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NEWSLETTER OF THE BIOLOGICAL SURVEY OF CANADA (TERRESTRIAL ARTHROPODS)

Table of Contents

Canadian Museum of Nature / Musée canadien de la NATURE

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 2003 issue is July 14, 2003.

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 and the Entomological Society of Canada. The 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.

This newsletter will also be available soon on the Survey's website at:

http://www.biology.ualberta.ca/bsc/bschome.htm

News and Notes

Spread your word

This newsletter has a circulation of 462, following a recent focussing of the circulation list associated with an update of the Survey's database of personnel. 438 recipients are individuals and the remainder are institutional libraries. Most subscribers (348) are in Canada, 55 reside in the U.S.A. and the balance (59) live in a variety of other foreign countries. Industry standards suggest that up to four people will read a single copy of a periodical. In addition, this newsletter is posted on the Survey website and therefore has the potential to reach many more people.

Your message could reach those people if you contribute an item for a future newsletter.

•This issue introduces a new section called the *Opinion Page* which is a forum for views and ideas of potential interest. See p. 15 for Steve Marshall's take on addressing the costs (societal and otherwise) of developing the tools needed to make insect identifications simple and accurate.

Other types of contributions welcomed include:

•Longer articles about any aspect of systematic and faunistic entomology in Canada

•Short news items, announcements, descriptions of new publications or websites of interest to readers (*News and Notes*)

•News about studies of arctic insects (*Arctic Corner*)

•Announcements of future conferences, congresses, and annual meetings of interest to readers (*Selected future conferences*)

Please send submissions to the editor (see inside front cover).

Label data brief translated

The brief 'Label Data Standards for Terrestrial Arthropods' published in 2001 in response to concerns about the variable quality of the information on specimen labels and the standards for the labels themselves was recently translated into French.

The text of 'Normes d'étiquetage pour les arthropodes terrestres' is now available on the Survey's website. See http://www.biology.ualberta.ca/bsc/french/frbriefs.htm. Paper copies (in limited quantities) will soon be available from the Survey Secretariat.

Biodiversity Research Website

The Biodiversity group at the Northern Forestry Centre, Canadian Forest Service, Edmonton is pleased to announce the launch of their new Biodiversity Research Website. The site describes the Centre's work in systematics and diagnostics, faunistics, insect ecology and management, effects of forest structure, and effects of forest practices. Information is also available on the arthropod collection and on the staff and their publications. The site is at http://nofc.cfs.nrcan.gc.ca/biodiversity/

Benthic Invertebrate Monitoring

The EMAN Coordinating Office has been working with several organizations to implement a pilot project in 2003 on standardized aquatic invertebrate monitoring using a tiered aquatic invertebrate monitoring approach, employing standardized collection, data storage and analysis methods. A tiered approach will harmonize an educational component, the rapid bio-assessment approach, the Canadian Aquatic Bio-monitoring Network approach, and a rigorous biodiversity assessment approach. An assessment of other provincial and territorial aquatic invertebrate monitoring programs is currently being conducted. Contact eman@ec.gc.ca for more information.

Activities at the Entomological Societies' meeting

The 2002 joint annual meeting of the Entomological Society of Canada and the Entomological Society of Manitoba took place in Winnipeg 5–9 October 2002. The meeting was attended by more than 200 people. Many student members attended and there were 27 entrants for the student paper competition. Items in the program or associated with it included:

A plenary session in accordance with the meeting theme of Insects and humans: confrontation and coexistence.

Symposia on "Human impacts on forests: consequences for human populations", "Crops as new habitats for insects: canola as a case study", "Biological control and native flora and fauna", "Pheromones: understanding the chemical language of insects", "Illuminating the 'green box': challenges in quantifying the impact of insect herbivores", "Arthropods of Canadian grasslands: ecology and interactions in grassland habitats", and "Practical problems when implementing biological control".

Workshops on "North American dragonflies" and "*Delia* species as pests of crops in Canada".

Submitted papers in three sessions.

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

An extensive poster session.

The ESC Heritage Lecture, given by Dr. Dan Johnson, entitled "The history of grasshopper outbreaks and research in Canada".

The ESC Gold Medal Address given by Dr. Bob Lamb.

Governing Board and Annual General Meetings also took place, the Gold Medal and other honours were awarded, and there were many opportunities for informal exchange of information, including an opening mixer and a banquet.

The Survey's grasslands symposium

The symposium on "Arthropods of Canadian grasslands: ecology and interactions in grassland habitats", organized by Dr. Terry Wheeler on behalf of the Survey's grasslands project, was well attended. It illustrated the range of grasslands and the many questions that are of interest about the insect faunas of these habitats, especially their ways of life and their interactions with other elements there.

Attributes of Canada's diverse grasslands. **J.D. Shorthouse**

Trophic guilds of higher Diptera in xeric Yukon grasslands. **T.A. Wheeler, S. Boucher**

Spiders (Araneae) collected in a tallgrass prairie in southern Manitoba and their importance to prairie conservation. **D. Wade**

The use of fire as a biodiversity and conservation management tool on tallgrass prairie. **R.E. Roughley**

Ponds in prairie habitats: a changing dynamic illustrated by predaceous water beetles. **M. Alperyn**

Temporal changes in the grasshopper (Orthoptera: Acrididae) fauna of Alberta grassland, in response to fire, weather and vegetation changes. **D.L. Johnson**

Abstracts of these papers are posted on the Survey's website at:
http://www.biology.ualberta.ca/bsc/english/grasssymposium.htm

Papers on systematics and related themes

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

Assessing the impacts of global climate change on forest insects. **J.A. Logan, J. Régnière, J.A. Powell**

Can butterflies be used as reliable indicators of diversity at the site and landscape level in managed spruce and pine forests? **R. Westwood, N.J. Holliday**

Abundance of Lygus bugs in canola grown adjacent to alfalfa. **H. Cárcamo, J. Gavloski, J. Soroka, J. Otani**

The effect of plant-insect interactions on interspecific competition within a component community of phytophagous insects. **M.L. Crowe, R.S. Bourchier**

Recruitment of natural enemies to an introduced bark beetle. **N. Rudzik, S.M. Smith**

Nontarget effects of host-specific biological control agents on native species. **D.E. Pearson, Y.K. Ortega, K.S. McKelvey, L.F. Ruggiero, R.M. Callaway**

Community level effects of burn season (spring, summer, fall) on the spider (Araneae) fauna of tallgrass prairie in southern Manitoba. **D. Wade**

Complexity of component communities associated with a stem gall on wild roses among geographic gradients in Northern Ontario. **S. Offman**

Non-target effects in biological control: a food web approach. **J. Memmott**

Biological control of the winter moth (*Operophtera brumata)* in Canada: interaction between introduced parasitoids and generalist predators. **J. Roland**

Non-target risk assessment in classical biological control of arthropods: the perspective of a practitioner. **U. Kuhlmann**

Impact of an introduced scolytid on its native competitor and natural enemy complex; can identifying a 'predator gap' help justify classical biocontrol? **S. Smith**

Post-release revelations on the host range of a root weevil. **R. De Clerck-Floate**

Gene flow between genetically divergent populati ons of *Pissodes strobi*. **R. Laffin, D. Langor, F. Sperling**

Thinning the boreal forest: do bark beetles benefit? **C. M. Simpson, M.L. Reid**

Tracking diversity patterns in boreal forest succession with beetle trophic guilds. **P. Paquin**

Diversity of saproxylic beetles along a forest successional pathway: from wildfire to old-growth to harvesting. **J. Jacobs, J. Spence**

Effect of regeneration type on the ecological diversity of carabid beetles (Coleoptera: Carabidae) in black spruce forests (*Picea mariana*) in eastern Manitoba. **L. Capar, A.R. Westwood**

Effects of Mimic® (tebufenozide) applications on the diversity of non-target Lepidoptera in Manitoba's boreal forests. **D.E. Saunders, A.R. Westwood**

Comparing the diversity of carabid beetle populations (Coleoptera: Carabidae) in burned and harvested aspen-dominated forest stands in western Manitoba. **J.K. Shaddock, A.R. Westwood**

Carabids in tall fescue forage grass and response to different nutrient inputs. **D.A. Raworth, M.C. Robertson, S. Bittman**

Habitat composition versus habitat structure: evaluating coarse filter strategies for maintaining invertebrates in boreal forests. **T.T. Work, J.R. Spence, J. Volney, K. Cryer**

Lice (Phthiraptera) infesting Manitoba's provincial bird, the great gray owl, *Strix nebulosa*. **T.D. Galloway**

Blow flies associated with pig carcasses in Nova Scotia. **D.B. Strongman, G. Simpson, H.N. LeBlanc**

Larval morphology of the Hygrobiidae (Coleoptera: Adephaga: Dytiscoidea) with phylogenetic considerations. **Y. Alarie, R.G. Beutel**

Application of molecular tools for conservation: the case of blink *Cicurina* (Araneae: Dictynidae) from Texas caves. **P. Paquin, M.C. Hedin**

Dispelling myth and hyberbole: the distribution and relative abundance of two invasive funnelweb spiders, *Tegenaria agrestis* and *T. duellica* (Araneae, Agelenidae) in Canada and the United States. **R.S. Vetter, A.H. Roe, R.G. Bennett, C.R. Baird, L.A. Royce, W.T. Lanier, A.L. Antonelli, P.E. Cushing**

