

NEWSLETTER OF THE BIOLOGICAL SURVEY OF CANADA (TERRESTRIAL ARTHROPODS)

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General Information

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

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Queries, comments, and contributions to the Newsletter are welcomed by the editor. Deadline for material for the Spring 2002 issue is January 28, 2002.

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Editorial Notes

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

*This newsletter will also be available soon on the Survey's web site at:
<http://www.biology.ualberta.ca/esc.hp/bschome.htm>*

News and Notes

Brief on label data standards published

In response to concerns about the variable quality of the information on specimen labels and the difficulty in finding recommendations on issues such as paper quality and weight and print quality and size for labels, the Biological Survey has recently published a brief that addresses these issues.

The abstract from the brief reads as follows:

“The data associated with specimens and recorded on their labels are a permanent record of research that is as important as the specimens themselves. This brief provides recommendations on how to prepare data labels for collections of terrestrial arthropods. Given here are standards for label data, to ensure that the data associated with the collecting event are clearly presented and organized, as well as standards for label preparation, to ensure that the labels are clear, useful and permanent. Labels should provide accurate, unambiguous locality information that includes latitude and longitude. Specific recommendations are also provided on how to format information about the date, collector, collect-

ing method and habitat that should appear on labels, and about unique identifier codes if used. Guidelines for preparing computer-generated specimen labels are given, as well as recommendations on paper and printers for both dry (pinned) specimens and wet specimens (preserved in fluid). Label data should be in a format that maximizes the efficiency with which the data can be extracted into databases, data retrieval systems and geographic information systems.”

Paper copies of the brief are available from the Survey Secretariat (see address on inside front cover). The brief will also be available soon in electronic format on the Survey's web site at:

www.biology.ualberta.ca/esc.hp/bschome.htm.

[Wheeler, T.A., J.T. Huber and D.C. Currie. 2001. Label data standards for terrestrial arthropods. A brief prepared by the Biological Survey of Canada (Terrestrial Arthropods). Biological Survey of Canada (Terrestrial Arthropods) Document Series No. 8, ISBN 0-9689321-0-X. 20 pp.]

Field trip to the Onefour grasslands

The Agriculture and Agri-Food Canada substation at Onefour, Alberta was the scene of this summer's Survey-sponsored grassland arthropod collecting expedition.

Co-organized by Survey members Rob Roughley and Kevin Floate, a total of 16 entomologists and their families made the trek to Onefour from locations in Alberta, Manitoba, Ontario and North Dakota.

Upon arrival, participants spread out to search the surrounding short grass prairie, badlands and Milk River valley for arthropods using yellow pan traps, sweep nets, soil cores, black lights and even aquatic dip nets in the few places where water could be found.

Despite the dry conditions, everyone came away with something of interest. A complete summary of the trip will appear in the

2002 Grasslands newsletter (March) with a tentative list of arthropod identifications.

The Onefour expedition is the first in what is hoped will be an annual series of expeditions to promote the Survey's Grasslands Project. The primary goal of the Project is to coordinate research on the diversity, ecology and impacts of the arthropods of Canadian grasslands, with the long-term objective of publishing the results of this research in a series of book volumes.

Information on the Grasslands Project is posted on the Internet at: <http://www.biology.ualberta.ca/esc.hp/bsc/english/grasslands.htm>. See also Wheeler, T.A. 2001. Project update: Arthropods of Canadian Grasslands. Newsletter of the Biological Survey of Canada (Terrestrial Arthropods) 20(1): 14-15.

Summary of the meeting of the Scientific Committee for the Biological Survey of Canada (Terrestrial Arthropods), April 2001

The Scientific Committee met in Ottawa on April 26-27, 2001.

Scientific Projects

The various scientific projects of the Survey were discussed, including the following progress.

1. Grasslands

Dr. Floate explained that a letter had been sent out through Agriculture and Agri-Food Canada to a number of philanthropic foundations soliciting support for the grasslands project. To date most replies have been negative because the project does not fit the foundations' funding priorities. However this avenue continues to be pursued. The example of Ross Lake, subject of an article in the most recent grasslands newsletter, had highlighted the fact that insects may have been collected in various sites but this is not widely known. Dr. Floate requested that information on grasslands collections continue to be forwarded to the subcommittee.

Dr. Wheeler reported on the informal conference on arthropods of grasslands held at the joint meeting in December and outlined in the latest grasslands newsletter. The session included papers by Dr. Floate, Dr. Roughley, Dr. Hamilton and Dr. Wheeler, followed by an informal discussion. Useful input was received, e.g. about areas currently being sampled, especially from people outside the Biological Survey. A more formal symposium is planned for the 2002 ESC Annual meeting in Winnipeg, with a focus on ecology/habitat-based work. Speakers will be invited to contribute chapters to a volume of symposium proceedings. Some speakers have already committed to participating and others are being approached. Dr. Wheeler had submitted an article about residues from insect collecting for the recent grasslands newsletter. As more studies continue in grasslands large amounts of residues are being generated. These residues are potentially good sources of material but are often difficult to ac-

cess. In the article Dr. Wheeler proposed that a system be established to better track this material. He encouraged people to read the article and contact him with suggestions. Dr. Wheeler also reported on some completed work on grassland insects.

Dr. Roughley reminded the Committee about the announcement in the grasslands newsletter of the upcoming excursion to the Onefour area as a focus site for work associated with the grasslands project. He indicated that there are no restrictions as to the group of entomologists, but that all persons must register in advance. The Committee concluded that it would be useful to know ahead of time what participants are expecting to achieve, in terms of the type of taxa, type of sampling and type of terrain to be sampled.

2. Family keys

Dr. Scudder announced that he, Dr. Rob Cannings and Mr. Syd Cannings have received funding to complete keys to the families of insects in British Columbia over the next five years. The results will be posted on a web site as well as printed. Therefore, Dr. Scudder will be able to expand the B.C. key to produce the Canadian key to apterygotes and exopterygotes in about one year.

3. Seasonal adaptations

Dr. Danks reported on several papers, published or in press, on insect life cycles and cold hardiness. Dr. Danks had also given some lectures and seminars on seasonal adaptations (especially in a Canadian context) at Kochi and Osaka City Universities in Japan, including some discussions about diapause and related themes. He is now working on an invited lecture on diapause responses for the 4th European Workshop of Invertebrate Ecophysiology (St. Petersburg, September 2001). Specific cooperative work in Victoria is proceeding and some interesting results are already in hand.

4. *Insects of Keewatin and Mackenzie*

Dr. Currie reported that two accounts of the 2000 trip to the Horton River had been published in Survey newsletters during the year 2000. [*Newsletter of the Biological Survey of Canada (Terrestrial Arthropods)* 19(2): 48-51; *Arctic Insect News* No. 11: 6-9]. During 2001, a smaller trip is planned to Yellowknife and Wood Buffalo National Park, an area in between the Horton and the Thelon Rivers. An expedition to the Thelon River will proceed in 2002. Dr. Giberson reported that she has finished sorting the stoneflies collected from the Horton river, none of which are shredders.

Other scientific priorities

1. *Arthropod fauna of soils*

Dr. Behan-Pelletier reported on several relevant publications, meetings, publicity for soil mites, and recent research activities and expertise – see especially the Project update in this newsletter (p. 51).

2. *Invasions and reductions*

Dr. Scudder reminded the Committee that there had been a session on alien invaders at the national EMAN meeting in January 2001. A book resulting from this session is now in press. Dr. Footit and Dr. Scudder are pursuing research and publications on this topic.

Dr. Wheeler reported that at McGill University, the Redpath Museum has hired two biodiversity faculty this year, one of whom works on freshwater invasive species. Dr. Floate commented that many biological control researchers in the United States are currently worried because they deliberately introduce exotic species but no invasive species are being allowed, a trend that may involve Canada too.

Dr. Behan-Pelletier requested that any information on invasive species in soil, especially arthropods, be forwarded to her because she is considering the possibility of a symposium on this subject. Dr. Roughley commented that he has collected a number of unidentified centipedes from imported plants, a finding that also is valuable for teaching purposes.

Dr. Marshall encouraged everyone to continue to highlight the importance of insect collections in identifying invasive species. Members of the Committee provided relevant examples. Dr. Shorthouse thought that this sort of information about the value of collections should be forwarded to NSERC. He noted that less than 3% of shipments coming into Canada by sea are examined for potentially invasive species.

