format, they are well done, and each is designed to best suit the needs of the author. And, while each chapter contains the minimal amount of information that makes that chapter a valuable addition to the book, the apparent

freedom given to the authors to develop individual styles and uses of the information available adds to the overall quality of the book. The editors should be applauded for allowing the authors to explore their interests, yet reining them in enough so that the volume did not become a collection of disparate thought and styles. The work load on the editors and the authors was certainly substantial. . . Each of the chapters is a self-contained entity with a separate list of references. Two indices are provided; an index of families and higher taxa of arthropods and a subject index. I found the subject index to be especially valuable because I was able to cross-reference general topics throughout all of the chapters. . . I found a lot to like in *Insects of the Yukon* . . . anyone interested in the broader applications of faunistic data will find inspiration and some thought provoking studies and discussions . . . this is another in a series of exceptional contributions provided through the efforts of the Biological Survey of Canada (Terrestrial Arthropods) and its contributing entomologists.”

Mark Oswood, emphasizing aquatic aspects (*Journal of the North American Benthological Society* 17(3): 377-378, 1998) wrote in part:

“The taxa lists provided in each of the chapters are important contributions to our knowledge of the fauna of northern ecosystems. . . Documenting the biodiversity of high-latitude regions is important because these regions are likely to see increased resource extraction and because climate models predict sizable temperature increases at high latitudes.

Nonetheless, reading taxa lists is mostly exciting only to dedicated systematists and biogeographers. Fortunately, . . . the chapter authors provide discussions of 2 themes that truly unify the chapters: 1) adaptations to high latitudes (especially life histories), and 2) Pleistocene glaciation (and the Beringian refugium) as a historical event that still haunts North America. . . The final chapter of the book . . . provides more than the usual summing-up chapter common to edited books. . . The motif of the book — seeking explanations about the nature of the Yukon insect fauna from geographic distributions of taxa considered in light of present and past environments of northwestern North America — is ably reviewed, helping readers make collective sense of the taxonomically constrained chapters. . . At only 95 and with just over 1000 pages, this book is a cost / unit bookmass bargain and a necessary addition to any academic library whose goals include decent holdings in entomology and biogeography. . . Finally, this book is a model of the value of long-term projects organized around a strong theme and thoughtfully synthesized.”

Copies of *Insects of the Yukon* are still available from the:

Entomological Society of Canada,  
393 Winston Avenue,  
Ottawa, ON, K2A 1Y8 Canada  
phone: (613) 725-2619  
fax: (613) 725-9349  
e-mail: entsoc.can@sympatico.ca  
95 (Cdn) to destinations in Canada (+ 7% GST)  
95 (U.S.) to destinations elsewhere



# Project update: Seasonal adaptations in insects

Seasonality is a dominant feature of Canadian environments. The Survey's long-standing project on seasonal adaptations in insects addresses various topics in conjunction with the roles of seasonal constraints in determining the fauna of the country, especially in northern regions. In northern Canada, conditions are so severe that many species cannot meet the resulting environmental challenges. Some consideration of seasonal adaptations therefore is included in various predominantly faunal publications of the Survey on Canadian, arctic, boreal, and Yukon regions.

More specific Survey studies and reviews have addressed a range of seasonal themes, such as cold hardiness and dormancy/diapause, as well as seasonal control and other aspects of life cycles more generally. These approaches have yielded several key findings. For cold hardiness, they include the importance of habitat choice as well as physiological and biochemical mechanisms of cold hardiness, and the need to integrate many elements – such as timing and energy use as well as just seasonally cold temperatures – into understanding cold hardiness. Recent work on cold hardiness focusses on the parallels between desiccation protection and cryoprotection, especially the role of trehalose; and on adaptations of species from harsh environments such as the high arctic moth *Gynaephora groenlandica* (cf. *Arctic Insect News* 10: 7-10, 1999) including a recent NSERC grant for cooperative work that includes the genetic control of some elements of the response.

A recent analysis of dehydration in dormant insects considers many features linked to both cold hardiness and dormancy. For dormancy, a major conclusion from the Survey's project is the need to view dormancies as developmental pathways that are an alternative to direct development. In this view, life cycles com-

prise a series of successive developmental choices rather than the action of a simple on-off switch. Such a conclusion, and more general consideration of the diversity and evolution of insect life cycles, emphasizes the breadth of trade-offs that must be understood to evaluate any particular life cycle. Recent work in this field includes several attempts to identify key patterns in the responses and fruitful ways to study them. These discussions again reinforce the value (in contrast to piecemeal studies prevalent in the past) of studying multiple facets of adaptation simultaneously in single species, preferably those that are relatively well known taxonomically (to avoid unpleasant surprises about the identity of the material) and for which there is adequate ecological information (so that key habitats and ecological pressures are already known).

The Survey's project continues with other reviews in progress on the themes of cold hardiness, dormancies and life cycles.

## Selected references

- BSC Newsletter. 1988. Canadian perspectives: Arthropod cold-hardiness. *Newsletter of the Biological Survey of Canada (Terrestrial Arthropods)* 7(2): 42-44.
- BSC Newsletter. 1992. Activities at the 1991 Entomological Societies meeting - Cold-hardiness symposium. *Newsletter of the Biological Survey of Canada (Terrestrial Arthropods)* 11(1): 11.
- Danks, H.V. 1979. Characteristic modes of adaptation in the Canadian insect fauna. pp. 548-566 in H.V. Danks (Ed.), *Canada and its insect fauna. Mem. ent. Soc. Can.* 108. 573 pp.
- Danks, H.V. 1980. Arthropods of Polar Bear Pass, Bathurst Island, Arctic Canada. *Syllogeus* 25. 68 pp.
- Danks, H.V. 1981. Arctic Arthropods. A review of systematics and ecology with particular reference to North American fauna. Entomological Society of Canada, Ottawa. 608 pp.

- Danks, H.V. 1987. Insect dormancy: an ecological perspective. Biological Survey of Canada (Terrestrial Arthropods), Ottawa. 439 pp.
- Danks, H.V. 1987. Insect-plant interactions in arctic regions. *Rev. Ent. Quebec*. 31: 52-75.
- Danks, H.V. 1990. Arctic insects: instructive diversity. pp. 444-470, Vol. II in C.R. Harington (Ed.), Canada's missing dimension: Science and history in the Canadian arctic islands. Canadian Museum of Nature, Ottawa. 2 vols, 855 pp.
- Danks, H.V. 1991. Winter habitats and ecological adaptations for winter survival. pp. 231-259 in R.E. Lee and D.L. Denlinger (Eds), *Insects at Low Temperature*. Chapman and Hall, New York and London. 513 pp.
- Danks, H.V. 1991. Life-cycle pathways and the analysis of complex life cycles in insects. *Can. Ent.* 123: 23-40.
- Danks, H.V. 1992. Long life cycles in insects. *Can. Ent.* 124: 167-187.
- Danks, H.V. 1993. [Seasonal adaptations in insects from the high arctic.] pp. 54-66 in M. Takeda and S. Tanaka (Eds.), [Seasonal adaptation and diapause in insects]. Bun-ichi-Sogo Publ., Ltd., Tokyo. 447 pp. (In Japanese).
- Danks, H.V. (Ed.) 1994. Insect life-cycle polymorphism: theory, evolution and ecological consequences for seasonality and diapause control. Kluwer Academic Publishers, Dordrecht, Netherlands. Series Entomologica 52. 376 pp.
- Danks, H.V. 1994. Diversity and integration of life-cycle controls in insects. pp. 5-40 in H.V. Danks (Ed.), 1994.
- Danks, H.V. 1994. Insect life-cycle polymorphism: current ideas and future prospects. pp. 349-365 in H.V. Danks (Ed.), 1994.
- Danks, H.V. 1996. The wider integration of studies on insect cold-hardiness. *European Journal of Entomology* 93: 383-403.
- Danks, H.V. 1999. Life cycles in polar arthropods – flexible or programmed? *European Journal of Entomology* 96: 83-102.
- Danks, H.V. 1999. La dormance et les cycles biologiques. *Antennae* 6: 5-8.
- Danks, H.V. 1999. The diversity and evolution of insect life cycles. *Entomological Science* 2: 651-660.
- Danks, H.V. 2000. Dehydration in dormant insects. *Journal of Insect Physiology*, in press.
- Danks, H.V., J.A. Downes, D.J. Larson and G.G.E. Scudder. 1997. Insects of the Yukon: characteristics and history. pp. 963-1013 in H.V. Danks and J.A. Downes (Eds.). *Insects of the Yukon*. Biological Survey of Canada (Terrestrial Arthropods), Ottawa. 1034 pp.
- Danks, H.V. and R.G. Foottit. 1989. Insects of the boreal zone of Canada. *Can. Ent.* 121: 626-677.
- Danks, H.V., O. Kukal and R.A. Ring. 1994. Insect cold-hardiness: insights from the Arctic. *Arctic* 47: 391-404.
- Ring, R.A. and H.V. Danks. 1994. Desiccation and cryoprotection: overlapping adaptations. *Cryo-Letters* 15: 181-190.
- Ring, R.A. and H.V. Danks. 1998. The role of trehalose in cold-hardiness and desiccation. *Cryo-Letters* 19: 275-282.



## The Quiz Page

— test your knowledge of Canada and its fauna —

1. What is the surface area of the very large lakes in Canada, as a percentage of the surface area of the Canadian mainland?
2. What is alluvium?
3. Name several ways in which insects are involved in the death of trees in Canadian forests.
4. Name some key features by which insects survive actual body freezing during the Canadian winter.
5. Name the food plants of the following well-known Canadian insects.
  - a) the butterfly *Danaus plexippus*
  - b) the beetle *Dendroctonus rufipennis*
  - c) the spittlebug *Aphrophora cribrata*
  - d) the moth *Choristoneura fumiferana*
  - e) the sawfly *Pristiphora erichsonii*

[Answers on p. 21]

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# Jumping Spiders of Canada

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## Introduction

Although jumping spiders are rather small (3–10 mm), they are among the most beautiful and delightful of all arthropods. The late, great naturalist J.H. Fabre, whom we consider the father of our passion for things small, mistakenly overlooked the jumping spider. He wrote of the black-bellied tarantula, the Narbonne lycosa, and the crab spider, but neglected this most congenial spider family (Fabre 1916). The most obvious character of the family Salticidae is a pair of disproportionately large eyes. Because of this, people feel compelled to assign them human behaviours. As their Latin name and common name imply, they are agile jumpers and can reach distances of up to 16 cm.

Salticids are easily distinguished from other spiders by their unique eye arrangement, habitus, general behaviour and mode of prey capture. Their eight eyes are arranged in three rows. The middle two eyes in the front row are the largest, giving jumping spiders acute binocular vision unmatched by other invertebrate visual systems. The carapace of jumping spiders is elevated and, in addition to other parts of their bodies, is often stout and covered in fine hairs or scales. Salticids are generally sexually dimorphic. Males can be remarkably coloured from metallic blues and greens to brilliant crimson. Females, on the other hand, tend to be dull brown or grey. Examples are displayed on Wayne Maddison's Salticidae web page,



Female *Phidippus* sp. (photograph by C.M. Buddle)

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<http://spiders.arizona.edu/nasaltshome.html>. One of the most beautiful jumping spiders found in Canada, *Habronattus decorus* (Blackwall), has bright blue iridescent scales on its cephalothorax and rose-coloured scales on its abdomen. Some salticids are exceptional ant-mimics; they appear to have three body segments and they elevate a pair of legs to simulate insect antennae. Canadian examples of salticid ant-mimics include *Peckhamia picata* (Hentz), *Synageles canadensis* Cutler, and *S. noxiosus* (Hentz).

Jumping spiders are skittish and deftly maneuver to maintain a close watch on pencils, probes, and fingertips. They stalk and pounce on their prey with catlike patience and precision. These spiders do not rely on webs to capture prey, but spin silk for drag lines, egg cases, and retreats. Jumping spiders are diurnal, sun-lovers. On a bright day, they can often be found perched on tree bark, blades of grass, shrubs, and other well-lit places. In cloudy or rainy weather, they withdraw inside silken retreats.

Globally, Salticidae is the most diverse spider family. This is especially evident in the tropics where their diversity is unmatched. Of the 34,000 described spider species, 4,000 to 5,000 are jumping spiders (Coddington and Levi 1991; Bennett 1999). Of the estimated 1,400 spider species in Canada (Dondale 1979; Bennett 1999), 8%, or 110 species, belong to the family Salticidae. Surprisingly, an estimated 20% of Canada's salticid fauna remain undescribed (Dondale 1979) and distribution records are sparse.

Given the interest in biodiversity research in Canada, and the prevalence of spiders in field collections of invertebrates, a comprehensive identification guide to the jumping spiders of Canada is desperately needed.

## Project Objectives

We aim to produce an identification guide to the jumping spiders of Canada. In pursuit of this goal, our first objective is to compile an annotated species list. This list will include synonymies, distribution records organized by



Frontal view of *Phidippus* sp.  
(photograph by D.P. Shorthouse)

province and territory, citations to the original and revised species descriptions, and notes regarding the species' taxonomic status.

In light of the taxonomic difficulties within the Salticidae, we hope to encourage collaboration with other jumping-spider enthusiasts. Initially we will create a web-based format for the identification guide. This will allow us to update changes, add to the species list, and include new records. Photographs and visual aids will be linked to taxonomic keys. Once North American Salticidae systematics have stabilized, our long-term goal is to publish *The Jumping Spiders of Canada* in a format similar to Agriculture Canada's *Insect and Arachnids of Canada* series.

## Progress

Our progress can be viewed at <http://www.ualberta.ca/~dps1/salticidae.html>. Approximately 110 species are listed on the web page, and this list is growing. British Co-

lumbia has the highest diversity of jumping spiders, followed by Ontario and Saskatchewan (Table 1). Records from eastern Canada, however, are lacking and the low number of species from this region likely reflects limited records rather than low diversity. There are approximately 20 species with records in five or more provinces and territories (Table 2).

Table 1. Preliminary estimates for the number of jumping spider species (Araneae: Salticidae) found in Canada.

Province / Territory	Number of Species
Newfoundland	13
Nova Scotia	16
New Brunswick	14
Prince Edward Island	n/a
Quebec	33
Ontario	44
Manitoba	36
Saskatchewan	38
Alberta	31
British Columbia	45
Territories	19

To date, 26 genera have been recorded for Canada. The most species-rich genera include *Habronattus* (19 species), *Pelegrina* (11 species), *Phidippus* (9 species), and *Sitticus* (9 species). Nine genera are represented by a single species.

We have contacted many arachnologists throughout Canada and the U.S.A. and have been encouraged by their enthusiastic response. However, we would appreciate any additional ideas and suggestions. The success of this project depends on obtaining jumping spiders from across Canada.

The next time you climb a tree, sit on a rock, clean your windowsill, or wander through a sunny meadow, please keep an eye out for jumping spiders. Hopefully, unlike J.H. Fabre, you won't overlook these lively gems.

Table 2. Jumping spider species found in 5 or more provinces or territories in Canada

<i>Bianor aemulus</i> (Gertsch, 1934)
<i>Eris militaris</i> (Hentz, 1845)
<i>Euophrys monadnock</i> Emerton, 1891
<i>Evarcha hoyi</i> (Peckham & Peckham, 1883)
<i>Habrocestum pulex</i> (Hentz, 1846)
<i>Habronattus americanus</i> (Keyserling, 1884)
<i>Habronattus decorus</i> (Blackwall, 1846)
<i>Neon nelli</i> Peckham & Peckham, 1888
<i>Pelegrina flavipedes</i> (Peckham & Peckham, 1888)
<i>Pelegrina insignis</i> (Banks, 1892)
<i>Pelegrina montana</i> (Emerton, 1891)
<i>Pelegrina proterva</i> (Walckenaer, 1837)
<i>Phidippus borealis</i> Banks, 1895
<i>Phidippus clarus</i> Keyserling, 1885
<i>Phidippus purpuratus</i> Keyserling, 1885
<i>Phidippus whitmani</i> Peckham & Peckham, 1909
<i>Salticus scenicus</i> (Clerck, 1757)
<i>Sitticus finschi</i> (L. Koch, 1879)
<i>Sitticus palustris</i> (Peckham & Peckham, 1883)
<i>Sitticus ranieri</i> (Peckham & Peckham, 1909)

## References

- Bennett, R.G. 1999. Canadian spider diversity and systematics. *Newsletter of the Biological Survey of Canada (Terrestrial Arthropods)* 18:16-27.
- Coddington, J.A. and H.W. Levi. 1991. Systematics and evolution of spiders (Araneae). *Annual Review of Ecology and Systematics* 22: 565-592.
- Dondale, C.D. 1979. Araneae. pp. 247-250 in H.V. Danks (Ed.), Canada and Its Insect Fauna. *Memoirs of the Entomological Society of Canada* 108. 573 pp.
- Fabre, J.H. 1916. *The Life of the Spider*. A.T. de Mattos (trans.). Dodd, Mead & Company, New York.



## Selected Future Conferences

Organization	Date	Place	Contact
<b>Entomological Conferences</b>			
<b>Entomological Society of Canada</b>	<b>2000</b> , 2-7 Dec.	Montréal, QC	(with Société d'entomologie du Québec and the Entomological Society of America) Program Chair, Marlin Rice: <a href="mailto:merice@iostate.edu">merice@iostate.edu</a> ESC Program Committee member: Hélène Chiasson, Urgel Delisle et Associés, Centre de Recherche et de Développement en Horticulture, 430 boul. Gouin, Saint-Jean-sur-Richelieu, QC J3B 3E6, Tel.(450) 346-4494 # 230, Fax (450) 346-7740, <a href="mailto:hchi@nrs.mcgill.ca">hchi@nrs.mcgill.ca</a>
	<b>2001</b>	Niagara Falls, ON	(with the Entomological Society of Ontario)
<b>Entomological Society of America</b>	<b>2000</b> , 2-7 Dec	Montréal, QC	(joint meeting with ESC, see above)
	<b>2001</b> , 9-13 Dec.	San Diego, CA	ESA, 9301 Annapolis Rd., Lanham, MD 20706-3115; <a href="mailto:meet@entsoc.org">meet@entsoc.org</a>
	<b>2002</b> , 10-15 Dec.	Philadelphia, PA	ESA, see above
<b>Northwest Diptera Taxonomic Workshop</b>	<b>2000</b> , 28-30 April	Ellensburg, WA	(sponsored by The Xerces Society, EPA Region 10, Aquatic Biology Associates, and EcoAnalysts.) Jeff Adams: <a href="mailto:jadams@xerces.org">jadams@xerces.org</a>
<b>The Lepidopterists' Society 53rd Annual Meeting</b>	<b>2000</b> , 26-30 July	Winston-Salem, NC	Bill and Mindy Conner, Department of Biology, Wake Forest University, P.O. Box 7325, Winston-Salem, North Carolina 27109; 336-758-5315; Fax: 336-758-6008; e-mail <a href="mailto:conner@wfu.edu">conner@wfu.edu</a>
<b>10th International Symposium on Trichoptera</b>	<b>2000</b> , 30 July - 5 Aug.	Potsdam, Germany	<a href="mailto:wolfram-mey@museum.hu-berlin.de">wolfram-mey@museum.hu-berlin.de</a>

Organization	Date	Place	Contact
<b>Coleopterists Society Annual Meeting</b>	2000, 5 Dec.	Montréal, QC	(Held in conjunction with the joint ESA/ESC/SE meeting) <a href="http://www.coleopsoc.org/">http://www.coleopsoc.org/</a>
<b>XXI International Congress of Entomology</b>	2000, 20-26 Aug.	Iguassu Falls, Brazil	details from <a href="http://www/sede/embrapa.br/ice/">http://www/sede/embrapa.br/ice/</a>
<b>15th International Symposium of Odonatology</b>	2001, 10-14 July	Novosibirsk, Siberia, Russia	Dr Oleg Kosterin, Institute of Cytology and Genetics of the Siberian Branch of the Russian Acad.Sci., Lavrentiev Ave. 10 RUS - 630090, Novosibirsk Russia, Tel / Fax: 383-(2) 33-12-7833-34-66, E-mail: <a href="mailto:kosterin@bionet.nsc.ru">kosterin@bionet.nsc.ru</a>
<b>Collections / Museums / Systematics</b>			
<b>Association of Systematics Collections Annual Meeting</b>	2000, 14-15 May	Baltimore, MD	Association of Systematics Collections, 1725 K Street NW, Suite 601; Washington, DC 20006-1401; <a href="mailto:asc@ascoll.org">asc@ascoll.org</a>
<b>Society for the Preservation of Natural History Collections Annual Meeting</b>	2000, 10-14 July	Halifax, NS	Iris Hardy, Geological Survey of Canada, (Atlantic), Bedford Institute of Oceanography, Phone: (902) 426-6127, Fax: (902) 426-4465, <a href="mailto:hardy@agc.bio.ns.ca">hardy@agc.bio.ns.ca</a>
<b>Other subjects (especially those relevant to Survey projects)</b>			
<b>North American Benthological Society 48th Annual Meeting</b>	2000, 28 May - 1 June	Keystone, CO	Will Clements, Program Co-Chair Dept. of Fishery & Wildlife Biology, Colorado State University, Ft. Collins, CO 80523, (970) 491-0690 Fax: 491-5091, <a href="mailto:wilc@cnr.colostate.edu">wilc@cnr.colostate.edu</a> N. LeRoy Poff, Program Co-Chair, Dept. of Biology, Colorado State University, Fort Collins, CO 80523, (970) 491-2079, <a href="mailto:poff@lamar.colostate.edu">poff@lamar.colostate.edu</a>
7th Triennial International Symposium on Insect/Invertebrate and Plant Cold Hardiness	2000, 28 May - 2 June	Victoria, BC	R.A. Ring, Biology Dept., University of Victoria, Victoria, BC V8W 3N5; <a href="mailto:raring@uvic.ca">raring@uvic.ca</a>
First International Conference on Entomology Libraries and Information Networks (ELIN)	2000, 25-27 Oct.	London, England	ELIN Conference Administrator, c/o The Royal Entomological Society, 41 Queens Gate, London, SW7 5HR, UK, <a href="mailto:reg@royensoc.demon.co.uk">reg@royensoc.demon.co.uk</a>

## Answers to Faunal Quiz

[See page 15]

1. The very large lakes in Canada comprise about 2%, or about 200,000 km<sup>2</sup>, of the surface of the country.
2. Alluvium is relatively recent detrital deposits resulting from the operations of modern rivers, including the sediments laid down in river beds, flood plains, lakes, fans at the foot of mountain slopes, and estuaries.
3. Insects are involved in the death of trees especially by single defoliations (which may kill conifers by removing up to five years of foliage), repeated defoliations (which will kill many deciduous trees), mass attack of woody tissues (e.g. some bark beetles) and transmission of fatal diseases (e.g. Dutch Elm Disease by elm bark beetles). In many cases, trees succumb only to a combination of factors, such as drought or fire damage, plus fungal attack, plus insect attack.
4. In insects that actually freeze during the winter, only part of the total body water is frozen, because water closely associated with biological molecules, for example, does not freeze. The freezing normally is extracellular only. Protection is usually provided to membranes, proteins, and so on by the action of cryoprotectants, typically polyhydric alcohols (such as glycerol) and sugars. Many of the species make nucleators for the winter, ensuring that supercooling will be limited and freezing will take place at relatively sub-freezing temperatures, so that ice formation is not as rapid and injurious as it would be if beginning at lower temperatures.
5. The food plants of these insects are as follows:
  - a) the monarch butterfly *Danaus plexippus* feeds on milkweed, *Asclepias* spp.
  - b) the spruce beetle *Dendroctonus rufipennis* feeds on spruces, *Picea* spp., including *P. glauca* and *P. engelmani*.
  - c) the pine spittlebug *Aphrophora cribrata* feeds on pines, *Pinus* spp.
  - d) the spruce budworm *Choristoneura fumiferana* feeds mainly on fir and spruce, especially on balsam fir, *Abies balsamifera* and white spruce, *Picea glauca*.
  - e) the larch sawfly *Pristiphora erichsonii* feeds on larches, *Larix* spp.

## Quips and Quotes

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*The reverse side also has a reverse side (Japanese proverb)*

“You can prove almost anything with the evidence of a small enough segment of time. How often, in any search for truth, the answer of the minute is positive, the answer of the hour qualified, the answer of the year contradictory!” (Edwin Way Teale)

“I like work; it fascinates me. I can sit and look at it for hours.”  
(Jerome K. Jerome)

“Nothing is impossible for the man who doesn’t have to do it himself”. (A.H. Weiler)

“Cockroaches and socialites are the only things that can stay up all night and eat anything”  
(Herb Caen)

“Recently, several authors have raised concerns about the validity of using time-series analysis to detect density dependence. . . . Using non-biological data (the electricity bills of one of the authors), we show how easy it is to be misled by the results of time-series analysis.” (M.D. Hunter and P.W. Price. 1998. Cycles in insect populations: delayed density dependence or exogenous driving variables? *Ecological Entomology* 23(2): 216-222.)

**No comment:**

“A millenium is something like a centennial, only it has more legs”  
(Test answer by a school boy)

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## List of Requests for Material or Information Required for Studies of the Canadian Fauna 2000

This list is intended to facilitate cooperation among entomologists by encouraging those who visit suitable areas while engaged in other studies to collect material of particular interest to workers elsewhere. Similar lists that were circulated in previous years prompted the transmission of several useful sets of material, and the efforts of the various cooperators were much appreciated.

**Minimum data requested with all specimens are, of course, locality, date, collector and habitat.**

(\*\*denotes address reference; listed on page 31)

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
1	Acari (free living and parasitic terrestrial and aquatic mites)	Anywhere, but especially subarctic and arctic Canada, Canadian grasslands	Berlese-Tullgren funnel extraction from subaquatic substrates, from grasses and sedges, and from bird and mammal nests, would be especially fruitful (preserve in 75% ethanol +5% glycerine).	V.M. Behan-Pelletier; E.E. Lindquist; I.M. Smith	1
2	Adelgidae (conifer woolly aphids)	Anywhere	Preserve insects and bark, needles or galls in 70% ethanol. Specimen records and host plant records.	R. Foottit	1
3	Aleyrodidae (whiteflies)	North America	Preserve insects and host plant material in 70% ethanol. Adults may be dried. Specimen records and host plant records. (Canadian National Collection deficient in all species, including pest species).	R. Foottit	1
4	Anthomyiidae	Nearctic region	Reared material in the following genera: <i>Acridomyia</i> (grasshopper parasitoids), <i>Hylemya</i> , <i>Lasiomma</i> and <i>Anthomyia</i> (larvae dung feeders, etc.), <i>Strobilomyia</i> (larvae in cones of conifers), <i>Egle</i> (larvae in willow catkins) and <i>Chirosia</i> (larvae feeding on ferns). Material should be properly mounted and labelled. It will be returned to sender in due course.	G.C.D. Griffiths	2

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
5	Anthomyzidae	New World	Adults from any habitat, but often associated with graminoids. Preservation in 70% ethanol preferred. Malaise and especially pan trap residues are acceptable and valuable. General description of herbaceous cover and soil moisture advantageous.	K.N. Barber	3
6	Aphididae (aphids)	Anywhere	Preserve in 70% ethanol. Specimen records and host plant records.	R. Footitt	1
7	Asilidae (robber flies)	North America	Pinned adults.	R.A. Cannings	4
8	Braconidae	Anywhere	Pointed or in ethanol.	M. Sharkey	5
9	Bumble bees	Anywhere in Canada	Include floral host if any. Collect and preserve dry (but specimens that have already been put into ethanol are acceptable).	R.C. Plowright	6
10	Butterflies (see also 35)	Arctic	Preserve papered or pinned (collecting / preserving information supplied on request) [for Alaska Lepidoptera Survey]	K.W. Philip	7
11	Ceratopogonidae	Anywhere in Canada	Send in fully topped-up vials of 70% ethanol. Reared material is especially valuable; provide type of substrate or habitat if material is reared.	A. Borkent	8
12	Cercopidae (froghoppers, spittlebugs)	Canada and Alaska	Specimens (preferably not in ethanol if possible), records and host records.	K.G.A. Hamilton	1
13	Chalcidoids, especially Eupelmidae	Holarctic	Incl. sweep-net samples (see also 44) (collect into ethanol). Reared material is especially useful.	G.A.P. Gibson	1
14	Chironomidae: <i>Larsia</i> (Tanypodinae)	Nearctic and Palearctic fresh waters	Reared material preferred but will accept all stages in ethanol or on slides.	B. Bilyj	9
15	Chironomidae: <i>Eukiefferiella</i> , <i>Tvetenia</i> (Orthoclaadiinae)	All areas, especially Ontario	Include sampling method, habitat information.	W.B. Morton	10
16	Chrysomelidae (leaf beetles)	Anywhere, but especially in Canada	Mounted or unmounted and preserved in acetic alcohol (70 ethanol: 25 water: 5 parts glacial acetic acid). Include accurate (species level) host plant information.	L. LeSage	1

	<b>Material Requested</b>	<b>Areas of Interest</b>	<b>Collecting Methods, Notes</b>	<b>Name of Requester</b>	<b>**</b>
17	Cicadellidae (leafhoppers)	Canada and Alaska	Specimens (preferably not in ethanol), records and host records.	K.G.A. Hamilton	1
18	Coccoidea (scale insects)	North America	Preserve insect and host plant material in 70% ethanol. Specimen records and host plant records.	R. Foottit	1
19	Coleoptera (adults or immatures)	Canada	For teaching. Material from mass collections accepted. (Kill larvae in boiling water removed from the heating element, let cool and transfer to 70% ethanol.)	Y.H. Prévost	11
20	Coleoptera (identified)	Northern Canada	Will collect S. Ont. in exchange; has N.W.T. duplicates to exchange for identification.	A. Morgan	12
21	Curculionidae (weevils)	Anywhere, but especially northern Canada	Adults can be pinned, pointed, or preserved in ethanol. Record host plant information if possible.	D.E. Bright	1
22	Cynipidae: insect galls from domestic and wild roses	Anywhere	Maturing to mature galls. Remove galls from plants and place in plastic bags. Try to segregate galls of different species. Preserve any emergents in 70% ethanol.	J.D. Shorthouse	13
23	Dermaptera: <i>Forficula auricularia</i> (perce-oreille européen / European earwig)	Amérique du Nord et autres régions si possible	A sec ou dans l'alcool.	J.C. Tourneur	14
24	Diprionidae (diprionid sawflies)	North America	Living diprionid sawflies of any species, identified or unidentified. Record foodplant. Contact in advance about shipping.	L. Packer	15
25	Dytiscidae (predaceous diving beetles)	Canada, Alaska and northern USA	Adults and larvae; adults should be pinned or if in ethanol preliminarily sorted.	D.J. Larson	16
26	Eupelmidae: <i>Anastatus</i>	North America	Reared materials with associated sexes are particularly important, regardless how few in number.	G.A.P. Gibson	1

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
27	Formicidae (ants)	Anywhere	Record type of habitat and nest site. Include brood if possible (preserve in ethanol).	A. Francoeur	17
28	Fungal pathogens of insects (esp. of deuteromycetes and ascomycetes)	Anywhere	Place any fungus-infected specimens in a vial. (Identification of the fungus available on request.)	D. Strongman	18
29	Halictidae (sweat bees) brown and black spp. only	North America	Particularly from blueberries. Pinned or preserved. Include flower record if available.	L. Packer	15
30	Hemiptera: Heteroptera (bugs)	Anywhere	Aquatic and semi-aquatic Heteroptera from acid waters (an indication of pH would be useful). Terrestrial Heteroptera from bogs. Preserve in ethanol.	G.G.E. Scudder	19
31	Hydracarina: <i>Sperchon</i> (Unionicolidae)			J.C. Conroy	20
32	Insects on snow	Especially western mountains	<i>Chionea</i> (Tipulidae), <i>Boreus</i> (Mecoptera), Capniidae (Plecoptera): preserve in 70% ethanol.	S. Cannings	21
33	Isoptera (termites)	N. America incl. Mexico	Preserve in 75% ethanol; try to collect as many soldiers as possible.	T.G. Myles	22
34	Leioididae (=Leptodiridae)	Northern forest and tundra areas; prairies and grasslands	Most easily collected by window traps or flight intercept traps; and car nets ( <i>Can. Ent.</i> 124: 745, 1992) (collect into ethanol).	S.B. Peck	23
35	Lepidoptera (see also 9)	Arctic	For revisionary work on the holarctic fauna.	J.D. Lafontaine	1
36	Lepidoptera	Manitoulin Island and surrounding islands	Records for use in monograph of the region. Information on old records from collections would be particularly welcome.	J.K. Morton	24
37	Lygaeidae	Anywhere	Material can be collected in ethanol.	G.G.E. Scudder	19
38	Mallophaga	Anywhere	Preserve specimens in 70% ethanol; host species is extremely important.	T.D. Galloway	25

	<b>Material Requested</b>	<b>Areas of Interest</b>	<b>Collecting Methods, Notes</b>	<b>Name of Requester</b>	<b>**</b>
39	Microlepidoptera (excluding Pyralidae and Tortricidae)	North America, esp. west in dry/arid habitats and prairies (CNC deficient in all western species)	Include collecting method and time of day collected. Kill with ammonia fumes. Field-pin; instruction leaflet and field kit available on request.	J.F. Landry	1
40	Milichiidae	Anywhere	Malaise traps are particularly productive; also any found in association with ant nests extremely appreciated. Preserve in 70% ethanol.	J. Swann	26
41	Odonata (dragonflies)	North America	Include 2-3 word habitat description. Adults preferably in envelopes or papered, prepared by immersing in acetone for 24 hours, then dried; larvae in 70% ethanol.	R.A. Cannings	4
42	Opiliones (harvestmen)	Canada and adjacent states	Preserve in 75% ethanol, especially adults with notes on habitats.	R. Holmberg	27
43	Orthoptera	Anywhere		J-T. Yang	28
44	Parasitic Hymenoptera	Anywhere	Including selected unsorted Malaise, suction, pan or pitfall trap collections (pan trap kits and instructions supplied free on request).	L. Masner	1
45	Phoridae	Anywhere; especially boreal	Collect into 70% ethanol: especially interested in Malaise trap samples from boreal forest.	B.V. Brown	29
46	Pipunculidae (big-headed flies)	Anywhere in North America	Adults can be pinned, pointed or preserved in ethanol.	E. Georgeson	30
47	Psyllidae	North America	Preferably preserve in glycerine or dried. Specimen records and host plant records.	R. Footitt	1
48	Pteromalidae: <i>Pachyneuron</i>	North America	Reared materials with associated sexes are particularly important, regardless how few in number.	G.A.P. Gibson	1

	<b>Material Requested</b>	<b>Areas of Interest</b>	<b>Collecting Methods, Notes</b>	<b>Name of Requester</b>	<b>**</b>
49	Salticidae (jumping spiders)	Canada	Adult specimens preserved in 70% ethanol. Include collecting method, habitat information	C. Buddle, D. Shorthouse	31
50	Scelionid egg parasites of Orthoptera	Anywhere	Especially from Grylloidea; preserve in ethanol.	L. Masner	1
51	Silphidae	Canada	Include habitat and trapping method. Malaise trap material welcome.	R. Lauff	32
52	Simuliidae (black flies)	North America, esp. western and northern species	Preserve larvae in Carnoy's solution (1 glacial acetic acid: 3 absolute ethanol). Reared adults with associated pupal exuviae preferred. Instructions available on request.	D.C. Currie	26
53	Siphonaptera (fleas)	Anywhere	Preserve specimens in 70% ethanol; host species is extremely important.	T.D. Galloway	25
54	Solpugida (sun spiders)	Canada	Preserve in 75% ethanol, especially adults with notes on habitat.	P. Holmberg	27
55	Sphaeroceridae	Anywhere, esp. arctic or high elevations	Collect into ethanol. Acalyptrate fraction of trap samples welcomed.	S.A. Marshall	33
56	Symphyta (sawflies)	Boreal and arctic Canada	Larvae and adults collected by Malaise trap, sweeping, etc. (collect into 70% ethanol). Identify larval food plant as far as possible.	H. Goulet	1
57	Tabanidae	Canada	Include habitat and trapping method. Malaise trap material welcome.	R. Lauff	32
58	Thysanoptera (thrips)	North America	(Preserve in 70% ethanol). Specimen records, habitat, host plant records where applicable.	R. Footitt	1
59	Trichoptera (caddisflies)	Anywhere	Larvae, pupae and adults, especially collections that might lead to species identification of larva through association with adult. Preserve adults dry or in 80% ethanol, larvae and pupae in Kahle's fluid or 80% ethanol.	G.B. Wiggins	26
60	[Identifications]	High Arctic	Specimens of soil animals in return for identifications	G. Søvik	34

## Cooperation Offered

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- |    |  |  |
|----|--|--|
| a. | Identification of groups of interest in return for a sample of duplicate specimens.                              | Most but not all of entries in list above.                 |
| b. | Willing to sort material from certain residues, bulk samples, etc.   | See entries 5, 13, 19, 44, 51, 55, 57 above                |
| c. | Field kits or instructions available on request.   | See especially entries 39, 44, 52 above.                   |
| d. | Exchange of specimens.   | Several requesters, including entries 7, 20, 41, 53 above. |
| e. | Limited collecting in Coppermine area, N.W.T., if particular material required.                                  | A. Gunn (address 35 below).                                |
| f. | Collecting of soil animals on Ellesmere Island, arctic Canada.   | G. Søvik (see entry 60 above)                              |
| g. | Material in exchange for identifications.  | G. Søvik (see entry 60 above)                              |
| h. | Caterpillars, larval sawflies, aphids and mites available on request from trapnests for solitary bees and wasps. | P. Hallett (address 36 below)                              |

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## List of Known Email Addresses

(by requester name)

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## List of Addresses

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  3. Canadian Forest Service, 1219 Queen St. E., Sault Ste. Marie, ON P6A 5M7
  4. Royal British Columbia Museum, P.O. Box 9815, Stn. Prov. Govt., Victoria, BC V8W 9W2
  5. Department of Entomology, University of Kentucky, 5 - 225 Agricultural Science Center North, Lexington, KY 40546-0091, U.S.A.
  6. 482 Montée de la Source, Cantley, QC J8V 3H9
  7. University of Alaska, Institute of Arctic Biology, P.O. Box 757000, Fairbanks, AK 99775-7000 U.S.A.
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  10. 3 Woodridge Dr., Guelph, ON N1E 3M2
  11. School of Forestry, Lakehead University, Thunder Bay, ON P7B 5E1
-

12. Department of Earth Sciences, University of Waterloo, Waterloo, ON N2L 3G1
  13. Department of Biology, Laurentian University, Sudbury, ON P3E 2C6
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  19. Department of Zoology, University of British Columbia, Vancouver, BC V6T 1W5
  20. Department of Biology, University of Winnipeg, 515 Portage Ave, Winnipeg, MB R3B 2E9
  21. B.C. Conservation Data Centre, Wildlife Branch, Ministry of Environment, PO Box 9344 Stn. Prov. Govt., Victoria, BC V8W 9M1
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  32. Department of Biology, St. Francis Xavier University, Antigonish, NS B2G 2W5
  33. Department of Environmental Biology, University of Guelph, Guelph, ON N1G 2W1
  34. Biological Institute, Department of Zoology, University of Oslo, P.O. Box 1050 Blindern, N-0316, Oslo, Norway
  35. Wildlife and Fisheries Division, Resources, Wildlife and Economic Development, Government of the Northwest Territories, Box 1320, Yellowknife, NT X1A 3S8
  36. Department of Physiology, University of Toronto, Toronto, ON, M5S 1A8
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