The relative abundance of native coccinellids in Manitoba before and after the appearance of the seven-spotted lady beetle (C7), *Coccinella septempunctata* L. **I.L. Wise, W.J. Turnock**

The spatial dynamics of a host-parasitoid community. **B.H. Van Hezewijk, J. Roland**

Lygus spp. (Heteroptera: Miridae) as a pest of buckwheat in Manitoba. **B. G. Elliott, I. Wise**

Dragonflies: Flagships of Canada's wetlands. **P.S. Corbet**

The dragonflies of northern British Columbia: field surveys, collections development, conservation and public education. **R. Cannings**

Alberta Odonata: a growing fauna, and a growing interest. **J. Acorn**

Odonata in Manitoba: diversity and transition. **B. Elliott**

Acquisition and management of data on Odonata for conservation study. **P.M. Brunelle**

Dragonflies at the edges: studies of Odonata along the PEI coast and some northern rivers. **D.J. Giberson, M. Dobrin**

The parasitoid guild of *Delia radicum* in canola in the Canadian Prairies and Europe. **K.S. Hemachandra, N.J. Holliday, U. Kuhlmann**

Biological control of orchard leafrollers using indigenous parasitoids. **J.E. Cossentine, E.K. Deglow, L.B.M. Jensen**

Identification of parasitoids from *Lygus* spp. in Saskatchewan. **M. Ashfaq, M. Erlandson, L. Braun**

Phylogeny of *Aphis* L. species (Hemiptera: Aphididae) using microsatellite flanking region sequences. **R. Foottit, E. Maw, R. Barrette**

Parasitic wasps (Hymenoptera) of filth flies (Diptera: Muscidae) in dairies in Ontario and Quebec. **G.A.P. Gibson, K.D. Floate**

Piecing together the life cycle of *Brychius* sp. Thomson (Coleoptera: Haliplidae) found in Manitoba. **T. Mousseau, R.E. Roughley**

Salt marsh caddisflies: discovery of the larva and larval habitat of *Limnephilus ademus* in salt marshes in Prince Edward Island, Canada. **O.S. Flint, D.J. Giberson**

Summary of the Meeting of the Scientific Committee for the Biological Survey of Canada, October 2002

The Scientific Committee met in Ottawa on October 17–18, 2002

Scientific Projects

1. Grasslands

Dr. Kevin Floate provided background about the reorganization at Agriculture and Agri-Food Canada, the Agricultural Policy Framework (APF) and the Biodiversity theme, and possible avenues for funding grasslands work within these frameworks. The Survey agreed to encourage contacts with Agriculture and Agri-Food Canada about such matters. Dr. Wheeler thought that the funding issue seems to be the most serious obstacle to the grasslands project. He would like to see new interest in doing grassland work. Dr. Danks pointed out that even if the project could not obtain large funding, it could proceed in the same way as the Yukon book and other Survey projects, whereby individuals apply for their own funding for subprojects.

Dr. Wheeler reported that the symposium on "Arthropods of grasslands: ecology and interactions" was held at the annual meeting of the Entomological Society of Canada. The symposium was attended by up to 50 people and the good talks helped to increase the profile of the project. Letters of invitation to potential authors for the first grasslands volume (with a title similar to that of the symposium) would soon be sent out. More potential authors would also be contacted to confirm their availability and interest.

Dr. Roughley explained that the planned grasslands field trip to the tall grass prairie reserve in July 2002 had been rained out. A trip might be feasible to the same area another year, but it might be better to cover new territory such as the Peace River or palouse grasslands in southern British Columbia. Other details would be discussed further at a meeting of the Grasslands subcommittee after the current meeting.

2. Family keys

A project to produce keys for all the insect families of British Columbia, which had earlier been stopped when funding was with-

drawn, has now received another year's funding from FII (Forestry Innovation Investment Program). Apterygote and exopterygote keys should be finished soon, allowing production of the Canadian key by adding to the provincial data.

3. Arctic invertebrate biology

Dr. Ring drew the Committee's attention to the article he had written for the Arctic Corner of the Survey newsletter (see Newletter 21(2): 64–66). This had coincided with a letter-writing campaign by the Association of Canadian Universities for Northern Studies. Both of these activities addressed the imminent collapse of Canadian polar science. Despite that view, Dr. Ring noted that some arctic-related work is going on. At the January 2003 annual meeting for the Society for Integrative and Comparative Biology there will be a CSZ symposium on biology in the Canadian arctic [see p. 19]. Dr. Ring circulated a book on Natural History of the Western Arctic now published, which includes a chapter on insects of the western Arctic. Dr. Ring noted that the Canadian Navy is sending two ships to the Arctic to establish sovereignty. He pointed out that the government is missing an opportunity to establish sovereignty – at the same time as supporting research in the Arctic – through researchers in the field.

4. Insects of Keewatin and Mackenzie

Dr. Currie reported that the third installment of this project took the form of a canoe trip along 300 km of the Thelon River by five cooperators. This area is an arctic oasis containing trees and other organisms well north of their typical range. A preliminary report of the Thelon River trip was published in the Survey newsletter. An expedition next year is likely to be farther east. Dr. Currie welcomed participants for future expeditions (see p. 12–13).

5. Seasonal adaptations

Dr. Danks reported that this project continues with the recent publication of papers on the range of insect dormancy responses and on the modification of adverse conditions by insects. A paper on insect photoperiodism and rhythmicity (from a 2002 International Japanese-Czech meeting) is in press. He had also accepted an invitation to present a paper (the only one on insects, considering the seasonal adaptations of arctic insects) at the symposium on Biology of the Arctic to be held in Toronto in January at the meeting of the Society for Integrative and Comparative Biology.

Other scientific priorities

1. Invasions and reductions

The Committee reviewed a number of relevant projects including information about alien Hemiptera, and introduced crayfish, gall wasps, and other organisms. Several members of the Committee are cooperating to evaluate how to use coccinellids as a model to investigate invasive species. Data from the CNC have been received and protocols to get all the specimen data in a similar format are being discussed. Broader issues will be addressed as part of the future planning for this project. The theme of the Entomological Society of Ontario meeting in October 2002 is invasive species and insect biodiversity.

2. Survey web site

Dr. Danks reported that major updates include a section on 'Specific sources of funding' added to the 'Biodiversity Funding' brief, the Spring and Fall BSC newsletters including additional photographs for the article on the Thelon River expedition, and the 2002 Grasslands newsletter. A number of minor corrections and edits were also made. The site meter, started about two years ago, has logged about 8400 hits. The online database of workers has been upgraded and the Survey has been soliciting updates. Despite some difficulties caused by an overall redesign (unknown to the Survey) that took place soon after an extensive mail-out to solicit entries, numerous updates have been received.

Members of the Committee commented that the website is an amazing resource, for example for reference to briefs and for educational use. The Insect Dormancy book, which is now out of print, can be downloaded. Col-

leagues have congratulated the Survey on its excellent and generous site.

3. Arthropods and fire

Current and earlier studies of arthropods and fire, for example in Manitoba and British Columbia, were described. Several themes or hypotheses that could be used to focus a symposium or synthetic document were noted. Dr. Roughley agreed to lead such an initiative when he finishes his sabbatical next year.

4. Voucher specimens

Information and examples were provided about the deposition policies of museums, good and bad voucher policies (including historical examples) and journal policies about voucher statements in published papers.

A complete draft of the Survey brief on voucher specimens had now been prepared by Dr. Wheeler, and would soon be available for final review by the Committee. The Committee also noted the absence of voucher requirements at any stage in the process of consultant work. There is no requirement for vouchers, no requirement for independent confirmation of identifications, and no requirement to verify consultant qualifications. Unfortunately too, many studies are not generated by the desire to gain knowledge but by some other requirement, which is not conducive to good science.

5. Monitoring of continuing priorities

Information on earlier or currently less active Survey projects was reviewed, including arthropod ectoparasites of vertebrates, arthropods of the Yukon, arthropods of the Queen Charlotte Islands (Haida Gwaii) (including an international symposium on introduced species), arthropods of special habitats, climatic change, and agroecosystems.

Under arthropod ectoparasites, it was noted that considerable funds are being directed to monitoring of the West Nile Virus and its potential mosquito vectors in Ontario, Nova Scotia, Quebec, Manitoba and elsewhere. A cause for concern is that the Ontario government is now considering spraying, which is likely to be ineffectual because these mosquitoes are container-breeding. The organism responsible for Lyme disease, transmitted by ticks, has been found in Nova Scotia.

Under arthropods of the Yukon, mention was made of an unusual web site at http://www.ec.gc.ca/Bisy, comprising a compilation of the aquatic insects collected in the Yukon as a result of the request by Environment Canada to companies for environmental assessment and collections for baseline evaluation and impact assessment (but excluding data from books, museums or journals). Most of the identifications were made by a consultant. The site has limited context and the species lists appear to be very incomplete.

Under agroecosystems, mention was made of a Quebec guide to cranberry pests (now available in English) and a website on the bees of Maritime Canada [http://res2.agr.ca/kentville/pubs/bees-abeilles_e.htm]. Talks at the Entomological Society of Canada annual meeting showed clearly the importance of biodiversity and taxonomy in identifying potential biocontrol agents for pest species.

6. Other priorities

The Committee also discussed actions and information about old-growth forests, endangered species, damaged ecosystems, faunal analysis, Survey publicity and other subjects.

Liaison and exchange of information

1. Canadian Museum of Nature

Dr. Mark Graham, Director, Research Services, reported on activities from the Global Biodiversity Information Facility. Canada is a member of GBIF [www.gbif.org]. The organization has a staff of 14 and there are 21 member countries. It is working collaboratively with other international entities. The aim is to co-ordinate information on biodiversity so that member countries can share and access it in a format that everyone can use. The budget for staff and operations is $3 million but this is not enough money to assist all countries in establishing an information node or electronic portal to distribute a country's biodiversity information. One work program aims to digitize in-

formation on the natural history specimens on earth. Another program aims for a complete list of all species names. GBIF will have programs to grant seed money. Canada hopes to be in a position to apply for some of that money. In response to questions, Dr. Graham stated that GBIF will primarily be funding research on how to make information available, i.e informatics. It is proposing to have funds available to obtain content but will only fund up to 20% of a total project up to $50,000 (U.S.).

The Museum is starting a new 5-year planning focus targeted to better address issues of relevance to Canadians. A cross-Canada survey was undertaken by an outside company. The main natural history topic that people are concerned about is environmental change and what impacts the environment, which therefore will be a key issue for the CMN for the next 5 years. Dr. Graham reported that the CMN is helping to organize a consortium of natural history museums. Members of the Committee expressed their hope for the success of the natural history consortium and encouraged the Museum to continue to take the lead on this initiative. However they also pointed out that GBIF parallels a similar pattern over previous years with NBII, CANBII, CBIN, BCIN and BKIN where substantial funds were used to hold meetings and build frameworks but no money ever filtered down to doing real science on specimens where the money is really needed. Therefore, scientists not directly involved in these projects are starting to view them with cynicism and ultimately these initiatives will lose the support that they need from grass-roots scientists. It was also pointed out that although known data can be entered there may well be hundreds of undescribed or poorly known species too. It will take a lot of time and money to get the data on these other species to a stage where they can be put into informatics schemes, which otherwise will always be seriously incomplete resources. Moreover, people must get credit for the work of providing information for these databases. However, organizations such as the Integrated Taxonomic Information System do not give such acknowledgements on their sites.

2. Agriculture and Agri-Food Canada

Dr. Gary Gibson reminded the Committee that the research branch of Agriculture and Agri-Food Canada, including the group formerly known as ECORC, is undergoing a reorganization. All research personnel now work under one of the national programs. Within each program there are themes and studies. All the systematists in Ottawa (as well as some professionals from elsewhere) have been assigned to the Biodiversity theme within the program of Environmental Health.

A systematic entomology position is currently being staffed at the Canadian National Collection, the first new one in 12 years. Three positions have been approved but funding is available for only one. Dr. Gibson explained that visiting scientists, students, etc. working unattended after hours at the Centre must now receive security clearance and therefore at least 2 weeks notice is required to complete the paperwork.

All documents including scientific ones on federal government websites must now be available in both official languages, a requirement that has had repercussions on projects such as the in-progress Ticks of Canada publication (intended for publication on the web). Even information that is available must be translated, resulting in delays as well as difficulties because of the technical nature of the material. Members of the Committee noted other consequences of the requirement for French and English versions. For example, at Environment Canada many primary publications have been removed from the web because they were not available in both languages. Scientists are also forbidden from even listing the titles of their publications unless they are available in both languages.

3. Entomological Society of Canada

Dr. Gibson reported on behalf of Society President Dr. Sandy Smith about the recent annual general meeting held in Winnipeg. He

also outlined the changes that have been made at the Canadian Entomologist. Effective 2003, the journal will be available online, to members only, through NRC Press. Members will first have the option of receiving it electronically or in hard copy or both for the usual membership fee. In subsequent years members will have to pay a surcharge to receive the journal in both formats. Institutions will not receive the electronic format until 2004. Effective immediately there is a new editorial structure for the journal. Formerly there was an Editor and associate editors. The editor will continue to receive papers initially but will then forward papers to the appropriate division editor. There will now be four divisions, each with its own editor who is responsible for the acceptance of papers in his/her division. Hence each division is headed by a specialist in the area. It is hoped that this new structure will reduce the load on the volunteer editor. The Committee contributed comments about the format of the journal. Dr. Gibson reported that foreign but not Canadian membership continues to decline.

4. Canadian Forest Service

Dr. John Huber was representing the Canadian Forest Service because most staff had been called to a meeting to discuss new priorities. The CFS continues to reorganize and examine its directions. A science branch meeting was called to discuss the alignment of the branch's roles, responsibilities and reporting relationships to reflect the need for a stronger role in planning and communication of the science and technology program while recognizing the possibility of new delivery models for forest science. Dr. Huber explained that budgets have been put on hold and will be reallocated for the remainder of the fiscal year. Ideas being considered are how national priorities relate to the biodiversity theme and how to identify scientific work that will address critical national needs and offer opportunities for products that result in high impact and visibility. Dr. Huber outlined part of the new vision under discussion. Later, he reported on the Science Branch meeting. At Forestry there will be 40% turnover of scientific staff over the next 5 years. The Director General wants the Science Branch to show increased relevance to clients as well as to balance regional needs with national objectives. There are plans to have a stronger integration of science and policy (especially dealing with the key issues of climate change, biodiversity, pesticides, and certain pest groups), a call for stronger top-down management, and a focus on important issues. The number of listed projects will be reduced. Thematic network teams would include one on forestry stewardship, addressing such issues as invasive species and biodiversity. These proposals will lead to further exercises and discussions.

5. Environment Canada

A new Water Quality Directorate at Environment Canada combines the various aspects of water quality such as contaminants and pathogens that currently are under different directorates. The Ecological Monitoring and Assessment Network is now part of a new directorate established within Environment Canada, the Knowledge Integration Directorate, which includes EMAN, the Canadian Information System for the Environment (CISE), Outreach Programs, Information Technology, and Human Resources and Innovation Services.

Dr. Danks had been in communication with Ms. Lisa Twolan, Scientific Project Officer for the General Status of Species program at the Canadian Wildlife Service. The General Status Working Group is gearing up to produce the second reporting document on wild species in Canada, entitled "Wild Species 2005". The proposed plan is to include national ranks for a range of taxonomic groups including butterflies, dragonflies/damselflies and tiger beetles.

6. Parasitology module, Canadian Society of Zoologists

Dr. Marcogliese reported that work continues on the protocols for EMAN. The stickleback project also continues, including a workshop at the International Congress of Parasitology held August 2002 in Vancouver. Most of the presentations from the Biodiversity symposium at the International Congress will

be published in a special issue of the Journal of Parasitology in 2003.

Dr. Marcogliese circulated a number of articles on issues such as online taxonomy, the All Species Foundation and challenges for taxonomy as well as relevant items from the President's symposium of the Helminthological Society of Washington on parasitology and its future.

7. Parks Canada

Dr. Danks reminded the Committee that Mr. Alvo, Parks Canada, attended the April meeting. Dr. Danks had sent him extensive information about the Survey. Its receipt had been acknowledged. No Parks representative was able to come to this meeting.

Prompted by the recent announcement of 10 new national parks and 5 new national marine conservation areas over the next 5 years, the Committee noted that despite the mandate of ecological integrity and recognition of the need to study the parks and gather baseline data, there is no additional funding. Therefore, the Committee drafted a letter (subsequently refined and sent) to relevant decision makers, pointing out the need for adequate resources and for the use of existing outside expertise for inventory and monitoring of Parks biota. In due course, the letter would be sent to professional societies urging them to send similar letters to decision makers. It was noted too that although it is unlikely that significant financial support for arthropod studies will come from Parks, the issue of access to some national parks and concern about differences in the ability to secure permits is also important.

8. Natural Sciences and Engineering Research Council of Canada

Dr. Shorthouse reported that the NSERC reallocation process has been completed. He reminded the Committee of its input in this area. Unfortunately, the funding through the Grant Selection Committee handling systematics and other topics was cut by $1 million; other life sciences committees likewise had funding reduced, to the benefit of chemistry, physics, computers and informatics. It was noted that some of the problems with the relevant GSC stem from its diversity and the divergence between historical ecology, evolution and systematics.

Other items

1. Reports on regional development of potential interest

Information of interest to the Survey from various parts of the country was outlined, including the following subjects.

In British Columbia, an attractive field handbook on the dragonflies of British Columbia and the Yukon has been published. The very successful pest management program at Simon Fraser University is still in limbo. The term of the Director has finished and no new students are being registered at least until January. Work in the south Okanagan valley has led to the conclusion that 50% of the valley needs to be protected as habitat to conserve a range of organisms. Dr. Wayne Maddison, a student of spiders, has been appointed at the University of British Columbia effective January 1.

In the prairies, the 50th annual meeting of the Entomological Society of Alberta (October 24–26) included a keynote address by Dr. George Ball summarizing 50 years of entomology in Alberta. Some outbreaks of carabid and scarabaeid beetles were reported this year in Alberta. Activities in various prairie laboratories were reviewed.

In Ontario, the Royal Ontario Museum is continuing with its major upgrade, "Rennaissance ROM". Ground will be broken in May 2003 for the first phase. Projects and personnel changes across Ontario were reviewed. Dr. Glenn Wiggins has completed a popular book on Trichoptera which will be a joint University of Toronto/NRC Press publication.

In Quebec, the pest diagnostic clinic was very busy this past summer: a record number of samples was received including some new records for North America and other interesting material. The joint meeting of the Conférence

Internationale Francophone d'Entomologie and the Societé d'Entomologie du Québec was held in July. Dr. Paul Bouchard died recently. His collection will be donated to the province. Dr. Chris Buddle, a student of spiders, has joined the Department of Natural Resources, Macdonald Campus of McGill University. At the Lyman Museum there was major curatorial effort in the Orthopteroid collection, and work to secure the Henry Lyman Library. The Université de Montréal is currently recruiting for a position in insect systematics and conservation. This position is a replacement for Dr. Peter Harper. A new network, le Reseau Québecois de la Biodiversité, has been formed. Opposition to cosmetic pesticide use continues to grow in Quebec, especially in the Montreal area. There have even been campaigns to encourage the acceptance of weeds. Other projects and changes in personnel were reviewed.

In the Maritimes and Newfoundland, Mr. Chris Majka at the Nova Scotia Museum of Natural History is making an effort to get many Coleoptera identified and build a reference collection, and has produced some interesting web pages. A workshop organized by the Biodiversity Convention Office and the Federal-Provincial Territorial Working Group took place in July. The workshop brought university researchers in biodiversity and others from Atlantic Canada together to draft an outline of a research agenda for biodiversity. The intention was to find areas of collaboration, encourage interdisciplinary work, increase publicity, and influence funding. A faculty position in biodiversity is being advertised at the University College of Cape Breton. Other activities across the Maritimes were reviewed.

For the arctic, the fact that the Polar Continental Shelf Project's budget was cut by 20% last year (so that some arctic researchers did not receive any logistic support) had led to an active letter-writing campaign to members of parliament and other agencies. The consequences of that campaign would be discussed at the annual general meeting of the Association of Canadian Universities for Northern Studies in October. The Canadian Polar Commission has compiled a publication on indicators of Canadian polar knowledge using two years' data. The 14 indicators include such things as studies of polar subjects supported by granting agencies, university courses in polar-related subjects, newspaper articles relevant to Canadian polar matters, and fiction publications by northern Canadian authors. The European Union Framework Program 6 is meeting in Brussels in November. This program has $27 billion Canadian going into research and development. There is much competition for partnerships with countries outside Europe.

2. Other matters

The Committee also considered information about other relevant subjects, including international liaison, membership of the Scientific Committee, operations of the Biological Survey Secretariat, and additional information about publications and conferences.

The Quiz Page

—test your knowledge of Canada and its fauna—

1. What is rock flour?

2. One well-known northern insect collecting locality was formerly known by the name Frobisher Bay. When was the name changed, what is it now, and what does it mean in Inuktitut?

3. What is the average fire rotation time, or mean time between fires, in the boreal forest?

4. What are loopers, gentles, hellgrammites, rose slugs and doodle bugs, and what do they have in common?

5. Define the following terms that apply to parasitoids:

   a) marking

   b) koinobiont

   c) idiobiont

   d) endoparasitoid

   e) hyperparasitoid

   f) microtype egg

[Answers on p. 24]

Project Update: Insects of Keewatin and Mackenzie

The insects of the Canadian north are among the most inadequately surveyed faunas in North America. The Northern Biting Fly Survey from 1947 onwards, the Northern Insect Survey that developed from it, and subsequent Studies on Arctic Insects resulted in extensive collections from arctic and subarctic Canada and provided valuable insights about insect diversity in the far north. The history of this collecting is outlined by Danks (1981), Riegert (1985) and Downes (1992). Nevertheless, relatively few sites were sampled, especially on the northern mainland, and the material collected is unsuitable for modern analysis such as cytology and DNA sequence analysis. The area remains difficult to access and few field stations or other elements of infrastructure are available to support field work, so that adequate collections can be made only by launching challenging temporary expeditions.

Recent findings about the black flies of the Yukon Territory (Currie 1997), including the strong Beringian affinities of many species, suggested that the territory east of the Mackenzie River, which is especially inadequately surveyed, would give particularly valuable insights into the diversity and biogeography of northern insects. Information about energetics and food web dynamics would also be forthcoming.

Therefore, a proposal to sample the northern mainland east of the Yukon was led by D.C. Currie. It was supported by the Committee for the Biological Survey in 1998 and was soon joined especially by D.J. Giberson. It resulted in a multiyear initiative to sample representative areas throughout the region. Expeditions were organized to the Horton River in 2000, by D.C. Currie, D.J. Giberson, P.H. Adler, B.V. Brown and M.G. Butler (Currie et al. 2000), to the Northwest Territories in 2001 by D.C. Currie and P.H. Adler, and to the Thelon River in 2002 by D.C. Currie, D.J. Giberson, P.H. Adler, A. Roe and L. Purcell (Currie et al. 2002). Travel to settlements on the eastern shore of Hudson Bay and adjacent inland sites, including Rankin Inlet, Baker Lake and Arviat, is planned for July 2003.

Already each area has been shown to contain a surprisingly large number of species, but with great differences in species composition from the Yukon and from one area to another. Other findings are being developed from material obtained on the previous trips (and see Currie et al. 2000, 2002), and will be extended through the specimens that will be collected on later expeditions. Those interested in participating in future elements of the Keewatin and Mackenzie project should contact Dr. Doug Currie (Centre for Biodiversity and Conservation Biology, Royal Ontario Museum, 100 Queens Park, Toronto, ON M5S 2C6; dougc@rom.on.ca).

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.

Downes, J.A. 1992. History Corner: Studies on arctic insects. Arctic Insect News 3:12–21.

Riegert, P.W. 1985. The Heritage Lecture: Some aspects of a limited history of northern insect studies. Bulletin of the Entomological Society of Canada 17 (4): 90–96.

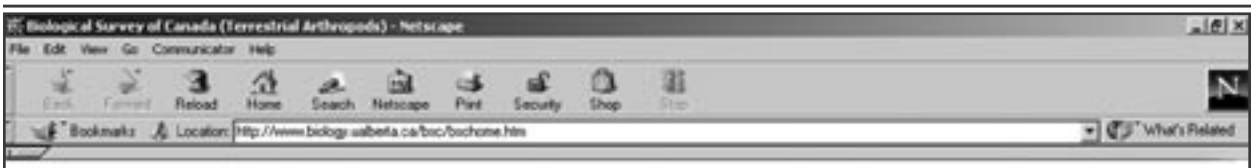
References

Currie, D.C. 1997. Black flies (Diptera: Simuliidae) of the Yukon, with reference to the black-fly fauna of North America. pp. 563–614 in H.V. Danks and J.A. Downes (Eds.), Insects of the Yukon. Biological Survey of Canada (Terrestrial Arthropods), Ottawa.

Currie, D.C., D. Giberson and B.V. Brown. 2000. Insects of Keewatin and Mackenzie. Newsletter of the Biological Survey of Canada (Terrestrial Arthropods) 19 (2): 48–51.

Currie, D.C., D. Giberson and P.H. Adler. 2002. Insect biodiversity in the Thelon wildlife sanctuary. Newsletter of the Biological Survey of Canada (Terrestrial Arthropods) 21 (2): 59–64.

(All photographs by D.C. Currie)



Biological Survey of Canada
Terrestrial Arthropods français

Web Site Notes

Home
Roles and responsibilities
Structure and personnel
Publications
Scientific projects
Arthropods of Canadian Grasslands
Canada's insect fauna
List of workers (database)
Faunal analysis project
Requests for Material or Information
Biological Survey Foundation
Other sites of interest
Site map
Search
What's new?

A colleague from Scandinavia recently congratulated the Survey on its "excellent and generous site" where many publications are available. For example, the full text of all of the Survey's briefs are posted in both html and pdf format. Two major publications from the Survey's Monograph series have also been put on the Survey's website:

Insect Dormancy: an ecological perspective (H.V. Danks. 1987. 439 pp.) has been out of print for many years. Posting the text on the web has again made this book accessible. The critically acclaimed book is a comprehensive synthesis from a new ecological orientation of information on how dormancy and related adaptations help to control insect life cycles

Insects of the Yukon (H.V. Danks and J.A. Downes, Eds. 1997. 1034 pp.) is another authoritative and highly acclaimed book. generated by the Survey's Yukon project, that brings together work by 35 international experts, allowing a synthesis of zoogeographical information about the fauna of the region.

Briefs available on the website include:

- Status and Research Needs of Canadian Soil Arthropods
- Recommendations for the Appraisal of Environmental Disturbance: Some general guidelines and the value and feasibility of insect studies
- Insects of Canada
- Arctic Invertebrate Biology: Action required
- Freshwater Springs: A national heritage
- Arthropod Ectoparasites of Vertebrates in Canada
- The Importance of Research Collections of Terrestrial Arthropods
- Terrestrial Arthropod Biodiversity: Planning a study and recommended sampling techniques
- How to assess insect biodiversity without wasting your time
- The advantages of using arthropods in ecosystem management
- Information on Biodiversity funding: Funding sources for graduate students in arthropod biodiversity
- Terrestrial Arthropod Biodiversity Projects – Building a factual foundation
- Label data standards for terrestrial arthropods

The link to these and other Survey publications is at: http://www.biology.ualberta.ca/bsc/english/publications.htm

Opinion Page

—The Opinion Page is a forum for views and ideas of potential interest to readers— Contributions should be sent to the editor.

The real costs of insect identification[1]

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The value of arthropod survey, inventory and monitoring projects depends on accurate identification of the taxa under study. While the impact of misidentifications in biodiversity projects is less obvious and immediate than the impact of misidentifications of pests, parasitoids or medically important arthropods, accurate identifications are at the heart of most biodiversity work and are crucial to conservation biology. Furthermore, correct names are predictive, they open the door to the literature on the taxa involved, and allow the data from a study to be properly shared and archived.

Identifying organisms usually demands effort, resources and expertise, and is therefore associated with a cost, but those costs are almost infinitely variable, ranging from essentially free (easily recognized species such as lady beetles) through to thousands of dollars (potentially invasive species in difficult taxa for which there are no keys). Identification costs between these extremes will vary according to the experience of the identifier, the nature of the taxon, and the availability of reference collections, revisions, reviews, monographs and regional works. For these reasons, the pre-set fees for identification implemented by various institutions are impractical and cannot possibly be based on a real per-specimen cost estimate. There is no point in trying to generate generalized figures for the "real cost of insect identification" based on the effort required to identify individual specimens, since in the ideal world any insect should be as readily identifiable as lady beetles and butterflies are today. Identification costs would be uniformly low if, for example, there was a central web site with links to user-friendly, richly illustrated, authoritative, regional keys for all adequately known insects. Instead of asking what it should cost to have individual insect species identified again and again, we should be addressing the costs of developing the tools needed to make those individual identifications simple and accurate.

Meeting the societal cost of insect identifications

Canadians need the capability to identify all of our species, most of which are insects, for a number of good reasons over and above our legal commitments to do so because of the Biodiversity Convention, new federal Species at Risk Legislation, and related laws at national, provincial and regional levels. We need to recognize pests and beneficials, invasive and threatened species, species of interest to related disciplines such as ecology, bioindicator species, species of potential pharmaceutical value, etc. Most insect species are currently difficult, and therefore costly, to reliably identify except by specialists with access to good reference collections. Repeated expenditures to identify species that require specialized expertise and specialized facilities or literature therefore represents an ongoing and significant cost to

[1]Recently, the Scientific Committee for the Biological Survey has been discussing the per-specimen costs of insect identification, which prompted me to develop this essay.

our society, legitimately met in part by the tax dollars that subsidize the museums and associated systematists who handle these identifications. This, however, is an inefficient approach to meeting the need for identifications and one that could be compared to "giving a man a fish" in the ancient aphorism "give a man a fish and you feed him for a day, teach him to fish and you feed him for a lifetime". What we need to do is to provide our population of naturalists, ecologists, conservation biologists, and others with the necessary tools to do as many of their own identifications as possible.

The tools required, and therefore the products that the taxonomic community must be adequately supported to develop, are as follows:

1) Primary revisions. Basic revisions are the building blocks upon which all further efforts (indeed, all of biology) stands. There is no point in talking about identifications of a taxon in which significant numbers of species have not yet even been described. Good revisions have always included identification tools, although keys in primary revisions are often difficult or impossible for non-specialists to use.

2) Reviews, handbooks and regional monographs. Usually built upon a framework provided by primary revisions, secondary treatments of major taxa such as the highly acclaimed Insects and Arachnids of Canada series go a long way towards making significant groups of insects readily identifiable. Most still require significant expertise and experience, and most (but not all) are difficult to use reliably without a reference collection.

3) User-friendly identification guides. Once fundamental revisions and regional reviews have been developed for a taxon, the next logical step is to use that foundation to develop easily used identification guides. Here in Ontario, any naturalist with a hand lens can now identify several groups for which there are provincial or northeastern North American field guides (for example: dragonflies, macromoths, butterflies, lady beetles, tiger beetles, long-horned beetles)

4) New tools for insect identification. Newly available software, hardware and other technology is providing unprecedented opportunities for new approaches to insect identification such as computer (matrix) keys and automated identification systems. Implementation of these approaches may allow us to bypass step 3 above, but step 1 remains essential and step 2 will normally be a prerequisite.

The question of interest, then, is not "how much do identifications cost?" but "how can we expedite the above steps to minimize the societal cost of insect identifications?" Steps 1 and 2 (revisions and reviews) must be recognized as fundamental, as there is no point in discussing efficient ways of facilitating identifications if basic taxonomic data are not available for the taxa in question (description, name, comparison to related species, distribution, dichotomous keys). Assuming, then, that the already scarce resources needed for this fundamental work will not be diverted to implement steps 3 and 4 (development of second generation identification tools), what can be done to minimize the societal cost of insect identifications?

New tools for insect identification – magic bullets or massive matrices?

The addition of molecular techniques to the taxonomists' arsenal has been one of the major (albeit most costly) advances of the last twenty years, and the use of molecular tools for insect identification has already shown great potential to expedite the identification of cryptic species, formerly unidentifiable life stages, and critical taxa such as disease vectors. Recent claims that molecular approaches comprise the only solution to the taxonomic crisis, however, should be taken with a grain of salt. Similar claims have been made by champions of emerging technologies (quantitative phenetics, cuticular hydrocarbons, gel electrophoresis, DNA-DNA hybridisation) in the past, in each case generating a flurry of interest (and funding) but never making a significant impact

on how organisms are identified. Some molecular biologists are now proposing that DNA sequences really will provide the magic bullet that earlier genetic technologies failed to yield. While I do not wish to be in any way critical of my colleagues' very interesting and worthwhile research programs in molecular taxonomy, I would like to suggest that some of the claims being made by proponents of these research programs comprise gross hyperbole and, although they may increase the flow of funding into their research programs, they are not in the best interest of taxonomy as a whole. For example, a recent paper by Hebert *et. al.* (2002) argues that "the sole prospect for a sustainable identification capability lies in the construction of systems that employ DNA sequences as taxon 'barcodes'". The authors base their case for this exclusive approach on the claim that "taxonomic expertise is collapsing", combined with the rather peculiar argument that a reliance on morphological taxonomists means that only professional taxonomists will be able to identify things, whereas molecular identifications will free us from that dependence. Their claim that "since few taxonomists can critically identify more than 0.01% of the estimated 10–15 million species, a community of 15000 taxonomists will be required, in perpetuity, to identify life if our reliance on morphological diagnosis is to be sustained" seems to ignore that fact that once a taxon has been revised and reviewed (***prerequisites for both molecular and morphological identification)*** identifications can usually be done by non-specialists. Furthermore, once a taxon is reviewed it is usually not that difficult to develop a user-friendly identification guide (and, as elaborated below, it is now especially practical to do so). We do not need a community of butterfly taxonomists in perpetuity to identify butterflies (although we do need butterfly taxonomists for many other reasons!), nor should we be dependant on taxonomists to identify most other taxa if the right tools are at hand. Hebert *et. al.* argue that the right tool, a system of DNA barcodes, can be developed for about a billion dollars (presumably American dollars), significantly less than that directed to other megascience projects such as the Human Genome project. While I admire the innovative research program proposed by Hebert *et. al.* have proposed, it is not the right tool with which to minimize identification costs of Canadian insects.

Having rejected, at least for the moment, a molecular solution to the taxonomic impediment, what are the alternatives? In my opinion, the Canadian entomological community is already moving in the right direction, and has been doing so for a long time through the production of secondary identification products such as checklists and catalogues, manuals, and handbooks. Although progress is slowed by our diminished ranks, opportunities to capitalize on readily available computer hardware and software combined with tremendous advances in digital imaging have set the stage to build on the infrastructure so successfully developed over the last century, and to render the Canadian insect fauna largely identifiable by non-taxonomists. One way this might be expedited is through the widespread use of expert systems or matrix keys developed using software such as LINNEAS, DELTA, 20Q, or LUCID. These programs expedite the construction of non-hierarchical keys that allow the user to select any character and character state from a list (or group of illustrations) rather than being constrained to a sequence of characters as in a traditional dichotomous key. More importantly, matrix keys such as LUCID allow for the almost limitless use of the photographs and other illustrations necessary to make any key user-friendly. In my opinion, the widespread availability of matrix keys on the web will represent the major revolution in insect identification over the next 20 years. This will happen quickly if taxonomists are given adequate credit for the production of matrix keys (*ie*, if there is a mechanism by which they can be reviewed and recognized as legitimate scientific publications), if funding is available (substantially less than a billion dollars!), and if our diminished taxonomic community is able to continue to generate the revisions and reviews which are necessary prerequisites to the

development of morphological or molecular identification tools.

What can be done now to ma ke Canadian insects more identifiable?

Compared to the world insect fauna of millions of insect species, Canada's total fauna of tens of thousands of species is relatively manageable. Keys already exist to virtually all genera and most species, and Canadian taxonomists are already world leaders in the development of identification tools for all of the major insect orders. Perhaps it is time to launch a unified national effort to produce a guide to the insects of Canada. This could be done either by providing funding and an appropriate venue (a digital journal) for the publication of matrix keys to major groups, or by launching a community-wide effort to develop a more traditional product incorporating photographs of every genus and most species of Canadian insects. The cost of publishing photographs has plummeted in recent years, and new technology for image acquisition makes it easier than ever before to obtain digital images of specimens and characters at any magnification. Many taxonomists have already built up major image libraries, and it is likely that a good proportion of our community of taxonomists would be willing to contribute expertise, time and images as co-authors of the Insects of Canada.