3. *Endangered species*

Dr. Scudder had spoken recently at the hearings of the parliamentary committee that is reviewing the endangered species legislation, a similar bill to the one that died last year on the order paper. There is an attempt to get the bill strengthened. Dr. Scudder reminded the Committee about the web site that enables scientists to sign in support of strengthened legislation [<http://www.scientists4species.org/>]. There are potential weaknesses of terminology and effectiveness in the bill, for example. The Atlantic Director of the Canadian Wildlife Service recently disbanded three endangered species recovery teams unilaterally without notice and Dr. Scudder had tabled letters at the hearings regarding this action.

Dr. Ring asked whether poor legislation is better than no legislation. Dr. Scudder speculated that the Act will not result in many benefits but that some corresponding actions may be beneficial. For example, the government has already allocated money towards stewardship programs. He thought that the real danger if the legislation is passed unchanged is that public perception may be that sufficient protection for endangered species is in place when it is not. Nevertheless, he thinks that this legislation will likely be passed without changes: none of the changes put forward in the last round were adopted. He said that the environmental groups and the NGO's are divided in their opinion as to the value of no legislation versus poor legislation. He had also heard opinions that there might never be any changes to the Act once it has passed, reinforcing the need to make improvements now. Moreover, there are no bio-

logical criteria that can be used to review the effectiveness of the legislation later.

Dr. Scudder reported that the University of British Columbia and the B.C. Ministry of Environment, Lands and Parks have just signed a memorandum of agreement to map richness and rarity hotspots for as many taxa as possible in British Columbia. Initial information shows that rarity hotspots for many different taxa overlap, and some of the richness hotspots also overlap the rarity hotspots. Dr. Scudder reminded the Committee that the B.C. Forest Practices Code requires that endangered wildlife, including insects, be identified and relevant areas managed.

4. *Survey web site*

Dr. Danks reported that some progress has been made. Additional elements of the site were not all posted or operational initially, and the personnel database and site-search features were added later, for example, although there is more to do.

In terms of feedback and usage, Dr. Danks reported that he has received several favourable comments from colleagues, and feedback from the site's email address. Members of the Committee added favourable additional comments about the appearance and content of the site. A site meter, which logs separate visits, was started in early October. To date it had recorded well over 2000 hits and over 2800 page views, and the number of hits seems to be increasing steadily.

Dr. Danks reported continuing problems with respect to posting new material and changes, because of the delays sometimes encountered by having to go through the ESC webmaster. The other major problem is the function of the database about relevant workers and their interests, which appear to stem partly from the original structure and operation of the database, not designed as a web-based system, and partly from hardware and software limitations in its current setting. Therefore, a new contract will be needed to refine or replace the software for web and other uses; substantial thought first has to go into ongoing needs and

other issues. Dr. Danks also outlined a number of pending updates.

5. *Faunal analysis*

Dr. Roughley reported that a list of number of species by family from *Canada and its insect fauna* and an introductory paragraph are now available to be added to the web site. There will be links on this list to any of the taxa that have updated numbers. Hopefully this posting will stimulate others to provide updated lists. The data will help to compare the change in knowledge over the years, as well as exposing gaps in knowledge.

Dr. Danks reminded the Committee that the original purpose of the project was to compile unassailable numbers about the diversity of insects and the lack of availability of expertise, in order to substantiate to politicians and others the need for increased numbers of systematists, for example. He asked if someone will take the lead in pursuing updates or would the Survey simply let the website speak for itself. Dr. Roughley volunteered to develop a plan in consultation with Dr. Scudder and Dr. Wheeler on how to take project further and to report at the next meeting.

6. *Standards for specimen data labels*

A draft copy of a brief on standards for specimen data labels had been circulated by Dr. Wheeler to Committee members. The Committee endorsed the brief, as useful for various purposes, and timely in view of increasing awareness of standards such as ISO 9000. The Committee agreed that the brief should be published as part of the Survey's document series, after some individual comments and suggestions from members.

7. *Voucher specimens*

Dr. Wheeler raised the issue of the lack of awareness of the importance of voucher specimens. The Biological Survey should make this message more widespread. For example all journals and NSERC applications should require that voucher specimens be deposited in recognized institutions (contrast the French

version of instructions in *The Canadian Entomologist*, for example).

Dr. Wheeler and Dr. Scudder volunteered to prepare a one-page document to emphasize the need for vouchers and circulate it to Committee members for comment before the October meeting. The Committee agreed that such a document could be published in the ESC Bulletin, sent to NSERC, and provided to organizations such as the Canadian Society of Zoologists and the Canadian Botanical Association, for example.

8. *Information on naturalist handbooks*

Dr. Marshall asserted that it is important to take advantage of the growing interest in biodiversity in the naturalist community. To that end he is developing a series of naturalist guides to Ontario insects. The first volume (Hemiptera) is almost complete and should be published this summer and other volumes are in progress. The books might then be expanded as a more technical product including keys, distributional information, and more species, that could be published by the Biological Survey, given the colour images readily available from the popular guides. The Committee recognized the value of such naturalists guides and praised the quality of the work. They discussed various aspects of this and possible future publications.

Given general agreement by the Committee that the suggestion is worthwhile, Dr. Marshall, Dr. Currie and Dr. Sperling agreed to consider how to best coordinate these sorts of publications and what should be the role of the Biological Survey. They would report at the October meeting.

9. *Arthropods and fire*

Dr. Scudder reported that a number of studies of arthropods are being made in fire sites. The site he is studying has not yet recovered from fire and might not do so for another 35 years. Dr. Roughley announced that his study on DND lands near Winnipeg is complete and the final report has been prepared. The extensive list of references is a useful source of information on grasslands and on fire and arthro-

pods. Dr. Roughley said that his data suggest that a full cycle in tall-grass prairie takes four to five years.

10. *Publication of systematic and faunistic papers*

The Committee discussed needs and possibilities for publishing the results of systematic and faunistic work in Canada. Dr. Wheeler thought that revitalizing the Lyman publication series might be feasible for publication of systematic, faunistic and natural history papers at a low cost to authors. Dr. Scudder had been asked to gauge interest in the community of starting a new Canadian NRC journal for systematics and taxonomy to accept submissions from a variety of disciplines, and to organize an appropriate letter to NRC from relevant societies.

The Lyman series might fill a niche in publishing longer monographs, theses, faunal inventories, descriptions of immature stages, biological notes, etc. that would not be published in *The Canadian Entomologist* or the proposed NRC journal, given the earlier demise of Canadian publications such as *Quaestiones entomologicae* and the ESC Memoirs.

The Committee endorsed both Dr. Scudder's journal proposal and the idea of a revitalized Lyman series.

11. *The cost of insect identifications*

Dr. Danks suggested that the Survey should prepare a short document pointing out and substantiating the time and expertise involved in identifying insects to various taxonomic levels, and hence the fair costs of the work. Such a document would serve not only as a point of reference for practical purposes but also would reinforce the fact that insect identifications require expertise, reference collections, time and so on. Although people could not necessarily charge the costs given in the proposed document, it would serve for consciousness-raising about the real costs. Others pointed out that such an effort would also encourage expert identifications, a big time and cost compo-

ment (including in-kind contributions) of biodiversity projects.

A subcommittee chaired by Dr. Behan-Pelletier volunteered to pursue the idea of a document about identification costs and to report at the next Committee meeting.

12. Monitoring of continuing priorities for work on Canadian faunas

Updated information on earlier or currently less active Survey projects was reviewed, including arthropods of peatlands, aquatic insects of freshwater wetlands, arthropod fauna of large rivers, arthropod ectoparasites of vertebrates, arthropods of the Yukon, arthropods of the Queen Charlotte Islands (Haida Gwaii), arthropods of special habitats, climatic change and agroecosystems.

Particular progress on the insects of Newfoundland was reported by Dr. Larson. For example, a draft key of the Newfoundland Hemiptera is available, and work is in progress on other orders. This project was reinstated as an active Survey priority.

13. NSERC reallocations exercise

Dr. Laurence Packer, a guest of the Committee, summarized the current reallocation process at NSERC, which is intended to redistribute a portion of the Research Grants budget among the various disciplines. He requested information he could use in preparing submissions about the biosystematics of terrestrial arthropods. The Committee discussed various possibilities at length and made some suggestions to Dr. Packer. Members of the Committee agreed to develop some of the suggestions further, and individual Committee members would submit further ideas to Dr. Packer.

14. Other priorities

The Committee also discussed other scientific priorities such as old-growth forests, damaged ecosystems, Survey publicity, and funding for biodiversity projects.

Liaison and exchange of information

1. Canadian Museum of Nature

Dr. Mark Graham, Director, Research Services, reported that the Global Biodiversity Information Facility (GBIF) has announced that Canada is one of its voting members. Canada's contribution to this new international organization is being organized by the Federal Biosystematics Partnership. GBIF's objective is to link up various national networks (see <http://www.gbif.org>).

The Canadian Museum of Nature is planning to open an educational exhibit on endangered plants in Canada in conjunction with the Royal Botanical Gardens, Hamilton. This travelling exhibit will open in Ottawa in about one year.

Dr. Graham also mentioned the NSERC post graduate supplement for systematics research, now in its third year; and a draft framework on collection care produced by the Natural Sciences and Engineering Research Council (NSERC) (see http://www.nserc.ca/programs/framework_mem_e.htm). In contrast to some wordings in the draft framework, some Committee members emphasized that regional collections are more valuable as separate regional units than if they are transferred to central repositories.

Dr. Graham also spoke about the Canadian Biodiversity Network Conference [and see below] which was held in early March with one focus on an electronic knowledge base to facilitate access to information that is not now easily accessible. Many organizations including the CMN took part in organizing the conference. A strategic planning group has been established to draft a plan for the next steps.

The CMN is developing its national collection development plan which will be ready for circulation and comment in about a month. This document will provide some context for what should come into the national collection given the limitations of finite space, large numbers of collections and the requirement to provide data electronically.

2. *Eastern Cereal and Oilseed Research Centre (ECORC)*

Dr. Bob Foottit announced that discussions have begun about restructuring the research branch of Agriculture and Agri-Food Canada. Decisions are expected this summer. There have been some preliminary discussions about national programs, placing less emphasis on a commodity-based structure. One such national program could be systematics. Plans for improving the collection facility are proceeding with a submission sent to Treasury Board. In the meantime smaller improvements are being made on a collection-by-collection basis. Approval has been received to hire a systematist in the next fiscal year, the first hiring for 10 years: discussions are underway as to which of the dozen taxa where there is a need will be covered.

Dr. Behan-Pelletier confirmed that AAFC has been the lead agency in getting Canada as a signatory to GBIF. Dr. Larson noted that the CNC was able to acquire the important John and Bert Carr beetle collection.

3. *The Canadian Biodiversity Network Conference*

Dr. Behan-Pelletier circulated the final list of participants at the Canadian Biodiversity Network Conference and noted the diversity of backgrounds of participants. She also noted that many of the speakers' presentations are available on the website [see http://www.nrc.ca/confserv/biodiversity/presentations_e.html]. Dr. Scudder identified two main issues stemming from the conference - bioinformatics databases and biodiversity science. A synthesis of ideas from the conference is being formulated. The final document with recommendations would likely take another year and a half to complete and might then take another 18 months to go through Treasury Board. The hope is to have the final document address all relevant aspects, such as training, chairs at universities, databasing, infrastructure, etc. However, it is unclear where the responsibility for biodiversity is in the federal system. Currently it spans a number of government departments and Dr. Scudder speculated

that some central department or system might be required to integrate it. Dr. Scudder thought that another important point is that Canada needs the equivalent of the U.S. National Science Foundation: an agency that will promote and fund research in biodiversity. Moreover, there is not yet enough provincial-federal cooperation. The provinces (except for Quebec and the Yukon) did not participate in the Conference even though they were invited.

Dr. Sperling commented that the importance of education was emphasized at the conference, including the gradual decline of systematists at universities, the importance of university collections for training and the importance of grassroots support and interest. Dr. Sperling emphasized the importance of drawing natural history groups into these biodiversity networks. He thought that the conference had been a useful exercise in consciousness building, and it is important to keep the initiative going. Lack of participation from the provincial level should change once a network is stabilized. The distributive nature of this initiative, i.e. the aim for a true collaborative network, is important. Members of the Committee commented that the meeting was encouraging from various other viewpoints, though it is still relatively early.

Dr. Graham recognized as positive signs the fact that two federal ministers gave introductory talks with significant comments, and the Assistant Deputy Ministers also spoke at the end of the conference.

4. *Entomological Society of Canada*

Dr. Foottit, President, Entomological Society of Canada, reported that the mid-term Governing Board meeting was held recently. The Society has a financial surplus now, in part as a consequence of the restructuring accomplished a few years ago. Some profit was realized from the Joint meeting and will be put into the ESC conference travel scholarship fund to assist students to travel to annual meetings. The Borden award for students of pest management has been established and a search for funding has begun. The current editor of *The Canadian Entomologist* has announced his intention to re-

sign effective January 2002. A search committee for a new editor has been formed. Dr. Footitt will be speaking with a number of people regarding the editorial philosophy and scope of the journal, which remains of excellent quality. The 2001 Annual Meeting will be held October 21 - 24 in Niagara Falls, Ontario. Dr. Footitt circulated a tentative program. He noted 3 workshops related to systematics: 1) Entomology in parks and protected spaces, 2) Bringing insects to the public, 3) New insect introductions. The 2002 meeting will be in Winnipeg, and planning for that meeting has begun.

A number of comments were made about the logistical and other difficulties of dealing with the large Entomological Society of America and especially the professional organizers of the Joint meeting (e.g. payments in Canada required in U.S. dollars; lack of recognition of ESC and SEQ partners). However, the science program was generally agreed to have been good.

5. *Parks Canada*

Dr. Stephen McCanny, Ecosystem Protection Biologist, Ecological Integrity Branch, Parks Canada reported that in February the Canada National Parks Act was proclaimed. Ecological integrity is given first priority in all aspects of parks management and planning. There is a definition of ecological integrity in the act; the act states that the parks should be managed to be characteristic of natural regions. Recently a document on the response to the panel on the ecological integrity of Canada's national parks was considered. Some recommendations have been acted upon, including having an ecologist sit on the Executive Board, having a charter to define the role of Parks Canada, training in ecological integrity for all staff, revised planning and marketing guidelines, and designating wilderness areas in some of the mountain parks. The next step will be to act on those things that require funding.

Two promises made by the government last fall included funding for new parks and for ecological integrity. Several recently established parks that require further inventory will be getting new funding. Treasury Board has ac-

cepted the idea that increased base funding is required to achieve ecological integrity and increased science capacity. A coordinated approach for environmental monitoring is planned with EMAN.

Dr. Roughley commented that knowledge of arthropod biodiversity is essential to ecological integrity and he would like to encourage a plan to facilitate insect work in parks. He added that parks are attractive to entomologists partly because of the long-term stability of these areas. Dr. McCanny indicated that there is a discussion of inventory programs in the new science strategy but that this would not likely receive substantial funding. Dr. Roughley and others pointed out that funding is not necessarily required initially; even increased access to national parks is critical and simple logistic support would be helpful. Dr. McCanny acknowledged that the permitting process has been a problem in the past. Dr. Danks summarized the two main problems perceived with the permitting process. First, the current guidelines are geared towards prohibiting removal of endangered birds, etc. but insect sampling is a different process. What has been collected needs to be sorted and identified, so that the sort of detail called for in the guidelines is impossible to provide. The other situation is that in the past this Committee has dealt with the headquarters of Parks Canada but in reality it is the individual parks personnel who make the permitting decisions.

Dr. Shorthouse reiterated the fact that the Biological Survey has been attempting to work with Parks for many years with few results. He asked Dr. McCanny what he thought the Survey could do to help facilitate invertebrate research in national parks. Dr. McCanny thought that there might be an opportunity in the development of Parks Canada's science strategy. It had been his impression that past requests involved funding or in-kind support which are not available. Members of the Committee emphasized that the greatest frustration has been inability to get permits, together with not knowing what to expect when dealing with individual parks. Dr. Marcogliese commented that he has had some success working with

Parks as a result of personal contacts. Dr. Danks volunteered to work with Dr. McCanny to try to initiate some more general discussions to inform Parks personnel about the value of arthropods and to start to work out some more feasible strategies. Dr. McCanny agreed that this would be useful, and perhaps language could be found that could be integrated with the science strategy.

6. *Parasitology module, Canadian Society of Zoologists*

Dr. Marcogliese explained that the parasitology module, which is not officially recognized or funded by the Canadian Museum of Nature, functions in somewhat the same way as the terrestrial arthropod module did in its early years. The parasitology module is trying to demonstrate its value and produce products. The current projects include protocols for monitoring parasites in biodiversity studies. The fish protocols have been published on the EMAN website, the bird protocol is completed and will be posted once it has been translated, the amphibian and reptile protocol is nearing completion. The other ongoing project is the national stickleback parasite survey which is now an IBOY project; 25 partners are currently involved worldwide. Dr. Marcogliese has applied for a grant for this work and is collaborating with some national parks. Dr. Marcogliese distributed copies of relevant articles, and provided information about scientific meetings and some more general issues.

Secretariat activities

Ongoing operations of the Biological Survey Secretariat were reviewed, including clearing-house and coordination roles, research and other items, and Dr. Danks travels to entomological centres on behalf of the Survey to exchange information about relevant work. In 2000 and early 2001, visits were made to Victoria and Kelowna, BC, Edmonton, AB, Winnipeg, MB, Guelph, ON and Montreal, QC. Seminars and lectures presented, in addition to more-or-less informal treatments of the Biological Survey, included: The Biological Survey of Canada (Terrestrial Arthropods); Insect cold

hardiness in northern Canada; Insects of the Yukon; Insect cold hardiness: a Canadian perspective; Arctic insects as indicators of environmental change; and Water balance in insects dormant for the winter.

Other items

1. Regional developments

Members of the Committee summarized information from different regions of the country. For example, in British Columbia, Dr. Scudder announced that the Butterflies of B.C. has been published. A Memorandum of Agreement has been signed with the Department of Environment, Lands and Parks to do a richness and rarity hot spot analysis for the province. Dr. Scudder and Dr. Footitt continue to work on the aphids of British Columbia. The mirids of the Pacific Northwest should be finished this year. Significant areas have been protected as a result of the data on endangered species, for example grassland areas in the Okanagan. The B.C. government put aside large areas of Chilcotin as well. Approximately 13% of land in B.C. has now been put aside as protected areas, although the use of these lands includes recreation and therefore may not help biodiversity. Dr. Scudder is finishing a handbook of the pentatomids of Canada. Finally, he is trying to finish his work on the lygaeids of the world. Dr. Ring reported that Dr. Robert Duncan has received a grant to publish an identification and information guide on conifer-defoliating insects of B.C. The proceedings from the species at risk conference held in Kamloops a couple of years ago have been published including a treatment of rare and endangered invertebrates in B.C. Dr. Robb Bennett has moved to the B.C. Ministry of Environment, Lands and Parks in the temporary position of Endangered Invertebrate Specialist. One of his mandates is to establish the Garry Oak Ecosystems Recovery Team. Dr. Rob Cannings continues his project on dragonflies in northern B.C. The annual invertebrate symposium at the University of Victoria included 4-5 papers from entomologists. Universities in British Columbia face a 3% decline in budget this year.

For the prairies, Dr. Floate reported that the expansion of the Lethbridge Research Centre continues and that the new offices and laboratories should be ready by September 2002. Dr. Roughley reported that much research on forests continues in Manitoba especially through the University of Winnipeg's new forest centre headed by Dr. Richard Westwood. Dr. John Conroy's former position at the University of Winnipeg is to be filled by an entomologist. Dr. Pat Mackay will retire from the University of Manitoba this year and an ecological insect physiologist will be recruited as a replacement. The University of Manitoba will experience its first budget increase in 20 years. Dr. Roughley reported that the Prairie Conservation and Endangered Species conference was held in Winnipeg in late February. He was surprised at the amount of prairie work being done and at the novel approaches being taken. Dr. Behan-Pelletier reported that the late Dr. Conroy's mite collections have been transferred from the University of Winnipeg to the Canadian National Collection. Dr. Sperling reported that the cabinet and drawer capacity of the Strickland Museum at the University of Alberta is increasing by 40%. There also will be an increase in computer disk space. A virtual museum is being built, comprising specimen data bases, species pages and applications (see www.biology.ualberta.ca/uasm/uasm.html). Dr. John Spence has accepted a position as the chair of the Department of Renewable Resources at the University of Alberta but will continue his research. Dr. Bev Mitchell and Dr. Ron Gooding will retire soon and will be replaced. The University of Alberta library, through the generosity of an alumnus, has an endowment fund for which the highest priority purchases will be systematic entomology monographs. Dr. Sperling announced the formation of the Alberta Lepidopterists Guild which has about 36 members, half of whom are very active. Dr. Sperling outlined other liaisons and activities, concluding that there are interesting and positive developments at the University of Alberta.

In Ontario, Dr. Currie reported that the master planning process continues at the Royal

Ontario Museum. Databasing of the butterfly collection is now complete and the information has been transferred for inclusion with the Biota of Canada project. Databasing of the dragonflies should be done by the end of the year. Work on Walpole Island and in the Haliburton forest as well as on odontocerids are planned. Publication of the book on Black flies of North America (including 1300 illustrations) is scheduled for 2002. Dr. Marshall reported that a student at the University of Guelph will study tall-grass prairie sites in southern Ontario. Work from Point Pelee and the Bruce Peninsula is being reported on. The University of Guelph is preparing a CFI proposal to establish a biodiversity centre. Dr. Paul Sibley, an aquatic entomologist, has been added to the faculty. The website for the University of Guelph includes the insect collection (<http://www.uoguelph.ca/~samarsha/>). Dr. Shorthouse noted student work at Laurentian University on parasitoids of rose gall wasps and on changes of Ontario species diversity with latitude.

In Quebec, Dr. Wheeler announced that the curatorial position at the Lyman Museum of McGill University has been filled by Ms. Stephanie Boucher. The herbarium and the Lyman Museum have received a grant to contribute to databasing material. Some students have finished but others will be starting. Parts of the Leon Provancher collection have been recognized by the Quebec government as a biological heritage collection. There has also been some public recognition of the value of biodiversity collections for documenting Quebec's cultural past. The Insectarium wishes to expand its research focus, and some joint initiatives with the Lyman are being explored. The Entomological Collections Network meeting was held just prior to the joint ESC/SEQ/ESA meeting in Montreal in December 2000. Dr. Chiasson mentioned that in the Innovateur à l'école program (where scientists go to public schools to talk about what they do) the two most popular subjects are astronomy and entomology. The 5^e Conférence Internationale Francophone d'Entomologie (CIFE) will be held in Montreal in July 2002 [contact Dr. Dan-

iel Coderre]. The 2001 SEQ meeting will be held November 8-9 with the theme of "Entomology and sustainable agriculture: towards an integrated production of fruit and vegetables". Dr. Daniel Coderre has been selected as the Dean of the faculty of science at the Université du Québec à Montréal. Dr. Daphne Fairbairn is leaving Concordia University to go to southern California (with Dr. Derek Roff, McGill University).

For Newfoundland and the Maritimes Dr. Larson reported that in Newfoundland much of the provincial civil service is being decentralized, including most of the natural resources related departments. As a result there have been massive resignations. Work on insects in endangered dune ecosystems will be proceed if the relevant person chooses to continue in her position. A study last summer showed that "bug zappers" are not effective and could even be considered an environmental menace by killing non-target insects. A survey in the Guelph of St. Lawrence showed the wide use by fish fry of insects in surface drift. Dr. Giberson reported that Health Canada is taking the threat of West Nile virus very seriously. The strategy this summer will be to monitor for dead crows potentially killed by the virus. The issue is leading to a number of large-scale mosquito surveys in Nova Scotia and New Brunswick. Dr. Giberson's studies in national parks continue. The annual meeting of the Acadian Entomological Society will be held at the University of Prince Edward Island, August 23-24, 2001. Dr. Trefor Reynoldson, an aquatic entomologist, has been seconded from Environment Canada (Burlington) to Acadia University and will be studying the aquatic insects of major rivers.

For the Arctic, Dr. Ring announced that he will not be going to the arctic this year because logistic support from the Polar Shelf Continental Project in the western arctic is not available and the centre at Tuktoyaktuk is closed. He has seen no tangible benefits yet resulting from the report of the national task force on northern research and he contrasted this situation with the role of the Norwegian Polar Institute that has provided considerable funding for research.

Dr. Ring cited some figures from the financial statement in the annual report of the Canadian Polar Commission, showing that half of the annual budget of \$956,000 is allocated for salaries and benefits of staff and the remainder for such things as professional services, travel, accommodation, honoraria for board members and overhead costs, but none for research. However, NSERC has announced some new northern research chairs. Available positions in the arctic recently advertised are supported by U.S. rather than Canadian funding. Dr. Sperlberg noted that Dr. James Kruse, a systematic Lepidopterist, recently started a three-year position as curator of entomology at the University of Alaska, Fairbanks.

2. *Other matters*

The Committee also considered recent Survey publications, notably the Survey, arctic and grasslands newsletters, the annual report to the Canadian Museum of Nature, liaisons with organizations outside Canada, and information on relevant publications and meetings. The Annual General Meeting of the Biological Survey Foundation took place.

Survey Office Disruption

Some events in July at the Canadian Museum of Nature (where the Survey Secretariat is housed) may have made communicating with us more difficult. A move of the Survey office within our building changed the fax number to 613-364-4022 as of July 16. Shortly after the move, the CMN's computer network was hit by a virus forcing email service to be shut down for several days. We apologize for any communications that may have been lost during this period.

Second spider newsletter published

The second volume of the *Canadian Arachnologist* was published in May 2001. This volume continues profiling Canadian arachnologists. As well the issue contains a note about "The case of the missing pedipalps in *Cybaeopsis euopla*", a progress report on the Canadian spider database project, an announcement of the impending publication of "Contributions à la connaissance des Araignées (Arachnida, Araneae) d'Amérique du Nord", a report from the 15th International Congress of Arachnology and other useful information.

Production of the first two newsletters was supported by the Biological Survey of Canada. Suggestions for a long-term source of funding are welcomed by the editors (David Shorthouse: dps1@ualberta.ca and Chris Buddle: c_buddle@yahoo.ca).

To subscribe to the newsletter or read the electronic version visit: <http://members.tripod.com/davidshorthouse/arachnologist/arachnologist.html>

Canadian Biodiversity Network

Since the Canadian Biodiversity Network Conference was held last March (as reported in the Spring issue of this newsletter) activities and developments have continued. For example, work continues on devising a National Biodiversity Knowledge Network Strategic Plan, the text of the speakers' presentations were posted on the web and a document with ideas and recommendations from the biodiversity conference workshop was released in July. The federal government is continuing to support a two-person secretariat. In the immediate future, work will continue on putting together an approach to seek funding and support for the Network.

For further information about these initiatives please contact Dr. Peter Hall, Executive Director and Chair, Biodiversity Knowledge and Innovation Network Initiative, tel. 613-759-7761; hallp@em.agr.ca
<http://www.nrc.ca/confserv/biodiversity/>

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Project Update: Arthropod Fauna of Soils 2001

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"We know more about the movement of celestial bodies than about the soil underfoot."

Leonardo Da Vinci, circa 1500's

Soils, wherever they are found, are recognized as habitats for much of the biosphere's undescribed diversity; they make up an environment where, even in North America, only about 50% of species are described as adults (Behan-Pelletier and Bissett 1992). The Biological Survey has long recognized the importance of soil fauna as essential for maintaining the fertility of Canada's soils. It regularly comments on relevant developments on soil arthropods, e.g., Behan-Pelletier (1995), although it does not have an active project because of the limited taxonomic resources in Canada. Also,

the Survey strongly encourages inclusion of soil arthropods in its Projects, such as the Grassland Project (<http://www.biology.ualberta.ca/esc.hp/bsc/english/grasslands.htm>) and Insects of the Yukon (Danks and Downes 1997). The Survey first outlined the status and research needs for Canadian soil arthropods in a brief (Marshall et al. 1982), a document as relevant today as then. Subsequently, it helped sponsor a conference on faunal influences on soil structure (Spence 1986), and ensured contributions on soil arthropods in publications associated with the Survey, e.g., Ball and Danks (1993) and Finnamore and Marshall (1994). The following update is not intended to be exhaustive. Rather, it attempts to highlight some recent developments.



Gozmanyina majesta (Marshall and Reeves), an inhabitant of soil and litter in mixed deciduous-coniferous forests of northeastern North America.

Since the publication of "Life in the Soil" (Freckman 1994) there has been considerable focus on soil biodiversity in general in North America, and more specifically on documenting the role of soil biodiversity in ecosystem function. Various workshops from the SCOPE Committee on Soils and Sediments have deepened awareness of fundamental similarities in biodiversity between terrestrial soils and the sediments of freshwater and marine environments (Brussard et al. 1997, Wall Freckman et al. 1997, Wall 1999). SCOPE workshops have addressed questions such as the impact of soil biodiversity on plant productivity (SCOPE 2001), have recognized that soils are critical transition zones (Bardgett et al. 2001), and have addressed possible effects of global change on soil biota (Young et al. 1998). Concurrent with SCOPE initiatives on soil biodiversity, the EMAN program of Environment Canada (Finnamore et al. 1998) and various Canadian and international biodiversity assessments, such as the SAGE Grassland Project (Finnamore 1996), and the ALAS Project in Costa Rica (have helped to formalize sampling methodologies for this biodiversity. In addition, this year FAO has developed a soil biodiversity internet portal (<http://www.fao.org/landandwater/agll/soilbiod/biodport.htm>) with the overall aim of promoting "a more ecological approach in agricultural systems and the integrated management of land resources with a view to enhancing agricultural productivity and agro-ecosystem sustainability".

In parallel with this surge in interest in soil biodiversity in North America, forest canopies, with their suspended soil habitats, have gained recognition as one of the last biotic frontiers (Winchester 1997; International Canopy Network (ICAN: <http://192.211.16.13/individuals/nadkarnn/main/info.htm>)). Canopies include a range of soil and litter microhabitats almost homologous to those on the forest floor. These microhabitats, collectively called 'canopy organic matter' host diverse assemblages of soil arthropods that can be distinct from and can rival in richness those on the forest floor (Behan-Pelletier and Walter 2000; Winchester 1997).

But have these and other initiatives increased taxonomic information AND awareness about soil biodiversity, especially for hyperdiverse taxa such as the arthropods? I think the answer is a qualified Yes. Granted, the "important deficiencies related to soil arthropods" outlined in Marshall et al. (1982) and reiterated by Behan-Pelletier (1993a) have not been addressed, but soil arthropod biodiversity is no longer ignored in meaningful ecosystem analyses.

Central to this change is that the taxonomic inadequacies are more widely appreciated, as a result of Kosztarab and Schaefer's (1990) analysis of status and needs for North American insect and arachnid systematics, subsequent analyses of specific groups, e.g., Bennett (1999), and the Soil Biology Guide (Dindal 1990) which includes keys to most of the major microbial and invertebrate inhabitants of North American soils. We know that Acari, Diptera and Coleoptera comprise over 75% of the arthropod species richness in most North American soils, but that these groups have only about 15%, 68% and 87% of adults identifiable to species, respectively (Behan-Pelletier and Bissett 1992). Furthermore, the immature stages of only 5-10% of species are described, even though these stages are typically the most metabolically active and long-lived in the soil. The few taxonomic experts available are trying to address these inadequacies by developing standard keys, and by using the internet to make data more available. An excellent example is the Checklist of the Collembola (Janssens 2001), the Collembola Key2000 Project (Janssens 2001) and the list of Collembola literature). But the taxonomic impediment remains, and ultimately, taxonomic deficiencies can only be solved by taxonomic expertise. In the meantime these deficiencies are being addressed in a number of ways outlined below:

- Focus on arthropod groups (or a subset thereof) for which there are comprehensive keys and/or expertise available. This is the approach advocated in biodiversity assessments, or environmental monitoring where resources are limited (Marshall et al. 1994;

Danks and Winchester 2000). Of necessity this approach is limited to macroarthropods, especially Araneae, Diplopoda and families of Coleoptera and Diptera (Paquin and Coderre 1997a,b; Bennett 1999; Carcamo et al. 2000; Scudder 2000). As examples, ground beetles and spiders are among the focus groups of the EMEND Project (Ecosystem Management by Emulating Natural Disturbance) in Alberta forests (<http://www.biology.ualberta.ca/emend/index.htm>), and of studies of the INCO mine tailings, Sudbury (Shorthouse and Bagatto 1995). A limitation is that these groups are primarily litter dwellers, and are rarely found in quantity in many soil microhabitats.

- Taxa are sorted to family, genus and to species or morphospecies and assigned an identifying number (e.g. Oppiidae: *Oppia* sp. 1). This approach is used in most studies assessing microarthropods (Acari and Collembola). It requires some taxonomic knowledge of the focus group, usually enhanced by participation in a concentrated course, e.g., The Ohio State University Summer Program in Acarology (<http://www.biosci.ohio-state.edu/~acarolog/sum2k1.htm>), or the participation of a competent systematist to sort the taxa. Granted this approach is limited, as it prevents extraction of information on species biology from the literature, and limits comparisons with other studies unless the specimens from the other study have been similarly treated by the same systematist. However, it is the approach used in a number of studies on soil arthropods, such as those of Newfoundland forests (Dwyer et al. 1997, 1998), INCO mine tailings (St. John et al. 2001), and ongoing studies on soil biodiversity in rangeland (J. Clapperton pers. comm.).
- Taxa are sorted as above and in addition to specimen vouchers, digital vouchers are prepared for internet availability, usually linked to a biodiversity assessment database such as BIOTA (Colwell 1997). These images can in turn be compared with an online database of images and information. This approach is already used by the BIOTRacker (http://biotrack.mq.edu.au/staf_f.htm) service in Australia, and digital vouchers of

microarthropods (with specimen voucher backup) will form the main output for GLIDE (the Global Litter Invertebrate Decomposition Experiment:

<http://www.nrel.colostate.edu/projects/glide/>), which includes sites in Canada, and is a core project of the International Biodiversity Observation Year (<http://www.nrel.colostate.edu/IBOY/>).

One or all of these approaches have been used in biodiversity and faunistic studies on soil arthropods in Canada, and have contributed qualitatively and quantitatively to our knowledge of this fauna. As an example, the diversity of studies on Canadian soil arthropods published since 1993 is illustrated for 2 groups, the Acari and Collembola, in Table 1.

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Table 1: Recent knowledge on systematics, distribution and ecology of Acari and Collembola in Canada (based on additions to the literature since Behan-Pelletier 1993a).

COLLEMBOLA	
TAXONOMY	New species BC (Fjellberg 1992); Diagnoses for species from sugar maple (Therrien et al. 1999)
CHOROLOGY	Sugar maple forest (Chagnon et al. 2000a); Douglas fir BC (Addison et al. 1998); Western hemlock BC (Fons & Klinka 1998); west coast forests (Battigelli et al. 1994); Balsam fir NF (Puvanendran et al. 1997)
ECOLOGY	<p>Environmental impact: <i>Experimental liming</i> (Chagnon et al. 2001), <i>Agriculture</i> (Neave & Fox 1998; Fox 1998; Fox et al. 1999; Tomlin et al. 1995); <i>Phytopharmaceuticals</i> (Cortet & Poinso-Balaguer 2000); <i>Earthworms</i> (McLean 1998); <i>Bacillus thuringiensis</i> (Addison 1993; Addison & Holmes 1995); <i>Insecticides</i> (Addison 1996a); <i>Harvesting</i> (Addison 1996b)</p> <p>Succession in tree stumps (Setälä et al. 1995)</p> <p>Feeding habits (Klironomos et al. 1992)</p> <p>Interactions with plants (Klironomos & Hart 2001)</p> <p>Interactions in soil (Setälä et al. 1996; Kaneko et al. 1998; Chagnon et al. 2000b)</p> <p>Interactions with mycorrhiza (Klironomos & Kendrick 1995; Klironomos & Ursic 1998; Klironomos & Moutoglis 1999)</p> <p>Trophic abundance (Ferguson 2001)</p>
ACARI	
TAXONOMY	Key to families and genera (Balogh & Balogh 1992; Niedbala 1992; Colloff 1993; Dindal 1990; Behan-Pelletier 1993b, 1994, 2000, Behan-Pelletier et al. 2001; Reeves & Behan-Pelletier 1998; Smiley 1992; Zacharda 1997)
CHOROLOGY	Mixedwood Plains Ecozone (Smith et al. 1996); Montane Cordillera Ecozone (Smith et al. 1999); Peatlands (Behan-Pelletier & Bissett 1994); Yukon (Behan-Pelletier 1997); Conifer canopies, BC (Fagan & Winchester 1999; Winchester 1997; Behan-Pelletier & Winchester 1998; Winchester et al. 2000); Douglas fir BC (Addison et al. 1998); Western hemlock BC (Fons & Klinka 1998); west coast forests (Battigelli et al. 1994); British Columbia (Scudder 1994); Balsam fir NF (Dwyer et al. 1997, 1998)
ECOLOGY	<p>Environmental impact: <i>Compression</i> (Kevan et al. 1995); <i>Agriculture</i> (Neave & Fox 1998; Fox 1998; Fox et al. 1999; Tomlin et al. 1995); <i>Phytopharmaceuticals</i> (Cortet & Poinso-Balaguer 2000); <i>Earthworms</i> (McLean 1998); <i>Bacillus thuringiensis</i> (Addison 1993); <i>Insecticides</i> (Addison 1996a); <i>Harvesting</i> (Addison 1996b)</p> <p>Interactions in soil (Setälä et al. 1996; Maraun et al. 1998; Kaneko et al. 1998)</p> <p>Interactions with mycorrhiza (Klironomos & Kendrick 1995)</p> <p>Trophic abundance (Ferguson 2001)</p>

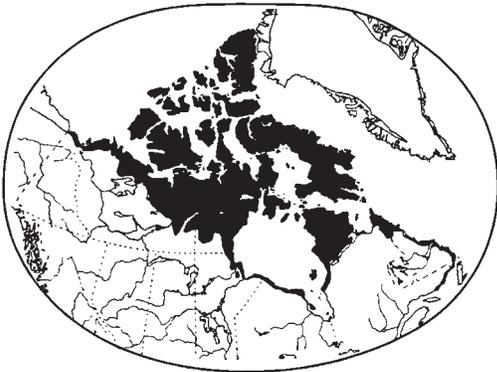
The Quiz Page

— test your knowledge of Canada and its fauna —

1. What feature of entomological relevance do the following sites have in common:
Cape Thompson, Alaska
Clyde Inlet, Baffin Island, Nunavut
Fort McPherson, N.W.T.
Hazen Camp, Ellesmere Island, Nunavut
Isachsen, Ellef Ringnes Island, Nunavut
Ross River, Yukon Territory
Summit Lake, Alaska
Umiat, Alaska
2. Name the developmental stages of typical mites (cf. the sequence of egg, larva, pupa, adult for endopterygote insects).
3. Name four microhabitats in Canada that can have populations of a single insect species in excess of 100,000 individuals per m².
4. Give the names of ten families of Diptera that occur in Canada and begin with the letter C.
5. What is the normal Canadian host of the following parasitic arthropods?
 - a) The fly *Hypoderma tarandi*?
 - b) The flea *Megabothris groenlandicus*
 - c) The tick *Dermacentor albipictus*
 - d) The chewing louse *Strigiphilus ceblebrachys*
 - e) The sucking louse *Echinopthirus horridus*.

[Answers on p. 66]

Correction: The elevation of Calgary given in the answer to Question 1 in the last Quiz Page should have read 1045 meters above mean sea level. Information for various weather stations was used as a source, with an incorrect elevation for that city.



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). As if to validate the decision to discontinue that separate newsletter, contributions about Canadian arctic entomology for *Arctic Corner* have been hard to come by. Such contributions of course are always welcomed by the Editor (see inside front cover).

University of the Arctic Launched

After four years of planning by northern institutions in eight arctic states, the Official launch of the University of the Arctic took place June 12, in Rovaniemi, Finland. This marks the beginning of UArctic's formal governance structure and its initial slate of academic programming. Elements of UArctic's core education programs, the Bachelor of Circumpolar Studies, The Arctic Learning Environment, and the Circumpolar Mobility Program will be piloted in the upcoming academic year.

The University of the Arctic (UArctic) is an independent, international initiative – a co-operating network of universities, collections and other organizations concerned with higher education and research. Canadian members of UArctic include the Arctic Athabaskan Council, the Association of Canadian Universities for Northern Studies (ACUNS), Athabasca University, the University of Northern B.C. and Yukon College.

Contact information:

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Encyclopedia of the Arctic

The *Encyclopedia of the Arctic* is planned for publication in the spring of 2003. The two large-format volumes, edited by Mark Nuttall of the University of Aberdeen and published by Fitzroy Dearborn, will contain 1200 entries on a diverse range of factors influencing the Arctic including entries on insects, insect larvae and mosquitoes.

Further information on the project can be found at <http://www.fitzroydearborn.com/london/arctic.htm>

Recent Canadian publications:

Brodo, F. 2000. The insects, mites, and spiders of Hot Weather Creek, Ellesmere Island, Nunavut. pp. 145-173 in M. Garneau and B.T. Alt (Eds.), Environmental response to climate change in the Canadian High Arctic. Geological Survey of Canada, Bulletin 529. 401 pp.

Danks, H.V. 2000. Insect cold hardiness: A Canadian perspective. *CryoLetters* 21: 297-308.



Selected Publications Associated with the Biological Survey

Arthropod ectoparasites of vertebrates in Canada. A brief	1991. T.D. Galloway and H.V. Danks. <i>Bull. ent. Soc. Can.</i> 23(1), Suppl. 11 pp.	Free of charge on request from the Survey; full text at http://www.biology.ualberta.ca/esc.hp/bsc/briefs/brarthro.htm
Arthropods of springs, with particular reference to Canada	1991. D.D. Williams and H.V. Danks (Eds.). <i>Mem. ent. Soc. Can.</i> 155. 217 pp.	\$21 (includes shipping) from Entomological Society of Canada*
The importance of research collections of terrestrial arthropods. A brief	1991. G.B. Wiggins <i>et al.</i> <i>Bull. ent. Soc. Can.</i> 23(2), Suppl. 16 p.	Free of charge on request from the Survey; full text at http://www.biology.ualberta.ca/esc.hp/bsc/briefs/brimportance.htm
Winter habitats and ecological adaptations for winter survival	1991. H.V. Danks. pp. 231-259 in R.E. Lee and D.L. Denlinger (Eds.), <i>Insects at Low Temperature</i> . Chapman and Hall, New York. 513 pp.	Book available through booksellers
Life cycle pathways and the analysis of complex life cycles in insects	1991. H.V. Danks. <i>Can. Ent.</i> 123(1-2): 23-40.	Copies available on request from author
Museum collections: fundamental values and modern problems	1991. H.V. Danks. <i>Collection Forum</i> 7(2): 95-111.	Reprints available on request from author
Long life cycles in insects	1992. H.V. Danks. <i>Can. Ent.</i> 124(1): 167-187.	Reprints available on request from author
Biodiversity and insect collections	1992. S.A. Marshall. <i>Canadian Biodiversity</i> 2(2): 16-22.	Available from author
Arctic insects as indicators of environmental change	1992. H.V. Danks. <i>Arctic</i> 45(2): 159-166.	Reprints available on request from author

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| Biodiversity of nearctic soil arthropods | 1992. V.M. Behan-Pelletier and B. Bissett. <i>Canadian Biodiversity</i> 2(3): 5-14. | Available from author |
| The biodiversity crisis, a national initiative: the Biological Survey of Canada (Terrestrial Arthropods) | 1993. H.V. Danks. <i>Association of Systematics Collections Newsletter</i> 21(2): 17-23. | |
| Systematics and entomology: diversity, distribution, adaptation and application | 1993. G.E. Ball and H.V. Danks (Eds.). <i>Mem. ent. Soc. Can.</i> 165. 272 pp. | \$25 (includes shipping) from Entomological Society of Canada |
| Environmental lip-synching in Canada | 1993. G.E. Ball. <i>Alternatives</i> 20(1): 21. | |
| Seasonal adaptations in insects from the high arctic | 1993. H.V. Danks. pp. 54-66 in M. Takeda and S. Tanaka (Eds.), [Seasonal adaptation and diapause in insects]. Bun-ichi-Sogo Publ., Ltd., Tokyo. (In Japanese). | Copies of English version available on request from author |
| La diversité des espèces d'insectes du Québec, vues dans une perspective nord-américaine | 1994. H.V. Danks. <i>Revue d'entomologie du Québec</i> 37 [1992]: 46-51. | Tirés-à-part disponibles sur demande. |
| Regional diversity of insects in North America | 1994. H.V. Danks. <i>American Entomologist</i> 40(1): 50-55. | Reprints available on request from author |
| Terrestrial arthropod biodiversity: planning a study and recommended sampling techniques. A brief | 1994. S.A. Marshall, R.S. Anderson, R.E. Roughley, V. Behan-Pelletier and H.V. Danks. <i>Bull. ent. Soc. Can.</i> 26(1), Suppl. 33 pp. | Copies available on request from the Survey; full text at http://www.biology.ualberta.ca/esc.hp/bsc/briefs/brterrestrial.htm |
| Terrestrial arthropods of peatlands, with particular reference to Canada | 1994. A.T. Finnermore and S.A. Marshall (Eds.). <i>Mem. ent. Soc. Can.</i> 169. 289 pp. | \$32 (includes shipping) from Entomological Society of Canada* |
| Insect Life-cycle Polymorphism: Theory, Evolution and Ecological Consequences for Seasonality and Diapause Control | 1994. H.V. Danks (Ed.). Series Entomologica 52. Kluwer Academic Publishers, Dordrecht, Netherlands. 376 pp. | \$195 U.S. Available from Kluwer Academic Publ. Group, P.O. Box 358, Accord Station, Hingham, MS 02018-0358 |

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| Insect cold-hardiness: insights from the Arctic. | 1994. H.V. Danks, O. Kukul and R.A. Ring. <i>Arctic</i> 47(4): 391-404. | Reprints available on request from author |
| Regional diversity of insects in the Pacific Northwest | 1995. H.V. Danks. <i>J. ent. Soc. Br. Columb.</i> 92: 57-71. | Reprints available on request from author |
| The advantages of using arthropods in ecosystem management. A brief from the Biological Survey of Canada (Terrestrial Arthropods) | 1996. A.T. Finnamore. 11 pp. | Limited number of copies available upon request from the Survey; full text at: http://www.biology.ualberta.ca/esc.hp/bsc/briefs/bradvantages.htm |
| The SAGE Project. A workshop report on terrestrial arthropod sampling protocols for graminoid ecosystems | 1996. A.T. Finnamore (Ed.) | Available on the Internet at http://www.cciw.ca/eman-temple/reports/publications/sage/intro.html |
| How to assess insect biodiversity without wasting your time. A brief. | 1996. H.V. Danks. Biological Survey of Canada Document Series No. 5. 20 pp. | Copies available on request (Abridged version in <i>Global Biodiversity</i> (1997) (version française dans <i>La biodiversité mondiale</i> (1997)) |
| The wider integration of studies on insect cold-hardiness | 1996. H.V. Danks. <i>European Journal of Entomology</i> 93(3): 383-403. | Reprints available on request from author |
| Annotated List of Workers on Systematics and Faunistics of Canadian Insects and Certain Related Groups | 1997. H.V. Danks and S. Goods. Third edition, 1996. Biological Survey of Canada Document series No. 6. 119 pp. | Free of charge on request from the Survey |
| Insects of the Yukon | 1997. H.V. Danks and J.A. Downes (Eds.). Biological Survey of Canada (Terrestrial Arthropods), Ottawa. 1034 pp. | \$95 (includes shipping) from Entomological Society of Canada* |
| Arctic Insect News | 2000. H.V. Danks (Ed.). No. 11. 31 pp. | Free of charge on request (Annual issues 1-10 also available) |
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La dormance et les cycles biologiques	1999. H.V. Danks. <i>Antennae</i> 6(2): 5-8.	See: http://www.seq.qc.ca
Life cycles in polar arthropods – flexible or programmed?	1999. H.V. Danks. <i>European Journal of Entomology</i> 96(2): 83-102.	Reprints available on request
The diversity and evolution of insect life cycles	1999. H.V. Danks. <i>Entomological Science</i> 2 (4): 651-660.	Reprints available on request from author
Dehydration in dormant insects	2000. H.V. Danks. <i>Journal of Insect Physiology</i> 46(6): 837-852	Reprints available on request from author
Terrestrial arthropod biodiversity projects - building a factual foundation. A brief from the Biological Survey of Canada (Terrestrial Arthropods).	2000. H.V. Danks and N.N. Winchester. Biological Survey of Canada Document Series No. 7. 38 pp.	Copies available on request from the Survey; full text at http://www.biology.ualberta.ca/esc.hp/bsc/briefs/brbioprojects.htm
Insect cold hardiness: A Canadian perspective	2000. H.V. Danks. <i>CryoLetters</i> 21: 297-308	Reprints available on request from author
Measuring and reporting life-cycle duration in insects and arachnids	2000. Danks, H.V. <i>European Journal of Entomology</i> 97(3): 285-303	Reprints available on request from author
Newsletter, Arthropods of Canadian Grasslands	2001. Danks, H.V. (Ed.). No. 7. 31 pp.	Free of charge on request or see http://www.biology.ualberta.ca/esc.hp/bsc/english/newsletters.htm#grasslands
Label data standards for terrestrial arthropods. A brief prepared by the Biological Survey of Canada (Terrestrial Arthropods)	2001. T.A. Wheeler, J.T. Huber and D.C. Currie. Biological Survey of Canada Document Series No. 8. 20 pp.	Copies available on request from the Survey

*To order publications from the Entomological Society of Canada contact the Society at 393 Winston Ave. Ottawa, Ontario K2A 1Y8; tel.: 613-725-2619, fax: 613-725-9349; email: entsoc.can@sympatico.ca [Orders from Canada pay the above-noted price in Canadian dollars; orders from other countries pay the above-noted price in U.S. dollars. Add 7% GST on all orders for Canada.]

Selected Future Conferences

Organization	Date	Place	Contact
Entomological Conferences			
Entomological Society of Canada	2001 , 21-24 Oct.	Niagara Falls, ON	(with the Entomological Society of Ontario) Dr. Cynthia Scott-Dupree, Dept. of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1 csdupree@evb.uoguelph.ca
	2002	Winnipeg, MB	(with the Entomological Society of Manitoba) Robert Lamb, Scientific Program Chair, rlamb@em.agr.ca
Entomological Society of America	2001 , 9-12 Dec.	San Diego, CA	ESA, 9301 Annapolis Rd., Lanham, MD 20706-3115; meet@entsoc.org
	2002 , 17-21 Nov.	Fort Lauderdale, FL	ESA, see above
5^e Conference Internationale Francophone d'Entomologie (CIFE) and Société d'entomologie du Québec	2002 , 14-18 July	Montréal, QC	Dr. Daniel Coderre, Département des Sciences Biologiques, Université du Québec à Montréal, C.P. 888, Succ. Centre-ville, Montréal, Québec, H3C 3P8 coderre.daniel@uqam.ca
5th International Conference of Hymenopterists	2002 , 22-26 July	Beijing, China	Chao-dong ZHU, Institute of Zoology, Chinese Academy of Sciences, Beijing, Haidian, Zhongguancun Road 19#, P. R. China; sea@panda.ioz.ac.cn http://www.ioz.ac.cn/zcd/
XI International Congress of Acarology	2002 , 8-13 Sept.	Merida, Yucatan, Mexico	xi_ica@ibiologia.unam.mx; http://www.ibiologia.unam.mx/xi_ica/Congress.htm
5th International Congress of Dipterology	2002 , 29 Sept. - 4 Oct.	Brisbane, Australia	http://www.uq.edu.au/entomology/dipterol/diptconf.html

Organization	Date	Place	Contact
Vllth European Congress of Entomology	2002 , 7-13 Oct.	Thessaloniki, Greece	Symposium Secretariat: Laboratory of Applied Zoology and Parasitology, Aristotle University of Thessaloniki, 540 06 Thessaloniki Greece; matilda@agro.auth.gr
XXII International Congress of Entomology	2004 , 15-20 Aug.	Brisbane, Australia	Jim Cullen, CSIRO Entomology, j.cullen@ento.csiro.au Myron Zalucki, University of Queensland, Australia m.zalucki@mailbox.uq.edu.au
Collections / Museums / Systematics			
Biodiversity Knowledge Management Forum includes Species 2000 Meeting and 2001 Meeting of Taxonomic Data Working Group	2001 , 4-12 Nov.	Sydney, Australia	see http://plantnet.rbgsyd.gov.au/bi/forum/index.html
Society for the Preservation of Natural History Collections Annual Meeting	2002 , 8-13 May	Montreal, Quebec	Jean-Marc Gagnon, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, ON K1P 6P4; jmgagnon@mus-nature.ca
Natural Science Collections Alliance Annual Meeting (formerly the Association of Systematics Collections)	2002 , 7-9 June	Washington, DC	Association of Systematics Collections, 1725 K Street, NW, Suite 601, Washington, DC 20006-1401; asc@ascoll.org
Other subjects (especially those relevant to Survey projects)			
Old-growth forests in Canada: A science perspective	2001 , 15-19 Oct.	Sault Ste. Marie, ON	http://ulern.on.ca/oldgrowthforest Bruce Pendrel, Natural Resources Canada, Canadian Forest Service, PO Box 4000, Fredericton, NB E3B 5P7; oldgrowth@nrca.gc.ca

Answers to Faunal Quiz

[see page 58]

1. All of these arctic and sub-arctic sites were visited for insect collecting by the Northern Insect Survey [during 1957 to 1961: Arctic Circular 14(4): 68-69].
2. Typical developmental stages of mites are egg, larva, protonymph, deutonymph and adult, although in some groups stages are added (e.g. another nymphal stage) or eliminated.
3. There are many examples of microhabitats that can have populations of a single insect species in excess of 100,000 per m², though not necessarily over an area as large as 1 m². For example:
 - Certain soils where some oribatid mites regularly reach very high populations.
 - Plant shoots with growing aphid colonies.
 - The mud of eutrophic ponds in which some species of chironomid larvae reach very large populations especially in early instars.
 - Birds with feather mites, which are locally abundant on the plumage.
 - Sites where dormant individuals aggregate in very large numbers for the winter or summer (e.g. some species of coccinellids).
 - Large insects attacked by small parasitoids with gregarious or polyembryonic larvae.
 - Leaves or flowers of some plants infested by phytophagous mites or by very small insects such as thrips.
 - Egg masses of some insects attacked by scelionid parasitoids.
 - Foodstuffs heavily infested by certain stored product pests, including certain mites and beetles.
4. Sixteen families of Diptera in Canada have names that begin with the letter C: Calliphoridae, Camillidae, Canaceidae, Carnidae, Cecidomyiidae, Ceratopogonidae, Chamaemyiidae, Chaoboridae, Chironomidae, Chloropidae, Chyromyidae, Clusiidae, Coelopidae, Conopidae, Culicidae, Curtonotidae
5.
 - a) The warble fly *Hypoderma tarandi* normally attacks caribou.
 - b) The flea *Megabothris groenlandicus* normally attacks lemmings.
 - c) The tick *Dermacentor albipictus* is a parasite of moose, deer and other animals.
 - d) The philopterid louse *Strigiphilus ceblebrachys* is a parasite of snowy owls.
 - e) The echinopthiriid louse *Echinopthirus horridus* is a parasite of walrus.

Quips and Quotes

The river of truth is always splitting up into arms which reunite. Islanded between them the inhabitants argue for a lifetime as to which is the mainstream.

(Cyril Connolly)

Tell the truth and run. (Yugoslavian proverb)

On writing

Writing is easy. All you do is stare at a blank sheet of paper until drops of blood form on your forehead. (Gene Fowler)

Some editors are failed writers, but so are most writers. (T.S. Eliot)

I can write better than anybody who can write faster, and I can write faster than anybody who can write better. (A.J. Liebling)

There are three rules for writing a novel. Unfortunately, no one knows what they are. (W. Somerset Maugham)

No comment

“Emblazoned in red across the cover of this book is “Reviewed by Carl W. Schaefer”. I did review the manuscript . . . But I did not expect the fact of my fairly routine review for the publisher to be trumpeted forth in red.” [disclaimer by Carl W. Schaefer in his review of *Assassin Bugs* (D.P. Ambrose) in *Annals of the Entomological Society of America* 94(2): 298.]

Requests for Material or Information Invited

Would you like assistance in studying the fauna?

The Biological Survey of Canada encourages cooperation in taxonomic and ecological studies of the arthropod fauna. Please complete and return the form on the next page if you have a request for material or information that might be obtained elsewhere in Canada (compare the sample entries from a previous list of requests that are shown below).

Requests should be made by the middle of January; the list of requests will appear in the Spring 2002 newsletter.

Sample entries (addresses omitted):

	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
2	Adelgidae (conifer woolly aphids)	Anywhere	Preserve insects and bark, needles or galls in 70% ethanol. Specimen records and host plant records.	R. Foottit
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
4	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
5	Aphididae (aphids)	Anywhere	Preserve in 70% ethanol. Specimen records and host plant records.	R. Foottit
6	Asilidae (robber flies)	North America	Pinned adults	R.A. Cannings

Request for Cooperation

Please complete and return to:

Biological Survey of Canada
(Terrestrial Arthropods)
Canadian Museum of Nature
P.O. Box 3443, Station "D"
Ottawa, ON K1P 6P4
Email: hdanks@mus-nature.ca

Name: _____

Tel. Number _____

Email: _____

Fax: _____

Address: _____

Material required (specify taxon, region, habitat, or other details, as appropriate):

Information required (describe in reasonable detail):

Cooperation offered - if there is anything specific you might be able to supply in return (e.g. identifications, material) please indicate it here:
