

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 2000 issue is January 14, 2000.

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Editorial Notes

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

News and Notes

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

The Scientific Committee met in Ottawa on 15-16 April 1999.

Scientific Projects

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

1. *Family keys*

Dr. Geoff Scudder reminded the Committee that the first part of this project had been the key to the families of myriapods. Work is ongoing for the keys to the apterygotes and exopterygotes, and many of the plates are now done. It is hoped that by next year work on the plates will be complete for the apterygotes and the exopterygotes and that the keys will be close to final form as well.

2. *Grasslands*

The Committee discussed the grasslands project at length, decided on a general strategy to move this important project forward, and established a larger subcommittee to steer it (see p. 57)

3. *Arctic Invertebrate Biology*

Dr. Richard Ring noted that the arctic has a role to play in the grasslands project as there are grasslands in the arctic. He added that the main initiative to come out of the arctic invertebrate biology project has been the encouragement of communication and collaboration, which continues largely due to the production of *Arctic Insect News*, now in its 9th year, with considerable international profile. Another initiative meeting the goal of communication and collaboration is a symposium on insect and plant cold hardiness planned for 2000 in Victoria.

Dr. Ring reviewed some arctic activities (for example his own work will continue with NSERC funding). Dr. Jens Böcher is completing publications on Greenland. Dr. Ring drew the Committee's attention to other recent publications relevant to the arctic.

4. *Seasonal adaptations*

Dr. Hugh Danks briefly reviewed activities under this project. A paper about the role of trehalose in cold-hardiness and desiccation had been published. A paper discussing whether the life cycles of polar arthropods are flexible or programmed (from the 1998 European Workshop on Invertebrate Ecophysiology) is in press.

An excellent meeting in Japan, the International Japanese-Czech New Year Seminar in Entomology on Seasonal Adaptations in Insects and Mites, was highly relevant for the seasonal adaptations project. Dr. Danks' invited lecture was developed into a paper for subsequent publication. Discussions were also held at Kochi University about life cycles and related subjects.

An article in *Antennae*, the bulletin of the Société d'entomologie du Québec, about dormancy and life-cycles might expose relevant ideas to a new audience. Other publications as well as specific cooperative work are in progress.

5. *Insects of Keewatin*

Dr. Doug Currie explained the great biogeographical interest of the Keewatin region and the fact that a large area between the Mackenzie River and Hudson Bay has been neglected faunistically. It is proposed to study various terrestrial as well as aquatic insects by travelling down the Horton river, using the river to cover a large distance over a relatively short period of time. This trip is tentatively planned

for three weeks in August 2000 and will cover 600 km from Horton to the Beaufort Sea. Dr. Currie welcomes further interest in this expedition, for which 4 of about 6 places are already taken.

Other scientific priorities

1. *Arthropod fauna of soils*

Dr. Valerie Behan-Pelletier commented on the 1999 acarology summer program at Ohio State University and the Soil Ecology Conference, at which a number of Canadians will be presenting papers or posters. She reminded the Committee about a report that is being prepared on biodiversity in Canadian agricultural soils for the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) by Agriculture and Agri-Food Canada. There will be an overview chapter and various subsidiary chapters on different groups of organisms in soil. Dr. Behan-Pelletier continues to collaborate with colleagues in studying canopies of western hemlock and of amabilis fir where oribatid mites are the dominant arthropods.

The first field season for a project entitled "Identifying ecosystem controls on soil biodiversity", in the Konza Long-term Ecological Research tall-grass prairie in Kansas, begins soon. Dr. Behan-Pelletier reviewed other work on soil arthropods, including other collaborative studies and students completing their theses.

2. *Old-growth forests*

Dr. Scudder had considered the possibility of a symposium on old-growth forests, with others, but it was deemed premature. A number of studies are still in progress and it would be beneficial to see more results. When progress is a little more advanced a small symposium or workshop to compare objectives and results and determine a bigger picture will be developed. It might be feasible in one or two years.

Dr. Scudder and Dr. Ring reported on specific studies and developments. Public and media interest in old-growth forests continues.

In British Columbia there has been a furor because of suggestions from members of the B.C. cabinet that crown land be given to the forestry companies in exchange for some of the land the companies have lost to parks. Dr. Neville Winchester recently visited Gabon (French canopy research group) and also gave a plenary lecture at a conference on "Species at risk". This summer Dr. Ring will be attending a first nations re-discovery program to talk about forest diversity.

3. *Insects of Newfoundland*

Dr. David Larson noted that study of the fauna in Newfoundland has been going on for a number of years. A number of people have been collecting and three reasonably representative collections have been assembled but there has been no decision on what will be done with the information. Active work has been carried out, such as cataloguing of literature information, and condensing information that will be useful for producing products on the Newfoundland fauna such as identification manuals, brief summaries on the ecology of the species, keys, etc. The Committee discussed possible products from this sort of work. Dr. Larson concluded that a number of people are interested in keeping the project going but due to other commitments no one is currently in a position to spearhead it. In the meantime, it can be continued on an ad hoc basis.

4. *Damaged ecosystems*

Dr. Joe Shorthouse reminded the Committee of the evolution of this project, which continues to study biodiversity on tailings in lands owned by Inco and Falconbridge. For example, a paper on the abiotic and biotic characteristics of ecosystems on acid metalliferous mine tailings near Sudbury is in press, and a report has been completed on using the mites of tailings as bioindicators. Dr. Shorthouse noted that new species are being discovered on the tailings: these ecosystems are atypical, and cannot be studied elsewhere. The Committee discussed some implications of these findings.

5. Dissemination of biodiversity information on Survey web site; and project on faunal analysis and gaps in expertise

Dr. Bob Anderson introduced a subcommittee report dealing with technical and cost issues related to a potentially larger BSC platform, potentially increasing the Survey's profile by making substantive faunal content (e.g. species data) available on the web page, potential expansion of other content or display components, the format of the web page, and linkages with the faunal analysis project of the Survey.

It was decided to keep the BSC site on the ESC server until such time as either CMN or AgCan set new standard protocols for what can be posted on their sites. A number of ideas were agreed upon as worthwhile objectives, but resources are required to implement the ideas. It was suggested to bring in an intern to help redesign the web site and deal with technical issues, and the Survey agreed to explore this possibility.

With regard to the faunal analysis, relatively complete contributions have been received for some orders of insects. Data on others might be posted as an incentive towards updates and Dr. Huber and Dr. Anderson will continue to solicit further content.