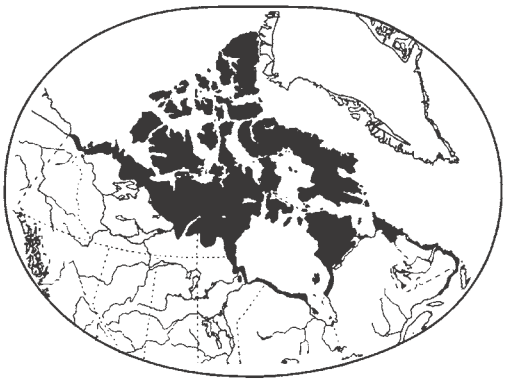
The development of a paper guide to Canadian insects and a concomitant library of images covering every genus in the country would also simultaneously deal with the limiting step in putting together a matrix key for web publication (the assembly of an image library), so these two suggestions are by no means mutually exclusive. Both suggestions require funding, and either could be managed as a flagship project of the Biological Survey of Canada.

Database of People Interested in Terrestrial Arthropods Updated

Thanks to the many people who responded to our letters and emails and provided us with up to date information about their interests in the systematics and faunistics of terrestrial arthropods of Canada. We hope the online list will be a useful tool. The database can be found on the Survey's website at http://www.biology.ualberta.ca/bsc/bschome.htm. Follow the menu item 'List of workers (database)'.

However, we have somewhat dated information about the following people, some of whom may have moved away. The Secretariat would be happy to receive up to date information concerning anyone on this list.

John Acorn
Michael Alperyn
Robert Anderson (Winnipeg)
Andrew Bennett
Jean-Pierre Bourassa
Rob Bourchier
Donald Bright
Jim Chaput
Helene Chiasson
Daniel Coderre
Jim Corrigan
Jeffrey Cumming
Douglas Currie
Rob Currie
Troy Danyk
Chris Darling
Peter De Groot
Ken Deacon
Eldon Eveleigh
Ed Fuller
Eric Georgeson
Rebecca Hallett
Victor Hellebuyck
Blair Helson
Bruce Heming
John Heraty
Gerald Hilchie
Lee Humble
Josh Jacobs
J.D. Lafontaine
Bob Lalonde
David Lewis
Robert Longair
Owen Lonsdale
Patricia MacKay
Kenna MacKenzie
Alain Maire
Valin Marshall
Lubomir Masner
Peter Mason
Alec McClay
Jeremy McNeil
William Morton
Timothy Myles
Vincent Nealis
Andrew Nimmo
Kevin Nixon
Georges Pelletier
Kenelm Philip
R.C. Plowright
F. Wolfgang Quednau
Dan Quiring
Amanda Roe
Jens Roland
James Ryan
Diana Saunders
Jade Savage
Cynthia Scott-Dupree
Michael Sharkey
Danny Shpeley
Ales Smetana
Ian Smith
Rob Smith
Sandy Smith
John Spence
Nick Tatarnick
Jean-Claude Tourneur
Bob Vernon
Dudley Williams
D. Monty Wood
Dicky Yu
Jack Zloty



ARCTIC CORNER

News about studies of arctic insects

Introduction

Arctic Corner provides a forum for news of particular arctic interest, replacing the Biological Survey's newsletter *Arctic Insect News* (1990–2000). Contributions to *Arctic Corner* are welcomed by the Editor (see inside front cover).

Arctic research notes

As noted by Richard Ring in the Fall 2002 issue of this newsletter (Canadian research in arctic entomology is out in the cold) there are few new research initiatives in arctic entomology (but see p. 12 for an update of the project on Insects of Keewatin and Mackenzie). However, some general arctic research activities are worth noting.

Symposium on Biology of the Canadian Arctic

In January 2003 the Canadian Society of Zoologists organized a symposium on Biology of the Canadian Arctic, with a focus on environmental change, which was held in conjunction with the 2003 annual meeting of the Society for Integrative and Comparative Biology. A variety of biologists presented a total of 15 papers, including one by Hugh Danks on Seasonal adaptations in arctic insects.

At that meeting a letter signed by 42 geographers, zoologists, botanists and climatologists was drafted and sent to Jean Chrétien and other members of parliament. The letter urged the federal government to recognize the diminished capacity of Canadian scientists to conduct research in the arctic and to take action to recognize Canada's renewed commitment to northern research, specifically:

"-by highlighting the need to reinforce Canadian arctic science in Minister Manley's upcoming budget speech;

-by providing new resources to the national funding research bodies (NSERC and SSHRC) so that all of recommendations of the 2000 Report of the Task Force on Northern Research "From Crisis to Opportunity", can be fully implemented;

-by committing additional funding to the Polar Continental Shelf Project to rebuild research infrastructure and logistic support in the Canadian Arctic;

-by expanding training opportunities for university and northern students through programs, such as the Northern Scientific Training Program;

-by further coordinating and supporting federal research activities in the north, as outlined in the 2000 Northern Science and Technology Framework and Research Plan."

This letter attracted coverage in the media following the meeting.

Northern Regional Impacts and Sensitivity to Climate Change

Northern Regional Impacts and Sensitivity to Climate Change (N-RiSCC) is a multi-agency network incorporating university and government researchers with a goal to elucidate the complex linkages and feedbacks among terrestrial, fresh water and coastal ecosystems in the face of global warming. N-RiSCC is proposing a Canadian research expedition on an icebreaker up the east coast of Hudson Bay to northern Ellesmere Island studying the sensitivity of coastal and terrestrial ecosystems to climate change. Canadian Foundation for Innovation funds to refit the icebreaker *Franklin* for polar science were recently awarded. Planning for the structure and support for N-RisCC (2005–2010) is now underway. For further information see http://www.geog.ubc.ca/~ghenry/N-RiSCC/home.htm

ArcticNet

Some funding towards the operation of the icebreaker for N-RisCC could come from a proposed Networks of Centres of Excellence Program initiative called ArcticNet. ArcticNet is planned to be a network for the cross-sectorial study of the changing Canadian arctic. An ArcticNet Workshop was held in Montreal on January 16, 17, 2003. For further information contact Louis Fortier, Université Laval, louis.fortier@bio.ulaval.ca

Circumpolar student conference

The Association of Canadian Universities for Northern Studies (ACUNS) is planning an international circumpolar student conference at the University of Alberta, 24–26 October 2003. For more information on the ACUNS 2003 Northern Students Conference contact David Malcolm (david.malcolm@ualberta.ca) at the Circumpolar Institute (www.ualberta.ca/~ccinst/).

Funding for arctic studies

Despite the general decline in financial support for arctic insect research, some sources of funding are available especially to assist students who want to do northern research. Some of these sources are outlined in the brief: "Information on Biodiversity Funding: Funding Sources for Graduate Students in Arthropod Biodiversity" by Terry Wheeler. See http://www.biology.ualberta.ca/bsc/english/funding.htm. Students are encouraged to read the entire document for advice on preparing applications.

Some sources of funding specific to northern research are listed below. In addition, the funding brief lists other sources not necessarily specific to arctic research.

AINA Grants in Aid - Arctic Institute of North America. Support up to $500 for young researchers, including graduate students, to defray the costs of research in the north.

See: http://www.ucalgary.ca/aina/scholar/scholar.html

Aurora Research Institute. The James M. Harrison Bursary is intended to assist a student planning to return to the Northwest Territories. It will be awarded to a NWT resident; graduate student, fourth year student, or third year student enrolled in a natural sciences program in a university or college. The Aurora Research Institute also helps fund research with the: Research Assistant Program; Research Fellowship Program, and the Research Associate Program.

See: http://www.aurresint.nt.ca/index.htm

Canadian Northern Studies Trust (ACUNS). The Canadian Northern Studies Trust offers one or two scholarships valued at $10,000 each, to students currently enrolled in a doctoral program at a Canadian university. Research must be conducted in northern Canada, where north is defined as on or north of the sporadic-discontinuous permafrost line.

See: http://www.cyberus.ca/~acuns/EN/a_sns_g.html

Canadian Northern Studies Polar Commission Scholarship. Administered by ACUNS. Studentships will be awarded to students enrolled in a doctoral program at a Canadian university. Studentships cover a 12-month period of study and are valued at $10,000. Proposals are especially invited from candidates who (a) will engage in research culminating in a thesis or other such document, (b) whose programs show excellence in research in Polar regions and (c) are willing to communicate results in a major national or Northern forum.

See: http://www.cyberus.ca/~acuns/EN/a_cnspcs_g.html

Churchill Northern Studies Centre. The goal of the Northern Research Fund (NRF) is to enhance field research conducted by researchers utilizing facilities and services of the Churchill Northern Studies Centre (CNSC). It is a fund-matching program that awards a combination of cash and in-kind support by the CNSC for expenses normally encountered during the course of research programs.

See: http://mail.churchillmb.net/~cnsc/refunding.html

Circumpolar/Boreal Alberta Research (C/BAR) Grants. Funded by the Government of Alberta, the Circumpolar/Boreal Alberta Research Grants are open to graduate and senior undergraduate students of the University of Alberta, staff or students at another college or University in Alberta, as well as residents of Alberta, Yukon, the Northwest Territories, and Nunavut. These grants-in-aid provide funds in support of research in any subject area.

See: http://www.ualberta.ca/~ccinst/GRANTS/grants.html

Jennifer Robinson Memorial Scholarship - Arctic Institute of North America. $5000 scholarship given annually to a graduate student in northern biology. May be used to defray the costs of research.

See: http://www.ucalgary.ca/aina/scholar/scholar.html

Lorraine Allison Scholarship - Arctic Institute of North America. $2000 scholarship given annually to a graduate student conducting research related to northern issues (including northern biology).

See: http://www.ucalgary.ca/aina/scholar/scholar.html

Northern Research Institute of Yukon College. The NRI Fellowships provide up to $6,000 for expenses associated with defined research in the humanities, social, pure and applied sciences, investigating northern issues especially those with a Yukon focus.

See: http://www.yukoncollege.yk.ca/programs/nri/

Northern Scientific Training Program - Administered by the Northern Studies Committee at selected Canadian Universities on behalf of the Department of Indian Affairs and Northern Development. Support up to $3000 for graduate students or senior undergraduates to defray the costs of research in the north.

See: http://www.ainc-inac.gc.ca/nstp/nstpb_e.html

Royal Canadian Geographical Society (RCGS). RCGS sponsored two studentships in 2003, both of which are administered by the Canadian Northern Studies Trust. The James W. Bourque Studentship is available for those enrolled in a doctoral program at a Canadian university. The other RCGS studentship is open to students currently enrolled in a master's level program. See: http://www.cyberus.ca/~acuns/EN/a_jwb_g.html

Selected Future Conferences

Organization	Date	Place	Contact
ENTOMOLOGICAL CONFERENCES			
Entomological Society of Canada	**2003**, 2–5 Nov.	Kelowna, BC	(with the Entomological Society of British Columbia) http://esbc.harbour.com/jam.html Terry Shore, tshore@pfc.forestry.ca
	2004	PEI	with the Acadian Entomological Society
Entomological Society of America	**2003**, 26–29 Oct.	Cincinnati, OH	ESA, 9301 Annapolis Rd., Lanham, MD 20706-3115; meet@entsoc.org
	2004, 14–18 Nov.	Salt Lake City, UT	ESA, see above
Annual Meeting of the Dragonfly Society of the Americas	**2003**, 20–22 June	Williams, Colusa Co., CA	http://www.sonic.net/~bigsnest/DSA2003/ Tim Manolis; Ylightfoot@aol.com
Annual Meeting of the Lepidopterists' Society	**2003**, 23–27 July	Olds, AB	http://www.furman.edu/~snyder/snyder/lep/meet.htm Felix Sperling, Department of Biological Sciences, University of Alberta, Edmonton, AB T6G 2E9; felix.sperling@ualberta.ca
II International Congress of Coleopterology	**2003**, 14–21 Sept.	Prague, Czech Republic	Milos Knizek, Secretary of II ICC, Forestry and Game Management, Research Institute Jiloviste – Strnady, CZ - 156 04 Praha 5 - Zbraslav, Czech Republic, knizek@vulhm.cz; www.coleocongress2003.cz
XXII International Congress of Entomology	**2004**, 15–20 Aug.	Brisbane, Australia	http://www.ccm.com.au/icoe/index.html Ashley Gordon, Congress Director; ashley@ccm.com.au Myron Zalucki, Chair ICE Executive M.Zalucki@zen.uq.edu.au
PROVINCIAL SOCIETIES			
Acadian Entomological Society	**2003**, 22–24 June	Bar Harbor, Maine	Andrei Alyokhin, Department of Biological Sciences, 5722 Deering Hall, University of Maine, Orono, ME 04469, andrei.alyokhin@umit.maine.edu; http://www.upei.ca/~aes/

Organization	Date	Place	Contact
Société d'entomologie du Québec	**2003**, 13–14 Nov.	Québec, QC	http:// www.seq.qc.ca/accueil_fr.htm
Entomological Society of Alberta	**2003**, 2–4 Oct.	Athabasca, AB	Robert Holmberg, Centre for Science, Athabasca University, 1 University Dr., Athabasca, AB T9S 3A3; robert@athabascau.ca; http: //www.biology.ualberta.ca/courses.hp/esa/esa2003.htm
Entomological Society of British Columbia	**2003**, 2–5 Nov.	Kelowna, BC	(with the Entomological Society of Canada; see that entry)
COLLECTIONS / MUSEUMS / SYSTEMATICS			
Natural Science Collections Alliance Annual Meeting	**2003**, 5–6 June	Berkley, California	http://www.nscalliance.org/annual_meeting/03/index.asp Judy Scotchmoor, Director of Education and Public Programs, University of California Museum of Paleontology, Valley Life Sciences Building, Berkeley CA 94720–4780; jscotch@uclink4.berkeley.edu
Society for the Preservation of Natural History Collections Annual Meeting	**2003**, 15–19 June	Lubbock, Texas	http://mum202-2.musm.ttu.edu/spnhc2003/ Richard Monk; rich.monk@ttu.edu
OTHER SUBJECTS (ESPECIALLY THOSE RELEVANT TO SURVEY PROJECTS)			
American Institute of Biological Sciences	**2003**, 21–23 March	Washington, D.C.	www.aibs.org
Canadian Society of Zoologists Annual Meeting	**2003**, 6–10 May	Waterloo, ON	http://www.wlu.ca/csz/home.html
10th Annual International Conference on the St. Lawrence River Ecosystem (Large River Ecosystems Under Stress)	**2003**, 3–14 May	Cornwall, ON	http://www.riverinstitute.com/html/conference.html
North American Benthological Society	**2003**, 27–31 May	Athens, Georgia	http://www.benthos.org/Meeting/index.htm Jack Feminella; Dept of Biological Sciences, Auburn University, 331 Funchess Hall, Auburn , AL USA , 36849-5407; feminjw@auburn.edu

Answers to Faunal Quiz

[see page 11]

1. Rock flour is finely ground rock particles, chiefly silt size, resulting from glacial abrasion.

2. Frobisher Bay had its name changed on the first of January 1987 to Iqaluit, which means “place of many fish” in Inuktitut.

3. The mean fire rotation time in the boreal forest is about 60 years in drier pine-dominated stands, but 100 years in spruce forests, and up to hundreds of years in mixed-wood forests, but there is great variation on a range of scales.

4. Loopers, gentles, hellgrammites, rose slugs and doodle bugs are all insect larvae, respectively the immature stages of geometrid moths, blowflies, Dobson flies, sawflies and ant lions.

5. a) Marking is placing a signal on the host, typically done by an ovipositing female using pheromones, normally to limit superparasitism.

   b) Koinobionts permit hosts to continue to move, feed and defend themselves after parasitism.

   c) Idiobionts are parasitoids which kill or permanently paralyze their hosts during oviposition.

   d) Endoparasitoids are parasitoids that develop inside the host.

   e) Hyperparasitoids are are parasitoids that attack other parasitoids.

   f) Microtype eggs are tiny eggs deposited away from the host, for example on foliage, and then ingested by the host.

In Question 5 of the Quiz in issue 21(2), the last part of the sentence, “now treated as a synonym . .” should be deleted, because the change of genus designated by parentheses around the author could have been necessary for reasons other than synonymy, such as error or splitting of the genus [contributed by Fenja Brodo].

Quips and Quotes

"*Micromalthus debilis* LeConte (1878), has one of the most bizarre life cycles of any metazoan. Reproduction is typically by thelytokous, viviparous, larviform females, but there is also a rare arrhenotokous phase. The active first-instar (triungulin) larva develops into a legless, feeding (cerambycoid) larva. This form either pupates, leading to a diploid adult female, or develops into any of three subsequent types of reproductive paedogenetic forms: (1) a thelytokous female that produces triungulins via viviparity; (2) an arrhenotokous female that produces a single egg that develops into the short-legged (curculionoid) larva, eventually devouring its mother and becoming a haploid adult male; or (3) an amphitokous female that can follow either of the two above reproductive pathways."

From D.A. Pollock and B.B. Normark. 2002. *J. Zool. Syst. Evol. Res.* 40(2): 105–112.

Walker Lake is a monomictic, nitrogen-limited, terminal lake located in western Nevada. . . As a result of anthropogenic desiccation, between 1882 and 1996 the lake's volume has dropped from 11.1 to 2.7 km^3 and salinity has increased from 2.6 to 12–13 g l^{-1}. . . If desiccation continues unabated, the lake will be too saline (>15–16 g l^{-1}) to support trout and chub fisheries in 20 years, and in 50–60 years the lake will reach hydrologic equilibrium at a volume of 1.0 km^3 and a salinity of 34 g l^{-1}.

From M.W. Beutel, A.J. Horne, J.C. Roth and N.J. Barratt. 2001. *Hydrobiologia* 466(1–3): 91–105.

"It is not necessary to understand things in order to argue about them." Caron de Beaumarchais

Terminological exactitude

"In some cases, the difficulty observed by experimentalists is a kinetic problem. Water in a very narrow, viscous layer is hard to remove even if the attraction to the hydrophilic surface is only modest. This is particularly the case at low temperatures because of the strong dependence of viscosity on temperature. Such water would fail to freeze not because it is in equilibrium with ice, but rather because it can remain in disequilibrium for a time exceeding the patience (or even the lifetime) of the experimentalist. In such cases, 'bound' water may be not so much tied up as unavoidably detained."

From J. Wolfe, G. Bryant and K.L. Koster. 2002. *CryoLetters* 23(3): 157–166.

No comment

"The purpose of GBIF is to make the world's biodiversity data freely and universally available."

"These pages were designed for browsers newer than Internet Explorer / Netscape 4. Pages may display fairly strange."

[Two messages on the home page of the Global Biodiversity Information Facility at www.gbif.org].

List of Requests for Material or Information Required for Studies of the Canadian Fauna 2003

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 coooperators were much appreciated.

This list can also be found on the Survey's website at http://www.biology.ualberta.ca/bsc/english/listofrequests.htm. It is updated there as information is received.

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

(**denotes address reference; listed on p. 34)

	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	North America	Specimens with biological data (especially reared specimens) in the genera *Strobilomyia* (conifer cone maggots), *Lasiomma* (larvae mainly in dung or bird nests), *Egle* (larvae in willow and poplar catkins), *Chirosia* (incl. *Pycnoglossa*) (larvae phytophagous in ferns), and *Acrostilpna* (biology unknown).	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. Foottit	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 33, 34)	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 43) (collect into ethanol). Reared material is especially useful.	G.A.P. Gibson	1
14	Chironomidae: *Larsia* (Tanypodinae)	Nearctic and Palearctic fresh waters	Reared material preferred but will accept all stages in ethanol or on slides.	B. Bilyj	9
15	Chironomidae: *Eukiefferiella*, *Tvetenia* (Orthocladiinae)	All areas, especially Ontario	Include sampling method, habitat information	W.B. Morton	10

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
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
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. Footit	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	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
21	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	12
22	Dermaptera: *Forficula auricularia* (perce-oreille européen / European earwig)	Amérique du Nord et autres régions si possible	A sec ou dans l'alcool	J.C. Tourneur	13
23	Diprionidae (diprionid sawflies)	North America	Living diprionid sawflies of any species, identified or unidentified. Record foodplant. Contact in advance about shipping.	L. Packer	14
24	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	15
25	Eupelmidae: *Anastatus*	North America	Reared materials with associated sexes are particularly important, regardless how few in number.	G.A.P. Gibson	1
26	Formicidae (ants)	Anywhere	Record type of habitat and nest site. Include brood if possible (preserve in ethanol).	A. Francoeur	16

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
27	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	17
28	Halictidae (sweat bees) brown and black spp. only	North America	Particularly from blueberries. Pinned or preserved. Include flower record if available.	L. Packer	14
29	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	18
30	Insects on snow	Especially western mountains	*Chionea* (Tipulidae), *Boreus* (Mecoptera), Capniidae (Plecoptera): preserve in 70% ethanol.	S. Cannings	19
31	Isoptera (termites)	N. America incl. Mexico	Preserve in 75% ethanol; try to collect as many soldiers as possible.	T.G. Myles	20
32	Leiodidae (=Leptodiridae)	Northern forest and tundra areas; prairies and grasslands	Most easily collected by window traps or flight intercept traps; and car nets (Can. Ent. 124: 745, 1992) (collect into ethanol).	S.B. Peck	21
33	Lepidoptera (see also 10)	Arctic	For revisionary work on the holarctic fauna	J.D. Lafontaine	1
34	Lepidoptera	Manitoulin and surrounding islands	Records for use in monograph of the region. Information on old records from collections would be particularly welcome.	J.K. Morton	22
35	Lepidoptera	Areas not previously sampled in western Canada	Standard collecting methods	N. Kondla	23
36	Lygaeidae	Anywhere	Material can be collected in ethanol.	G.G.E. Scudder	18
37	Mallophaga	Anywhere	Preserve specimens in 70% ethanol; host species is extremely important.	T.D. Galloway	24
38	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

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
39	Milichiidae	Anywhere	Malaise traps are particularly productive; also any found in association with ant nests extremely appreciated. Preserve in 70% ethanol.	J. Swann	25
40	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% ethanoll.	R.A. Cannings	4
41	Opiliones (harvestmen)	Canada and adjacent states	Preserve in 75% ethanol, especially adults with notes on habitats.	R. Holmberg	26
42	Orthoptera	Anywhere		J-T. Yang	27
43	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
44	Phoridae	Anwhere; especially boreal	Collect into 70% ethanol: especially interested in Malaise trap samples from boreal forest.	B.V. Brown	28
45	Pipunculidae (bigheaded flies)	Anywhere; especially boreal	Adults can be pinned, pointed or preserved in ethanol.	E. Georgeson	29
46	Psyllidae	North America	Preferably preserve in glycerine or dried. Specimen records and host plant records	R. Foottit	1
47	Pteromalidae: *Pachyneuron*	North America	Reared materials with associated sexes are particularly important, regardless how few in number.	G.A.P. Gibson	1
48	Salticidae (jumping spiders)	Canada	Adult specimens preseved in 70% ethanol. Include habitat information, specific location of collection, collecting method.	D. Shorthouse C. Buddle	30 31
49	Scelionid egg parasites of Orthoptera	Anywhere	Especially from Grylloidea; preserve in ethanol.	L. Masner	1
50	Sciomyzidae	Anywhere	Preferably pinned	L. Knutson	32
51	Silphidae	Canada	Include habitat and trapping method. Malaise trap material welcome.	R. Lauff	33

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
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	25
53	Siphonaptera (fleas)	Anywhere	Preserve specimens in 70% ethanol; host species is extremely important	T. D. Galloway	24
54	Solpugida (sun spiders)	Canada	Preserve in 75% ethanol, especially adults with notes on habitat.	R. Holmberg	26
55	Sphaeroceridae	Anywhere, esp. arctic or high elevations	Collect into ethanol. Acalyptrate fraction of trap samples welcomed.	S.A. Marshall	34
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	33
58	Thysanoptera (thrips)	North America	(Preserve in 70% ethanol). Specimen records, habitat, host plant records where applicable.	R. Foottit	1

Cooperation Offered

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, 43, 51, 55, 57 above
c	Field kits or instructions available on request	See especially entries 38, 43, 52 above
d	Exchange of specimens	Several requesters, including entries 7, 40, 53 above.
e	Limited collecting in Coppermine area, N.W.T., if particular material required.	A. Gunn (address 35 below).
f	Caterpillars, larval sawflies, aphids and mites available on request from trapnests for solitary bees and wasps [and see *Am. Bee. J.* 2001, pp. 133–136, 441–444].	P. Hallett (address 36 below)
g	Insect material from grassland and adjacent habitats at Onefour, Alberta, is available for examination.	D.L. Johnson (address 37 below)

List of Known Email Addressess (by requester name)

Barber, K.N. . . . . kbarber@nrcan.gc.ca

Behan-Pelletier, V.M. . . . . behanpv@agr.gc.ca

Bilyj, B.. . . . . biotax@interlog.com

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Tourneur, J.C. . . . . tourneur.jean-claude@uqam.ca

Yang, J-T. . . . . jtyang@dragon.nchu.edu.tw

List of Addresses

1. Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, 960 Carling Ave., Ottawa, ON K1A 0C6
2. 117 Collingwood Cove, 51551 Range Road 212A, Sherwood Park, AB T8G 1B2
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.
8. 1171 Mallory Road, R1-S20-C43, Enderby, BC V0E 1V0
9. 12 Westroyal Road, Etobicoke, ON M9P 2C3
10. 3 Woodridge Drive, Guelph, ON N1E 3M2
11. Faculty of Forestry and the Forest Environment, 955 Oliver Rd. Lakehead University, Thunder Bay, ON P7B 5E1
12. Department of Biology, Laurentian University, Sudbury, ON P3E 2C6
13. Département des Sciences biologiques, Université du Québec à Montréal, C.P. 8888, Montréal, QC H3C 3P8
14. Department of Biology, York University, 4700 Keele Street, Downsview, ON M3J 1P3
15. Department of Biology, Memorial University of Newfoundland, St. John's, NL A1B 3X9
16. Département des Sciences fondamentales, Université du Québec à Chicoutimi, 9555 boul. de l'Université, Chicoutimi, QC G7H 2B1

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18. Department of Zoology, University of British Columbia,Vancouver, BC V6T 1W5

19. 2650 Arbutus Road, Victoria, BC V8N 1W5

20. Faculty of Forestry,University of Toronto, 33 Willcocks, Toronto, ON M5S 3B3

21. Department of Biology, Carleton University, Ottawa, ON K1S 5B6

22. Department of Biology, University of Waterloo, Waterloo, ON N2L 3G1

23. Government of British Columbia, Ministry of Sustainable Resource Management, 845 Columbia Ave., Castlegar, BC V1N 1H3

24. Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2

25. Centre for Biodiversity and Conservation Biology, Royal Ontario Museum, 100 Queen's Park, Toronto, ON M5S 2C6

26. Athabasca University, Centre for Science, Athabasca, AB T9S 3A3

27. Department of Entomology, National Chung-Hsing University, Taichung, 402 Taiwan

28. Entomology Section, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007 U.S.A.

29. N.S. Department of Natural Resources, P.O. Box 130, Shubenacadie, NS B0N 2H0

30. Department of Biological Sciences, University of Alberta, Edmonton, AB T6G 2E9

31. Department of Natural Resource Sciences, McGill University, Macdonald Campus, 21,111 Lakeshore Road, Ste.Anne-de-Bellevue, QC H9X 3V9

32. Paluzzo Gioia Piazza Traniello, 8-Int. 26, 04024 Gaeta (LT), Italy

33. Department of Biology, St. Francis Xavier University, PO Box 5000 Antigonish, NS B2G 2W5

34. Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1

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 and Zoology, University of Toronto, 144 Hendon Avenue, Willowdale, ON M2M 1A7

37. Lethbridge Research Centre, Agriculture and Agri-Food Canada, PO Box 3000, Lethbridge, AB T1J 4B1

Index to Taxa (entry nos.)