The Committee discussed how information published on a web site can be cited. [See: Citing Electronic Sources: A Bibliography on the National Library of Canada's web site: <http://www.nlc-bnc.ca>]. Author and revision date are especially important, for example.

The Committee agreed that two servers might best fulfill the Survey's needs - one with considerable memory but without the necessity for rapid changes to be used for posting books and other Survey publications, preferably in a searchable format, and the other that would be smaller but easier to access for rapid updates.

6. Survey publicity

Dr. Shorthouse explained that he has been developing material for a slide presentation that might be used when people are speaking about the Survey. Such a presentation might

also be useful in the future when seeking funding. He displayed and circulated some of the slides assembled so far and requested that other members send him photographs, slides or electronic images of themselves at their institutes or working in the field. The material could be kept at the Survey Secretariat office or copies made and distributed.

7. Funding for biodiversity projects

Dr. Terry Wheeler reviewed earlier discussions and reported that he has continued to collect information on sources of funding for biodiversity projects. About 40 sources are divided into categories such as scholarships, funding for field work and research, and funding for visits to institutions, with relevant information about each one. After comment and additional suggestions from the Committee the information, as well as an introduction with advice on grant writing, will be posted on the Survey's web site.

8. Workshop on biodiversity monitoring sponsored by EMAN

The Survey had organized a workshop, sponsored by EMAN, to determine which groups of organisms would be best to use for biodiversity monitoring at all EMAN sites. A representative group of biologists met in Ottawa in February 1999. A report of the workshop and recommendations from participants was submitted to EMAN, a version of which will be posted in due course on the EMAN web site. The recommendations do not provide a definitive list of what must be monitored, because for insects especially many more expert discussions would be required to determine an optimum package of protocols.

9. Geographic data standards for specimen labels

Dr. Wheeler reported on the feasibility of establishing standards for labels. He had identified three issues, of which the first is label preparation standards (e.g. paper quality and weight and print quality and size). A basic reminder of acceptable standards would be useful. A second issue is the standards for informa-

tion to go on the label, such as specific latitude and longitude information. A third issue is standards to facilitate data retrieval. The Survey agreed to produce a brief that synthesizes this sort of information; the Committee would review a draft at its next meeting.

10. Monitoring of continuing priorities

Information concerning Survey projects that are no longer fully active was reviewed, including notes about arthropods of peatlands, aquatic insects of freshwater wetlands, arthropod fauna of springs, arthropod fauna of large rivers, ectoparasites of vertebrates, arthropods of the Yukon, arthropods of the Queen Charlotte Islands, arthropods of special habitats, climatic change, and agroecosystems.

11. Other priorities

The Committee reviewed information about other topics of interest, including invasions and reductions in the Canadian insect fauna, endangered species, scientific representation on biodiversity forums, and a potential brief on biodiversity.

Liaison and exchange of information

1. Canadian Museum of Nature

Dr. Mark Graham, Director of Research Services, sent a report via Dr. Anderson. The Canadian Museum of Nature has moved fully into its new facility, the Natural Heritage Building in Aylmer, but there will be some operating challenges in the next year, as the building owner will be working to bring the building up to correct seismic specifications. Some engineering errors were made in the original calculations. Resulting changes may involve moving people and/or collections, although details are not yet available. Insurance will cover all of the expenses required to correct the building as well as any loss of productivity.

The CMN continues as a partner in the Canadian Biodiversity Information Initiative, as it develops the butterfly module of the Biota

of Canada project (<http://www.nature.ca/CanBII>).

The CMN continues to provide logistic and financial support for 35 ongoing research activities being carried out by 14 research scientists under four main projects: collection management and conservation research, issues in biodiversity, rare elements and paleobiological studies (see <http://www.nature.ca>). A paleobiology position has been advertised to replace the now retired Dr. Dick Harington, for a paleoecologist and systematist with a specialization in Cenozoic mammals and/or birds. Dr. André Martel continues his work as the Assistant Director of the Bamfield Marine Research Station. The CMN continues to develop the Federal Biosystematics Partnership (FBP) which includes Agriculture and Agri-Food Canada (ECORC), Environment Canada (Canadian Wildlife Service and Biodiversity Convention Office), Fisheries and Oceans Canada, Natural Resources Canada (Canadian Forest Service) and the CMN. The CMN seat on the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) now also represents the FBP. In December the Museum launched the Nature Discovery Fund [see page 55].

There is continued development of a collection management system to make the collections accessible electronically. The Museum now has a Visiting Fellowship Program to offset the costs of workers who want to travel to the Natural Heritage Building, in amounts up to \$1500 per applicant.

The CMN has now ceased publication of *Global Biodiversity*. Ms. Anne Breau, Canadian Centre for Biodiversity, Canadian Museum of Nature, explained that the decision to cease publication had been made as a result of fiscal realities and other internal priorities such as the opening of new public galleries. Ms. Breau explained that even with approximately 2,000 subscribers the publication was not breaking even. Ms. Breau added that attempts have been made to have another federal agency take over the publication but no firm offer to do so has yet been made.

2. ECORC, Agriculture and Agri-Food Canada

Dr. Jean-Marc Deschênes, Director, ECORC, said that he has been at ECORC for about seven months. He explained that the Biological Resources Program used to be one of three programs at ECORC and has now been reorganized to create three sections. One deals with botany and mycology. Another is concerned with systematic entomology and is headed by Dr. Robert Footitt. The third section deals with biodiversity and bioinformatics and is headed by Dr. Ian Smith. ITIS and CANBII are both part of the biodiversity program.

Dr. Deschênes reassured the Committee that sufficient resources will continue to be devoted to maintain and curate the collections. He confirmed Agriculture's involvement with the Federal Biosystematics Partnership, as reported earlier: each department's assistant deputy minister recently signed a memorandum of understanding. Dr. Deschênes reported on recent ECORC participation in an OECD meeting of the Global Biodiversity Information Facility, an international undertaking that Canada is interested in but has not yet made a commitment, though a business plan is being developed.

Dr. Deschênes described a proposal for a Biota of Canada information network. Agriculture continues to have strong collaborations with Environment Canada and Parks Canada. Cooperative research agreements continue with EMAN to complete the assessment of species diversity in the Prairie Ecozone and to initiate similar studies in the Atlantic Maritime Ecozone. There is also a proposal to develop a database of insects in Canadian national parks. Agriculture continues to explore opportunities to develop partnerships whereby Agriculture would provide expertise and other departments would contribute funding. Staffing priorities are currently being reviewed in conjunction with priorities of all programs under ECORC.

In response to questions about the Biota of Canada project, Dr. Smith explained that this proposal has been made to the 5NR committee (Agriculture and Agri-Food Canada, Natural Resources Canada, Health Canada, Environ-

ment Canada and the Department of Fisheries and Oceans). A biota of Canada information network will call for the establishment of two compatible committees, a scientific committee and a technical committee, to put in place a distributed network of biodiversity databases that would be founded on the ITIS core, i.e. a taxonomic dictionary that would contain the names of all organisms important to Canada and would be the access point for interfaces with other biodiversity databases. Initially this would include only federal departments but ultimately would extend to all available information about Canadian organisms. A final decision is awaited on the proposal.

3. Entomological Society of Canada

ESC president Dr. Linda Gilkeson reported via Dr. Danks, Past-President. The final items in the Society's strategic review have been completed. For example, a 3-year contract with the NRC Research Press for production of *The Canadian Entomologist* has now been signed. The Society is in a good financial position for the future. Because the midterm meeting of the Society Executive is scheduled for April 17 other developments cannot yet be reported, although among major developing issues are the many arrangements and discussions related to the joint Annual Meeting with the Entomological Society of America and the Société d'entomologie du Québec in the year 2000 (December 2-7).

4. Canadian Forest Service

Dr. Ben Moody, Scientific Advisor, Pest Management, reported that the Canadian Forest Service has been examining the biosystematics of exotic pests such as the Asian longhorn beetle. A joint workshop with the Canadian Food Inspection Agency in October looked at the approach that the CFS might take to deal with economic pests. The resulting report listed needs and gaps to deal with exotics, including the need for biosystematics. The CFS Biosystematics Working Group has prepared a draft report listing existing expertise, gaps and needs for the future. Dr. Moody noted that the U.S. President has called for spending \$29 mil-

lion to combat invasive species and to do research on restoring damaged ecosystems. This initiative might lead to a number of interdepartmental partnerships.

CFS recently signed a MOU with the Canadian Food Inspection Agency. A committee meets regularly and the CFS has promised to conduct research, especially on safer, less environmentally harmful fumigants. Regulations requiring inspection of shipments from China and Hong Kong have been put in place and Dr. Moody believes that those countries are now cooperating. Another 30 inspectors will be hired to handle the increased inspections. Members of the Committee noted that although more inspectors will be hired there would as usual be no increase in scientific personnel to handle the resulting increase in identifications.

5. Parks Canada

Mr. Jean Poitevin, Applied Research Coordinator, Parks Canada reported on activities in Canadian Parks related to database gathering and information building. Parks is in the process of setting up national lists of mammals, fish, reptiles, and amphibians. An ongoing project with the Université de Montréal is assembling a list of vascular plants. The goal is to have this list eventually on the Parks Canada web site. The next step would be to put more emphasis on arthropods for the State of the Parks report due in 2001. A commitment has been made to contribute to a small database project with Agriculture and Agri-Food Canada, organizing the data on insects collected in past contracts into digital format so that it could be shared. If the value of the existing data (collected from six national parks from 1975 to 1985) could be demonstrated future support would be more likely.

6. Environment Canada / Ecological Monitoring and Assessment Network

Dr. Peter Hall explained that he is working part time with EMAN on partnerships within the federal government and other organizations with respect to environmental monitoring projects, development of environmental monitoring methods, and publicizing the results

of monitoring efforts in Canada in order to raise the public profile and awareness of monitoring of biological entities. He noted that the Biological Survey has already done work with EMAN. Dr. Hall reported that the national EMAN meeting, held in January 1999 in Victoria, was attended by approximately 400 people from diverse backgrounds. He noted that the need to get an environmental monitoring message across to the public and to the senior levels of government in order to maintain support came up again and again throughout the meeting. The meeting included presentations, poster sessions, workshops and field trips. The proceedings will be published and circulated and some papers will be published in an environmental monitoring journal. Among the workshops were ones on Climate and biodiversity, on Aboriginal knowledge, and on Development of partnerships. The Biological Survey had displayed a poster at the meeting. The next EMAN national meeting will be in Toronto, January 2000.

7. Canada/MAB and the Biodiversity Science Board of Canada

Dr. Patricia Roberts-Pichette informed the Committee about developments related to the DIVERSITAS International Biological Observation Year (IBOY). She also reported on news from the Biodiversity Science Board, including draft reports on a number of topics (including vegetation monitoring protocols). Final products will appear on the EMAN web site in due course [<http://www.cciw.ca/eman/intro.html>].

Dr. Roberts-Pichette noted that Canadian memberships in international activities are declining. For example, funding for the International Global Change Program has been reduced, and Canadian memberships in the International Institute for Applied Systems Analysis and the International Union of Biological Sciences have been discontinued. Other examples of Canada's withdrawal from international bodies (such as the Pacific Science Association), were cited by members of the Committee, evidently reflecting government policy. The Committee discussed possible actions, but decided not to follow up on such matters, which would

require considerable new expertise and research. Instead the Committee decided to concentrate its efforts on what it does well, such as selected science projects.

8. Parasitology module, Canadian Society of Zoologists

Dr. David Marcogliese, parasitology module, noted the Canadian Museum of Nature's continuing intellectual support for the parasitology module. He reported that the ongoing stickleback project continues to receive new data. The final draft of the protocols for sampling for parasites of freshwater fish has been finished and submitted. Drafts for other groups are being prepared. The Canadian Society of Zoologists has formed a standing committee on biodiversity. Its purpose is to advise the CSZ president and executive about regional, national and international issues in biodiversity in order to allow the society to become responsive and proactive in biodiversity issues. The 1999 annual meeting of the CSZ includes a symposium on host-parasite interactions in a changing climate.

Dr. Marcogliese noted some international issues and also noted web sites and publications of interest (e.g. concerning Nova Scotia's newly passed endangered species legislation: <http://www.gov.ns.ca/legi/legc/>; and about biodiversity in Quebec: <http://www.redpath-museum.mcgill.ca/>).

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 1998, visits were made to Bamfield and Victoria, B.C., Edmonton and Vegreville, Alberta, Winnipeg, Manitoba and Quebec City, Quebec. Seminars and lectures presented, in addition to more-or-less informal treatments of the Biological Survey, included: Insects of the Yukon; Insect biodiversity — planning and executing a

study; Diversity of terrestrial arthropods in the nearctic region, and resources for their study; How to assess insect biodiversity without wasting your time; and Arctic insects as indicators of environmental change.

Other items

1. Regional developments

Members of the Committee summarized information from different regions of Canada. For example, in British Columbia, Dr. Scudder has retired from UBC, but no replacement has been hired and courses have been cancelled. The disposition of the UBC collections is still unknown. Many new faculty positions will be needed to maintain the status quo at universities in B.C. and elsewhere. A habitat atlas, which provides details of suitability of the habitat for supporting rare and endangered species in the Okanagan valley, will be prepared. The Nature Trust has purchased a large area of the wet lake basin where some experiments on maintaining habitat will be carried out. Renewed funding for work on habitats has been received. The B.C. dragonfly survey will continue this year. Two new NSERC industrial chairs have been established at the University of Victoria. A series of workshops are being held at the Bamfield Marine Station, including a module on arthropod biodiversity.

In the prairies, construction work for a building expansion at the Lethbridge research centre will begin in the fall. Because of the major lygus bug outbreak across the prairies last year, Dr. Hector Carcamo was hired there on a three-year term. A major grassfire in December 1997 that burned 200,000 hectares was supposed to be a 1 in 100-year event, but several more similar fires have occurred in the past year, affording opportunity to continue research. Dr. Larson is studying the water beetle and corixid faunal composition in a variety of prairie ponds. An active program on forest biodiversity continues at the University of Alberta. Dr. Felix Sperling will take up a position in systematic entomology there in July 1999.

In Ontario, the Royal Ontario Museum has a new Vice-President of Collections and Research, Dr. Hans-Dieter Sues. A new biodiversity gallery is scheduled to open soon and will include a substantial insect component. Four graduate students in entomology are currently working at the ROM, and others will be joining the group. Several interns are working on entomology projects at the Canadian Museum of Nature. A more comprehensive survey of the CMN's Natural Heritage Building site in Aylmer will be carried out this summer. An Ontario-wide Odonata survey is being set up to determine the annual phenology of as many species as possible over many years.

In Quebec, the White Admiral Butterfly was voted to be the insect emblem of Quebec although among entomologists the Ebony Jewelwing damselfly was the favourite. The May issue of *Québec Science* magazine will have a 15-page supplement about the field of entomology in Quebec and will include a section on collections and museums in Quebec. A virtual tour of insect biodiversity is now on the Schoolnet web site: [http://www.schoolnet.ca/collections/biodiversity/about_insects_what.html]. Planning continues for the joint ESC/ESA/SEQ meeting in 2000 to be held in Montreal. The Université du Québec à Trois Rivières has received funding for a project on insect biodiversity in road corridors in Quebec. McGill University has received substantial funds to upgrade facilities for long-term ecological monitoring and research at its field stations in southern Quebec, Schefferville, and Axel Heiberg Island. Dr. Vickery will be leaving the Lyman Museum of Macdonald College in May and moving to Nova Scotia. Many students in insect biodiversity projects and systematics are working at Macdonald College. The Laurentian Forestry Centre continues to monitor post-ice-storm changes in the insect fauna. As well students are collecting insects at the Mt. Ste. Hilaire biosphere reserve and McGill University's new Molson reserve.

In Newfoundland and the Maritimes, there are now relatively few active entomolo-

gists. The Newfoundland insectarium will open officially in October 1999. A previous annual entomology field trip on Brunette Island, north of St. Pierre and Miquelon, has led to a paper in press about the collection made there: several introduced species are still present in disturbed habitats as relict introductions on this now uninhabited island. There are several lists of Newfoundland insects in the forestry and Agriculture Canada collections. It has been more or less agreed to standardize the data in future by using the Biota program. Pending legislation in PEI will require buffer zones along watercourses to protect riparian habitat, and will favour the stream and pond biota. The Atlantic dragonfly inventory project continues. Dr. Donna Giberson is studying the dragonflies of the national park.

With respect to the Arctic, the International Tundra Experiment (ITEX) group met at the EMAN national meeting in January. A tundra ecosystem monitoring network will include an entomology component. A sign of optimism is renewed lobbying for research in the north. For example, NSERC has formed a task force dealing with problems in research in the north and recently sent out a questionnaire about the current state of affairs. In response, the Survey had written in support of arctic research. A new list server called Northsci is a communication vehicle for northern researchers. [email peterj@aix1.uottawa.ca]. The United States National Science Foundation has increased funding this year and a large amount is going to arctic research. A meeting will be held in Iceland in 1999 to discuss the curriculum for the planned University of the Arctic.

2. Other matters

The Committee also considered recent Survey publications especially newsletters, the annual report to the Canadian Museum of Nature and liaison with foreign organizations. The annual general meeting of Biological Survey Foundation members took place, including information about the appearance of very favourable reviews of the book *Insects of the Yukon* that was published by the Foundation.

Biodiversity Diversity

The internet has a huge number of items covering biodiversity. For example, normal search engines will find over 300,000 items. Many of them deal with government programs or positions in response to the International Convention. Others offer coverage of local issues. Some address more general scientific or societal themes. A shortlist of sites from which to start an exploration of the range of links and information available is:

<http://www.nhm.ac.uk/science/projects/worldmap/> (British Natural History Museum);

<http://biodiversity.uno.edu/> (The Biodiversity and Biological Collections Web Server);

http://kaos.erin.gov.au/life/general_info/biodiv_assess.html (bibliography on biodiversity assessment) and related items

<http://www.nbii.gov/biodiversity/index.htm>
(U.S. national biodiversity information initiative)

Canadian National Collection of Insects, Arachnids and Nematodes on the Web

Information about the Canadian National Collection (CNC) of Insects, Arachnids and Nematodes has been consolidated on a web site. The site provides information on the roles and uses of the collection, the history of the collection, the CanaColl Foundation, curatorial units, and on-site and off-site links. Each curatorial unit section describes the holdings in the collection and provides links to relevant personnel, publications and related sites. The site is part of the larger ECORC (Eastern Cereal & Oilseed Research Centre, Agriculture and Agri-Food Canada) site and can be found at <http://res.agr.ca/ecorc/cnc/>

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The Northern Forestry Centre Insect Museum: Open for Business

Greg R. Pohl

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The Northern Forestry Centre (NoFC) in Edmonton, Alberta is the Canadian Forest Service office responsible for the forested regions of Alberta, Saskatchewan, Manitoba, and the Northwest Territories. The facility was opened in 1970, when the Winnipeg and Calgary Research Laboratories merged. The NoFC insect museum has existed since that time, although much of the material housed here has a much longer history.

The bulk of the museum's holdings are made up of Forest Insect and Disease Survey (FIDS) specimens collected in the region. FIDS was most active from 1945 to 1970, with a team of forest rangers collecting and rearing insects and diseases to document outbreaks and population cycles. They typically spent their summers collecting samples, and their winters identifying and curating specimens. Collecting effort went far beyond important pest species, and resulted in much new knowledge about insects in Canada. Detailed host and locality information was recorded into a database containing hundreds of thousands of records; the FIDS specimens thus serve as a voucher collection for these data. In the past the FIDS database has provided historical pest information and contributed to knowledge of the biology of many species. Currently the Canadian Forest Service is computerizing the database to make the information there more accessible.

For a time in the 1950s, the Winnipeg Forest Entomology Laboratory was responsible for shelterbelt surveys. This resulted in significant collections of prairie insects, primarily from research labs at Indian Head, Saskatchewan, and Aweme, Manitoba. The latter was the laboratory of the renowned Norman Criddle, Dominion Entomologist; many of his specimens from the early part of the 1900s now re-

side at the NoFC museum. Another significant acquisition was a voucher collection of cicindelids put together by the Winnipeg naturalist J.B. Wallis, following the publication of his "Cicindelidae of Canada" in 1961.

By the time NoFC opened, the FIDS initiative was being wound down. Since 1970, specimens continued to be collected, though usually through the course of more directed research on particular groups. However, since 1989, scientists at NoFC have been involved in biodiversity work, which has produced a large amount of material to be housed in the museum. Significant voucher collections include carabids and staphylinids from various forest types in Alberta, insects from coarse woody debris, and Lepidoptera from Alberta and Saskatchewan. Some of these specimens have proved useful in genetic analysis for systematic work.

To some extent, the content of the museum reflects the interests and expertise of the taxonomists who have been employed here. Sawflies are particularly well represented due to the tenure of Dr. Horne R. Wong from 1970 to 1988. Scolytids and Curculionids have benefited from the presence of Dr. David Langor, beginning in 1989.



A Century of
Innovative Solutions
Cent ans de
solutions innovatrices

In recent years, the NoFC insect museum has been neglected due to funding cuts. As taxonomic knowledge grew, the determinations on older specimens were rapidly falling out of date. The museum had reached a critical situation where older material was becoming less useful, and newer material was piling up beyond the capacity of the room. In the past two years, we have rectified this by doubling the number of cabinets, and installing a mobile track system to accommodate them. As well, a wall was removed to expand the museum into an adjoining laboratory. The taxonomically inclined entomologists here (myself, David Langor, and Daryl Williams) have begun re-organizing and re-determining the specimens to conform to modern classification schemes.

Currently the NoFC Museum contains over 700 drawers of insects, with another 160 drawers available for expansion. In all, the museum houses over 100,000 pinned specimens, with many more in alcohol. It is particularly strong in Coleoptera (210 drawers), Hymenoptera (80 drawers) and Lepidoptera (260 drawers). Although forest insects such as

wood borers and defoliators are particularly well represented, there are considerable holdings of other groups as well.

Since taking over curatorial duties in 1997, I have worked primarily on carabid and staphylinid beetles, and Lepidoptera. However, I would like eventually to get the entire museum collection properly identified and curated. To this end, I invite interested experts to borrow material for their taxonomic studies, in return for up-to-date determinations. I am still in the process of sorting and organizing the collection, but I hope one day to have much of the label information available online.

If you are interested in information or specimens from the NoFC insect museum, I can be reached as follows:

Greg R. Pohl, curator
Northern Forestry Centre Insect Museum
Canadian Forest Service
5320 - 122 St.
Edmonton, AB T6H 3S5
telephone: (780)-435-7211
electronic mail: gpohl@nrca.gc.ca

The Nature Discovery Fund

The Canadian Museum of Nature, with the participation of Canadian author Margaret Atwood, recently launched the Nature Discovery Fund (NDF), a non-profit fund seeking to encourage public support for systematics through an enhanced public profile and by making available additional financial resources for the study of systematics in Canada. The launch of the Fund drew attention to the great diversity of insects and their relatives in Canada, and to the fact that only one-half of them are named.

The Fund emphasizes the value of the scientific names of species: every insect species needs a unique scientific latinized name under which all information about that species is filed.

In the past, these names have been reserved for special features about the organism. For example, they might reflect where it was found, refer to a striking feature of structure or colour, or honor the person who collected it or even a fel-



low scientist who contributed to study of the group. The Fund undertakes, in recognition of a donation of \$500 or more, to arrange for a species to be named (within 24 months) in honor of the donor or in recognition of someone or something they designate. Donations are viewed not as the purchase of names, but as practical support for the science of systematics.

In September of each year NDF will invite applications for use of the donated funds by recognized Canadian entomologists in the field of systematics, especially those proposing to sample and study previously unexplored or

poorly explored areas or habitats within Canada. Further details of the application process are provided below.

To request an information package about the Nature Discovery Fund including detailed procedures for making donations please contact Marc Villeneuve at the Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, ON. K1P 6P4; 1-800-263-4433, 1-613-566-4222; mvilleneuve@mus-nature.ca or visit www.nature.ca

Nature Discovery Fund: Call for Applications 1999

The Nature Discovery Fund (NDF), administered by the Canadian Museum of Nature, invites applications for funding in support of "discovering and naming Canada's insect biodiversity". Established in December of 1998, NDF is a non-profit fund seeking to provide resources to recognized entomologists in support of field-based scientific exploration and research in systematics within Canada. The NDF is financed through individual donations in support of Biodiversity research.

Projects which will document the fauna by field work in previously unexplored or poorly explored areas or habitats are preferred. Support is also available for the completion and publication of already existing projects with a similar focus, but for which additional field work is not necessary. Recipients of NDF financing will be encouraged to support the continuation of the program by recognizing NDF donors in the naming of newly discovered species.

All applications will be assessed by a review panel composed of 3 Canadian systematists. Various levels of funding are possible (generally \$500-\$3000), but the number and level of awards are contingent upon resources available within the Fund.

Deadline for receipt of applications is December 31, 1999.

Results will be made known to applicants by April 1, 2000.

Application materials and more information can be obtained from Robert Anderson, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, ON. K1P 6P4, or via email: randerson@mus-nature.ca

Project Update: Arthropods of Canadian Grasslands

The arthropods of Canadian grasslands are surprisingly inadequately known. The grasslands project aims to catalyse and coordinate relevant work in these areas, for example by identifying sites that represent “undisturbed” grassland habitats, characterizing the faunas of different kinds of habitats (in selected arthropod groups), and also comparing them with the faunas of modified habitats.

The grasslands project therefore is a large and important project of the Biological Survey (see Appendix for a brief history), and recently its scope and organization were revisited, now that the major efforts on the Yukon fauna have come to fruition with publication of the book *Insects of the Yukon*.

At the Survey committee meeting in April 1999, some basic requirements for planning the project were discussed. Possible outputs were considered that would allow the scientific community interested in grasslands across the country to push forward the knowledge of these habitats. The tasks of structuring these plans were passed to an enlarged subcom-

mittee, which met after the meeting of the full Committee.

A range of possible products was evaluated to decide what might be the best mix in terms of timing and intensity, including major scientific publications, smaller products such as workshops or symposia, and more limited outputs such as individual species accounts or a newsletter, as well as such things as a scientific prospectus for the project. Some ideas for funding possibilities were also explored.

It was decided to foster the following potential outputs (not necessarily in chronological order):

- A major volume with a focus on diversity, species inventory and zoogeography, including multiple sites and habitats.
- A major volume with a focus on ecological and habitat associations.
- A baseline framework for grasslands, providing a sound scheme by which to classify or identify the different types of grasslands. This idea will be pursued by Dr.



Joe Shorthouse, for example by contacting relevant botanical experts.

- Informal conference at the 2000 joint meeting of the Entomological Society of Canada, the Entomological Society of America and la Société d'entomologie du Québec, which will allow ideas to be exposed and developed and the project made known more widely. Dr. Terry Wheeler will pursue this program element and begin planning.
- A symposium at the 2001 ESC meeting, providing a published initial scientific synthesis on various subjects, also as a basis for further development. Dr. Terry Wheeler and the subcommittee will plan for this symposium.
- An annual grasslands newsletter, to disseminate information, encourage cooperation and develop ideas. If multiple future issues can be guaranteed, this newsletter will be edited by Dr. Hugh Danks and launched within a year.
- A prospectus for the project, which will give a scientific outline of the rationales and plans for the project and underpin its development. Dr. Joe Shorthouse and Dr. Terry Wheeler agreed to prepare an initial draft.
- A list of current research projects, which will help in seeking contributors and planning for the informal conference and the symposium,

as well as encouraging cooperation. Dr. Kevin Floate agreed to prepare this list (expected to be published in the grasslands newsletter in due course).

Other items to be developed when more of the basic planning and work has been done would include development of information for the Survey's web page, and proposals for funding.

Composition of the subcommittee

Members of the subcommittee are as follows:

V.M. Behan-Pelletier; H.V. Danks; K.D. Floate (co-chair); D.J. Larson; R.E. Roughley; G.G.E. Scudder; I.M. Smith; J.D. Shorthouse; T.A. Wheeler (co-chair); D. Wrubleski

Appendix: A brief history of the project

The grasslands project of the Biological Survey was initiated for the "Prairies" in 1979. Dr. Gordon Pritchard prepared a list of undisturbed prairie sites (1980). Interest was generated by a special interest group at the Banff Annual Meeting of the Entomological Society of Canada (1981), organized by Dr. John Spence and Dr. Pritchard. Subsequent efforts by Dr. Spence (with Mr. Rob Cannings) led to the production of a Grasslands Newsletter, which commented on current field activities. Some



preliminary work was carried out to prepare a format in which to characterize selected grassland sites, and the work of characterization was started by Mr. Cannings among others. Later Dr. Geoff Scudder, who was carrying out studies in grasslands especially in B.C., took over leadership of the project. Initially, interest was kept alive by occasional issues of the Grasslands Newsletter, pending completion of the Yukon Project, which involved many of the potential contributors to a grasslands project. When the Yukon project experienced delays, this also slowed the Grasslands work. Subsequently, Dr. Bert Finnamore initiated several projects on grasslands, studying such sites as CFB Suffield (1994-) and Grasslands National Park (1996-). Dr. Scudder continued with his long-standing studies of grassland arthropods in British Columbia, and Dr. Roughley studied sites in Manitoba (1994-). The sorting, distribution, and identification of material from these places is in progress. In 1995, Dr. Finnamore became chair of the Survey's Grasslands subcommittee. At about the same time, he prepared a brief published by the Survey about the use of grassland arthropods in ecosystem management. He pursued funding for his projects on grasslands in Canada and elsewhere. He also cooperated with the Ecological Monitoring and Assessment Network (EMAN), helping to develop detailed sampling protocols and carrying out work related to the prairie ecozone. Some limited Scientific Committee discussions of the grasslands project were held during this period, and in 1999 a major effort was made to move the project forward more broadly, as outlined above.

Selected publications from the Survey's grasslands project and on Canadian grasslands arthropods

1980. D.M. Lehmkuhl. Temporal and Spatial Changes in the Canadian Insect Fauna - Patterns and explanation: the prairies. pp. 1145-1159 in J.A. Downes (Ed.), Temporal and Spatial Changes in the Canadian Insect Fauna. Can. Ent. 112 (11).
1983. Grasslands Newsletter no. 1 (Ed., J.R. Spence)
1983. Project update: BSC Newsletter 2(2): 41.
1984. Grasslands Newsletter no. 2 (Ed., J.R. Spence)
1985. Grasslands Newsletter no. 3 (Ed., J.R. Spence)
1987. Grasslands Newsletter no. 4 (Ed., G.G.E. Scudder)



1987. Project update: BSC Newsletter 6(1): 7-8.
1990. Grasslands Newsletter no. 5 (Ed., G.G.E. Scudder)
1993. G.G.E. Scudder. Geographic distribution and biogeography of representative species of xeric grassland-adapted Nearctic Lygaeidae in western North America (Heteroptera: Lygaeidae). pp. 75-113 in G.E. Ball and H.V. Danks (Eds.), Systematics and Entomology: Diversity, Distribution, Adaptation and Application. Mem. ent. Soc. Can. 165.
1996. A.T. Finnamore. The advantages of using arthropods in ecosystem management. A brief from the Biological Survey of Canada (Terrestrial Arthropods). 10 pp.
1996. Contributions in A.T. Finnamore (Ed.), the SAGE project. A workshop report on terrestrial arthropod sampling protocols for graminoid ecosystems. <http://www.cciw.ca/eman-temp/reports/publications/sage/intro.html>
1997. Contributions (especially on Heteroptera and Cicadellidae) in H.V. Danks and J.A. Downes (Eds.), Insects of the Yukon. Biological Survey of Canada (Terrestrial Arthropods), Ottawa. (Biological Survey Monograph Series No. 2, 1034 pp.)
1998. Project update; Results from grasslands: aculeate wasps from CFB Suffield. BSC Newsletter 17(2): 44-57.
1999. A.T. Finnamore and D. Buckle. Arthropod component report: The stinging wasps (Hymenoptera:Chrysidoidea, Vespoidea, Apoidea) and spiders (Araneae). Canadian Wildlife Service. 197 pp.

The Quiz Page

— test your knowledge of Canada and its fauna —

1. What is relict permafrost?
2. The mean July temperatures in Saskatoon and in Quebec City are identical at 19.3°C. What are the main differences in their climates?
3. If a person can run for some distance at 20 km / hour, is it worth running away from the attack of biting flies, given their speed of flight?
4. What is the highest body temperature at which terrestrial arthropods are active?
5. One characteristic Canadian tree is white spruce, *Picea glauca*. Name a well known species from each of five different orders of insects that feeds on this species.

[Answers on page 66]

Recent 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
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.	\$25 (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
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
Museum collections: fundamental values and modern problems	1991. H.V. Danks. <i>Collection Forum</i> 7(2): 95-111.	Reprints available on request
Long life cycles in insects	1992. H.V. Danks. <i>Can. Ent.</i> 124(1): 167-187.	Reprints available on request
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
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.	

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| 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. | \$28 (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 |
| 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 |
| 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 |
| Terrestrial arthropods of peatlands, with particular reference to Canada | 1994. A.T. Finnamore and S.A. Marshall (Eds.). <i>Mem. ent. Soc. Can.</i> 169. 289 pp. | \$35 (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 |
| Insect cold-hardiness: insights from the Arctic. | 1994. H.V. Danks, O. Kukal and R.A. Ring. <i>Arctic</i> 47(4): 391-404. | Reprints available on request |
| 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 |
| 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 |
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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-temp/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, ISBN 0-9692727-6-6. 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
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
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	1998. H.V. Danks (Ed.). No. 9. 31 pp.	Free of charge on request (Annual issues 1-8 also available)
La dormance et les cycles biologiques	1999. H.V. Danks. <i>Antennae</i> 6(2): 5-8.	See: http://ecoroute.uqcn.qc.ca/group/seq/seq2.htm
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
Publications of the Biological Survey of Canada (Terrestrial Arthropods)	Leaflet	Free of charge on request
Biological Survey of Canada (Terrestrial Arthropods)	Leaflet	Free of charge on request
Commission biologique du Canada (Arthropodes terrestres)	Feuillet	Gratuit sur demande

[*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

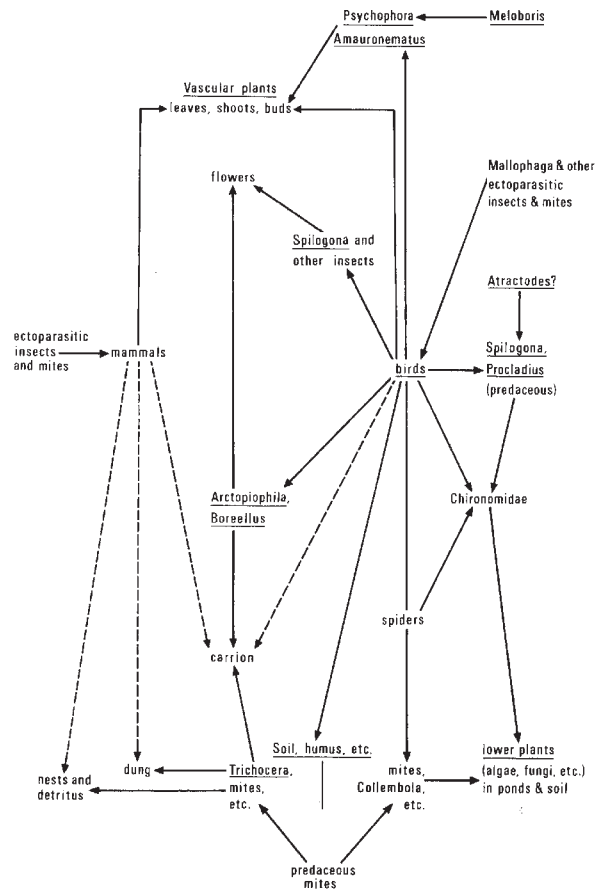
Organization	Date	Place	Contact
Entomological Conferences			
Entomological Society of Canada	1999, 26-29 Sept.	Saskatoon, SK	(with Entomological Society of Saskatchewan); Dr. Dwayne Hegedus, Organizing Committee Chair (Agriculture and Agri-Food Canada, 107 Science Place, Saskatoon, SK, S7N 0X2; hegedusd@em.agr.ca) or Dr. Cedric Gillott (Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon SK, S7N 5E2; gillott@duke.usask.ca)
	2000, 2-7 Dec.	Montréal, QC	(with Société d'entomologie du Québec and the Entomological Society of America)
Entomological Society of America	1999, 12-16 Dec.	Atlanta, GA	ESA, 9301 Annapolis Rd., Lanham, MD 20706-3115; meet@entsoc.org
	2000, 2-7 Dec	Montréal, QC	(joint meeting with ESC, see above)
	2001, 9-13 Dec.	San Diego, CA	ESA, see above
	2002, 10-15 Dec.	Philadelphia, PA	ESA, see above
10th Auchenorrhyncha Congress	1999, 6-11 Sept.	Cardiff, UK	Su Hayward-Lewis, Conference Co-ordinator, Cardiff University, Southgate House, Bevan Place, PO Box 533, Cardiff CF4 3XZ, UK; auchen@cardiff.ac.uk
2nd International Lepidopterist Conference of Africa	1999, 4-6 Nov.	Capetown, South Africa	Jenny Heath, 209 Ringwood Dr., Pinelands, 7405 South Africa; aheath@mweb.co.za
XXI International Congress of Entomology	2000, 20-26 Aug.	Iguassu Falls, Brazil	details from http://www/sede/embrapa.br/ice/
Collections / Museums / Systematics			
15th Annual Meeting of the Society for the Preservation of Natural History Collections	2000, 10-14 July	Halifax, NS	Iris Hardy, GSC (Atlantic), 1 Challenger Drive, P.O. Box 1006, Dartmouth, NS B2Y 4A2; hardy@agc.bio.ns.ca; http://www.geo.ucalgary.ca/spnhc/annconf.htm

Organization	Date	Place	Contact
Society of Systematic Biologists (SSB) Symposia - Annual Meeting	2000	Bloomington, Indiana, USA	David Mindell; mindell@umich.edu
Other subjects (especially those relevant to Survey projects)			
Australasian Conference on Grassland Invertebrate Ecology	1999, 21 Sept. - 1 Oct.	Perth, Western Australia	John Matthiessen, CSIRO Entomology, Private bag, PO Wembly, Western Australia 6014; johnm@ccmar.csiro.au
7th Triennial International Symposium on Insect/Invertebrate and Plant Cold Hardiness	2000, 28 May - 2 June	Victoria, BC	R.A. Ring, Biology Dept., University of Victoria, Victoria, BC V8W 3N5; raring@uvic.ca

Challenge Question

Many food chains in Canadian systems have several successive links. For example, plant–moth caterpillar–insect parasitoid–insect hyperparasitoid in forests, or periphyton–mayfly larva–stonefly larva–fish–heron in aquatic habitats. Multiple links occur even in the high arctic (see figure), such as microflora–springtail–spider–bird. Most systems add multiple cross links.

So what is the longest set of links that includes insects in a Canadian ecosystem? Examples submitted will be published in the *Newsletter*.



Answers to Faunal Quiz

[see page 60]

1. Relict permafrost is permafrost that was formed in the past and that persists in places where it cannot form today.
2. Saskatoon is colder in winter than Quebec City (January mean -17.6° vs. -11.5° C), the daily range and extremes of temperature are greater, and it is drier in the summer (about half of the Quebec precipitation) and much drier in the winter (only about 1/5th of the Quebec precipitation).
3. Although theoretically a person can outrun mosquitoes and midges (e.g. 4 to 9 km / hour), and even black flies, some horse flies could keep up (10 to 22 km / hour), and in any case some of these species can relocate hosts after substantial displacement especially in open habitats; all of them have a potential flight range of many kilometres. In particular, however, running away from attack would normally bring the victim into an area occupied by other individuals of the same species.
4. A pseudoscorpion from the Namibian desert has been reported to enter heat coma only at 65° C (Vannier, G. 1987. Bulletin de la Société d'Écophysiologie 12: 165-186). However, normally arthropods use habitat selection and nocturnal activity to avoid rather than confront such high temperatures. In Canada, the opposite behaviours of thermophily, basking and endothermy perhaps are more common.
5. Many well known species feed on white spruce, but sample species of insects that do so are the spruce budworm, *Choristoneura fumiferana* (Lepidoptera), the spruce beetle, *Dendroctonus rufipennis* (Coleoptera), the spruce cone maggot, *Delia anthracina* (Diptera), the spruce seed chalcid *Megastigmus atedius* (Hymenoptera) and the spruce adelgid, *Adelges strobilobius* (Homoptera).

Quips and Quotes

“This analysis thus indicates that the “crisis” in taxonomy — the basic scientific underpinning of all the efforts of those interested in biodiversity and its preservation — is not a figment of the imaginations of taxonomists but can be objectively documented in the published literature.”

*[Excerpt from J.E. Winston and K.L. Metzger. 1998. Trends in taxonomy revealed by the published literature. *BioScience* 48(2): 125-128.]*

“While we are speeding ahead with new data manifestations, abstractions to be sure, there better be specimens or other types of credible vouchers to back them up. And that means someone better make sure there are taxonomists and funded museums, otherwise the information is so much electronic confetti.”
[Brian J. Armitage in *BioOhio* 7(1): 4, 1999.]

“. . . Hodkinson & Casson (1991) determined that only 37.5% of the 1690 Hemiptera species in their rainforest samples from Sulawesi, Indonesia, are described. Knowing the approximate number of Hemiptera species described for the world fauna (about 71 000) they assumed that these, too, represent 37.5 % of a global total that must thus represent some 189 000 hemipteran species. Finally, given that Hemiptera currently represent about 7.5% of the described insects of the world, they assume that the same is true for the undescribed insects of the world, and use this proportion to arrive at an estimate of about 2.5 million species for the world insect fauna. . . . The appearance of ‘step-by-step’ estimation in such examples is illusory. In fact, the estimate depends entirely on the degree to which the state of taxonomic knowledge of Sulawesi Hemiptera is typical of global Insecta; the global estimate of 2.5 million species is simply the number of described insect species divided by 0.375”

[Excerpt from R.K. Colwell and J.A. Coddington. 1994. *Phil. Trans. R. Soc. Lond., Biol. Sci.* 345: 101-118.]

“The effects of habitat removal from an ancient woodland site have been studied at Buddon Wood [England], a site which was celebrated for its rare beetles in the nineteenth century but which has since been clear-felled in the Second World War, partially burnt in the 1950’s and quarried over two-thirds of its area since the 1970s (M.B. Jeeves, unpublished results)” [Excerpt from D.A. Lott. 1996. Insects of mature trees and ancient woodland. pp 72-76 in M.D. Eyre (Ed.), *Environmental monitoring, surveillance and conservation using invertebrates*. EMS Publications, Newcastle upon Tyne.]

“There is a view that conservation management should be for the whole habitat, not just for a single species. There is a view that by managing for the whole habitat, all the component species will look after themselves. There is the view that the world is flat and that the moon is made of cream cheese. Such views have to be respected but should not hinder progress in wildlife conservation or astrogeology.” [Excerpt from D.A. Sheppard. 1996. *Managing habitats for single species conservation*. pp. 53-59 in M.D. Eyre (Ed.), cited above.]

No comment

It is a damn poor mind that can think of only one way to spell a word. (Andrew Jackson)

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 2000 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
7	Braconidae	Anywhere	Pointed or in ethanol	M. Sharkey
8	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

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:
