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NEWSLETTER OF THE BIOLOGICAL SURVEY OF CANADA (TERRESTRIAL ARTHROPODS)

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Canadian Museum of Nature / Musée canadien de la NATURE

General Information

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

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Queries, comments, and contributions to the Newsletter are welcomed by the editor. Deadline for material for the Fall 2006 issue is July 17, 2006.

Editorial Notes

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

This newsletter will also be available soon on the Survey's website at:
http://www.biology.ualberta.ca/bsc/bschome.htm

To receive this newsletter via email (as an Adobe Acrobat file) instead of a paper copy please send an email message to the Editor.

News and Notes

Bio-Blitz 2006

In collaboration with the Newfoundland and Labrador Department of Environment and Conservation and Parks Canada, the Biological Survey of Canada (BSC) will hold its 6th annual Bio-Blitz in Gros Morne National Park (GMNP), Newfoundland, July 5-10, 2006. This will be the first Bio-Blitz held in eastern Canada (previous events were held in Alberta and Manitoba).

GMNP was designated a UNESCO World Heritage Site in 1987. Beyond its awe-inspiring scenic beauty, Gros Morne National Park boasts an incredible biotic richness and is internationally acclaimed for its unique combination of geologic features. GMNP is dominated by two distinctly different landscapes, a coastal lowland bordering the Gulf of St. Lawrence and the alpine plateau of the Long Range Mountains. These provide habitats for a diverse array of flora and fauna consisting of a unique mixture of temperate, boreal, and arctic species. Major plant community types include coastal scrub (tuckamoor), lowland bogs, riverine thickets, balsam fir and black spruce forests, heath barrens, sedge meadows, tundra, serpentine barrens, and intertidal salt marshes. The park is home to over 700 species of flowering plants, 400 species of bryophytes and 400 species of lichens. This remarkable diversity is due to the wide range of habitats provided by bedrock types, soil development, exposure, altitude range, and proximity to the ocean. On the hills, conditions are cooler, windier, and moister than on the lowlands. Hiking from the seashore up onto the Long Range Mountains is a bit like travelling into the past, to a time when Newfoundland was covered with Arctic plants and animals. From seashore to highland tundra there are many unusual niches in the park for you to explore and sample! Rare species are usually found in rare habitats, and Gros Morne National Park, like the rest of the Great Northern Peninsula, has no shortage of either. The entomological fauna of the park has not been well collected. You are invited to join in this unique opportunity to collect in one of Canada's most scenic and biologically diverse locations. In addition, opportunities will be provided for participants to collect in other interesting and rare habitats on the west coast of Newfoundland.

The Tablelands
(T. Knight, Parks Canada)

Gros Morne Mountain
(T. Knight, Parks Canada)

Stay tuned to the BSC website for updates or contact David Langor (780-435-7330; dlangor@nrcan.gc.ca).

D. Langor

Activities at the Entomological Societies' meeting

The 2005 joint annual meeting of the Entomological Society of Canada and the Entomological Society of Alberta took place in Canmore, Alberta, 2-5 November 2005. The meeting was attended by about 300 people. Many of these were student members and there were many entries for the student presentations competition. Items in the program included:

A plenary address by Dr. Michael Majerus on "The peppered moth: Decline of a Darwinian disciple".

Symposia from graduate students, and on "Maintaining arthropods in northern forest ecosystems", "Biology and diversity of arachnids", "Fire and arthropods" and "Wheat stem sawfly".

A workshop on *Delia*.

A demonstration on Constructing inexpensive databases for remote contributions: tools for biodiversity, systematics and collaborative efforts.

Numerous contributed papers in several sessions.

A student presentation competition for the President's prizes of the Entomological Society of Canada, in several sessions – Pest management, Faunistics and systematics, Forest entomology, Parasitoids and biocontrol, and Terrestrial, riparian and aquatic ecology.

An extensive poster session, including a student competition for the President's Prize.

The ESC Heritage Lecture given by Dr. David Larson entitled "The prairies then and now: Personal reflections on entomology and entomologists".

The ESC Gold Medal Address given by Dr. Peter Kevan.

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

The ESC meeting was followed by the meeting of the Scientific Committee for the Biological Survey of Canada (Terrestrial Arthropods).

Symposium on Maintaining arthropod diversity in forest systems

The symposium on maintaining arthropod diversity in forest systems, organized by the Biological Survey and sponsored by the University of Alberta, exposed data and evaluations about biodiversity in forest systems under various circumstances, including responses to natural and artificial disturbances.

Deciphering a complex web: the structure and dynamics of spider assemblages in disturbance-driven boreal forests. **D.P. Shorthouse**, **C. Buddle**

Using core species assemblages and rare carabid taxa to evaluate forest change in Canada. **T. Work, J.R. Spence, D.W. Langor, M. Koivula, J. Sweeney**

Rove beetles (Coleoptera: Staphylinidae) in northern forests. **G. Pohl, D.W. Langor, J. Klimaszewski, T.T. Work**

Maintaining saproxylic insects in managed forests. **D.W. Langor, J.R. Spence, J.E.H. Hammond, J. Jacobs, T. Cobb**

Structure and conservation of lepidopteran communities in managed forests of northeastern North America: a review. **K. Summerville, T.O. Crist**

Aquatic arthropods and large-scale land-use effects in temperate North America. **J. Richardson**

Unthreatening forest arthropods: simultaneous management of 'beezillions' of small and heterogenous risks. **J. Spence, D.W. Langor, W.J.A. Volney, J. Jacobs**

Symposium on "Fire and arthropods"

The symposium on fire and arthropods, organized by the Biological Survey, showed a variety of responses to fire in different ecosystems, including forest and grassland.

Introduction. **A. Sternbjerg**

Documenting fire characteristics: what is important in understanding fire and insect interactions? **B. Hawkes**

Pyrophilous arthropods and post-fire salvage harvesting: the ecological implications of an economic reality. **T. Cobb, D.W. Langor, J.R. Spence, I.D. Phillips**

Pyrophily in boreal insects: Do wildfires really contribute at maintaining higher populations? **M. Saint-Germain, C.M. Buddle, P. Drapeau**

Recovery of the arthropod fauna in an Antelope-brush community following destruction by fire. **G.G.E. Scudder**

Beetles, fire and tallgrass prairie. **R.E. Roughley**

Summary and conclusions. **R.E. Roughley**

Papers on systematics and related themes

Many presentations were made in contributed sessions on biodiversity. The following titles include some of the papers of faunal interest that were presented in these and various other scientific sessions, including posters. (Interesting treatments on a range of other subjects were presented in the various sessions.)

Effects of food limitation and density on carabid populations in forest floor enclosures. **E. Esch, J. Jacobs, J. Spence**

Ground beetle (Coleoptera: Carabidae) responses to different weed management practices in corn in southern Albera. **S. Bourassa, J.R. Spence, H.A. Cárcamo, R.E. Blackshaw, K.D. Floate**

Canopy oribatid mite communities in ancient Western red cedar. **Z. Lindo, N.N. Winchester**

Blood and tissue feeding parasitic mties on Alberta birds. **W. Knee, H. Proctor**

Unresolved roaches: phylogenetic analysis of Blattodea based on 16S and 28S. **M. Djernaes**

Recent advances in the systematics of the family Clusiidae (Diptera). **O. Lonsdale, S. Marshall**

Hybrid interactions between the spruce budworm, *Choristoneura fumiferana*, and the two year cycle budworm, *C. biennis* (Lepidoptera: Tortricidae). **L. Lumley, F. Sperling**

What the buzz is all about: a taxonomic revision of the Genus *Piezura* Rondani (Diptera: Fanniidae). **A. Moores, J. Savage**

Long morphological branches in the genus *Nicrophorus* (Coleoptera: Silphidae). **T. Mousseau, D.S. Sikes**

Do molecular data support an ancient rapid radiation in *Nicrophorus* (Coleoptera: Silphidae). **C. Venables, D.S. Sikes**

A taxonomic study of *Anopheles* (Diptera: Culicidae) based on cytogenetic and morphological data. **A. Thielman, F.F. Hunter**

Effects of seasonality and plant species on boreal rhizosphere invertebrate assemblages. **D. Belter, H. Proctor**

Ground-dwelling beetle and forest mosaic. **C. Bergeron, J.R. Spence, W.J.A. Volney**

Saproxylic beetles and woody debris decomposition in burned boreal forests: linking biodiversity to ecosystem function. **T. Cobb, D.W. Langor, J.R. Spence, B. Kishchuk**

Sericoda (Carabidae) beetles and *Antennoseius* (Ascidae) mites: the mystery continues. **A. D. Déchêne, T.P. Cobb, H.C. Proctor, J.R. Spence**

The response of ants (Hymenoptera: Formicidae) to seral change in the sub-boreal forests of British Columbia. **R. Higgins, B.S. Lindgren, D.A. McColl**

A molecular approach to evaluating the ecological host range of European *Peristenus* spp. (Hymenoptera: Braconidae), parasitoids of *Lygus* spp. (Hemiptera: Miridae). **T. Gariepy, U. Kuhlmann, C. Gillott, M. Erlandson**

Oviposition deterring signal found on housefly eggs. **K. Lam, D. Babor, B. Duthie, E-M Babor, M. Moore, G. Gries**

The dynamics of coexistence of three temperate species of web-building spiders in British Columbia. **M. Salomon, S. Vibert, B.D. Roitberg**

Comparison of component communities associated with cynipid galls near James Bay and central Ontario. **M.J.T. Bodnar, J.D. Shorthouse**

Characteristic communities, hungry hunters, and unknown immatures: studying spider assemblages in apple orchards. **T. Sackett, C. Buddle, C. Vincent**

Carabid beetle diversity associated with agroforestry buffers and its potential impact on adjacent field crops. **C. Noronha**

Phenology of lygus bugs (Miridae: Heteroptera) and their *Peristenus* nymphal parasitoids

(Braconidae: Hymenoptera) in southern Alberta. **H. Cárcamo, C. Herle, H. Goulet, J. Otani**

Mesostigmatic mites in Australian wet forests: free-living predators can be habitat specific but why? **F. Beaulieu, D.E. Walter, H.C. Proctor, R.L. Kitching**

Beyond Matador: diversity of Oribatida in Canadian grasslands. **V. Behan-Pelletier, D. Kanashiro, J.M. Clapperton**

Cicurina (Dictynidae): the genus from hell. **P. Paquin**

Behavioural evolution in the jumping spider genus *Habronattus*. **W. Maddison, M. Hedin**

A review of the factors influencing spider diversity: Why do we have so many eight-legged freaks? **C. Buddle, T.E. Sackett**

Developing a directed approach for including spiders in Canada's endangered species conservation efforts. **R. Bennett**

Rove beetles as a target group for biodiversity research on litter inhabiting fauna (Coleoptera: Staphylinidae). **J. Klimaszewski**

Fire severity, salvage logging and mixed-wood forest ground beetles (Carabidae). **M. Koivula**

Project IBISCA – Stratification and beta diversity of arthropods in a Panamanian rainforest. **N. Winchester**

Oribatid mite fauna of central British Columbia – Impact of harvesting and soil compaction on abundance and diversity 10 years later. **J. Battigelli**

Ant biodiversity in disturbed and undisturbed Guanacasta, Costa Rica lowland forest fragments. **D. Larson**

Validity of using chronosequence studies to predict carabid beetle (Coleoptera: Carabidae) assemblage response to forest succession in managed and natural jack pine (*Pinus banksiana*) forests in southeastern Manitoba. **K. Ryan, N.J. Holliday, A.R. Westwood**

Breaking down the break-down: The rise and fall of beetle empires. **J. Jacobs, J.R. Spence, D.W. Langor**

Hyperdiversity in the tropics: the role of spatial and ecological turnover of species of predatory mesostigmatic mites in Australia. **F. Beaulieu**

Brachychthoniidae from western Canadian Grasslands; a new examination of the genus *Liochthonius*. **D. Kanashiro, M.J. Clapperton, V. Behan-Pelletier**

Do feather mites choose hosts based on host body size? **H. Proctor, S. Kembel**

Spider-habitat associations in a disturbed coastal sand dune ecosystem in southwestern British Columbia. **R. Bennett, M. Salomon**

Does bad taxonomy serve conservation purposes? The case of the *Cicurina cueva* complex (Araneae: Dictynidae) in the vicinity of Austin (Travis Co.) Texas. **P. Paquin, M. Hedin**

The spider's niche. K. Hancock, **J. Hancock**

Muscles, glands and genitalia – the utilization of soft-part morphology in butterfly systematics. **T. Simonsen**

The effects of time and preservation techniques on DNA quality in insect specimens. **A. Roe, F.A.H. Sperling**

Response of ground beetle assemblages (Carabidae) to cultivation of Bt corn during a 4-yr study. **K. Floate, H.A. Cárcamo, R. Blackshaw, B. Postman, S. Bourassa**

Colonisation and association of freshwater invertebrates with three species of wood in a temperate stream. **N. Hofer, J.S. Richardson**

Changes in distribution, abundance and phenology of Orthoptera in grassland, montane and alpine habitats during recent decades, with reference to influences of weather and vegetation. **D. Johnson**

Went down to the cemetery looking for beetles. **D. Hartley, J.R. Spence**

Review of the Harvestmen (Arachnida, Opiliones) of Canada. **R. Holmberg**

Biodiversity and ecologically-based pest management in agroecosystems. **M. You**

Flower visiting in a little-known Fly family: Are acrocerids pollinators or opportunists? **C. Borkent**

Gerrid diets: specialists for a surface smorgasbord. **J. Spence**

Pitfall trap depth in 3 forest habitats. **C. Bergeron, J.R. Spence**

Islands in the sky: oribatid mite communities in suspended soils of western red cedar as model systems of island biogeography and metacommunity dynamics. **Z. Lindo**

The Canadian Arachnologist On-line Spider Database. **D. Shorthouse**

Beetle diversity in burrowing owl pellets: impacts of agriculture on prey availability. **P. Bouchard, R.G. Poulin, T. Wellicome, G. Holroyd**

Diversity of gall wasps (Hymenoptera: Cynipidae) on bur oak (*Quercus macrocarpa* Michx.) in Riding Mountain National Park, MB. **S. Digweed**

Recent progress in Linyphiidae taxonomy. **N. Dupérré, P. Paquin, D. Buckle, D. Ubick**

Some of Waterton Lakes National Park's spiders. **J. Hancock**

Habitat utilization of the pyrophilous beetle *Sericoda quadripuctata* (Carabidae) in burned white spruce stands. **J. Jacobs**

Rates of recovery of biodiversity of grasshoppers (Orthoptera: Acrididae, Tettigoniidae) and leafhoppers (Homoptera, Auchenorrhyncha: Cercopidae, Cicadellidae, Cicadidae) following intense wildfire in fescue foothills of Alberta. **D. Johnson, K.G.A. Hamilton**

Dynamics of a Lepidoptera (moth) community in managed boreal forests of northwestern Alberta, Canada. **E. Kamunya, J.R. Spence, W.J.A. Volney**

A coarse filter approach to conserving arthropod biodiversity in Canadian forests. **D. Langor, J.E.H. Hammond, G.R. Pohl**

CMN workshop on "Strategic Planning for a BSC"

On 26 October 2005, the Canadian Museum of Nature held an all-day workshop organized by Dr. Mark Graham (Director of Research Services) to consider the development of the Biological Survey of Canada. The CMN wanted to explore how to develop a much broader BSC, through broadening the partnership, and also exploring possible new operations. This initial workshop was held in order to meet with many possible partners – to understand current operations, explore activities and discuss other functions including other potential taxa – in the hope that it would lead to a narrower meeting with real potential partners to develop terms of reference and a strategic plan.

The workshop was attended by about 22 people, including the President, managers, scientific program heads and others from the Museum, representatives from scientific societies such as the Entomological Society of Canada, the Canadian Society of Zoologists and the Canadian Botanical Association, members of the Alliance of Natural History Museums of Canada (meeting in Ottawa the following day), and representatives of government agencies including Parks Canada, Agriculture and Agri-Food Canada, the Biodiversity Convention Office, the Ecological Monitoring and Assessment Network, and the Committee on the Status of Endangered Wildlife in Canada.

The agenda, as planned by Dr. Graham, included introductory remarks, an overview of the Survey by Dr. Hugh Danks, a series of Break-out groups (followed by presentations from each group) on Current and future needs for a BSC, Necessary functions of a BSC, Best approaches, and Making it happen, followed by an open discussion.

Very few ideas for Survey activities that were put forward were new to the BSC or its Scientific Committee, although there was some emphasis on the additional need for specimen data basing and the like. Most of the scientists at the workshop thought that science and the need for understanding should drive the priorities (as in the present Survey), but especially the senior government representatives thought

that government "strategic priorities" should drive everything, as in the current exclusively top-down model for line departments.

An unweighted summary of all points made was prepared by Dr. Graham for circulation to participants. However, because some of the ideas put forward were mutually exclusive and because the diverse ideas from the brainstorming sessions were not assembled into a practical or coherent scheme, finite output from the workshop will require additional discussions.

Summary of the Meeting of the Scientific Committee for the Biological Survey of Canada (Terrestrial Arthropods), November 2005

The Scientific Committee met in Canmore, Alberta, on November 5, 2005. Because of budget restrictions this was an abbreviated meeting and some members were not able to attend.

Scientific Projects

1. Grasslands

Most chapters for the book on ecology and interactions in grassland habitats have been submitted. The outstanding chapters should be submitted by the end of 2005. Dr. Wheeler will be communicating with all authors in the near future. Potential authors for the second volume on arthropods in altered grasslands will be approached once the first volume is in production.

2. BSC e-journal of Arthropod Identification

The BSC e-journal of arthropod identification continues to be developed with a target launch date in 2006. The Committee discussed several issues including cross postings of identification products, copyright, the range of items that could be published, editorial policies, and author guidelines.

3. Terrestrial arthropods of Newfoundland and Labrador

Work continues on a number of keys although a great deal of work is needed to prepare illustrations. The keys to the Curculionidae should be complete by the spring of 2006 and will be submitted to the BSC e-journal. The 2006 BioBlitz is being planned for Gros Morne National Park and other sites on the west coast of Newfoundland. Work on the Lepidoptera of Newfoundland has commenced.

4. Forest arthropods

The 2005 BioBlitz, held in Waterton Lakes National Park in July, was very successful, attracting no less than 30 participants from Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. Parks Canada provided great support and Waterton Lakes National Park will manage the database of specimen records. Issue number 2 of the Forest Arthropods newsletter will be published in March 2006. Progress with the project on Cerambycidae of Canada and Alaska has been excellent. The database of Forest Biodiversity projects will be updated by March 2006. The symposium on Maintaining arthropods in northern forest ecosystems was held at the ESC annual meeting and a set of 7 manuscripts will be published in the Canadian Entomologist.

5. Insects of the Arctic

Collecting was done in the Norman Wells, NWT area in the summer of 2005 in collaboration with local wildlife personnel. Residues from a Malaise trap will be available from Dr. Doug Currie who is currently extracting the biting flies from those samples. Dr. Currie and Dr. Peter Adler spent a month in eastern Siberia collecting blackflies. Dr. Donna Giberson and Dr. Jade Savage were in Rankin Inlet this past summer. Dr. Buddle did some pitfall trap-

ping in the Yukon and also has material people might be interested in.

6. Seasonal adaptations

A number of papers on this topic have been published or are in press, including ones in the Journal of Insect Physiology and in Applied Entomology and Zoology. Dr. Danks attended the International Symposium on Ecophysiology of Ectotherms and Plants in Denmark. He was an invited speaker in a symposium in Japan on environmental change, part of an international meeting under the auspices of a well-funded centre of excellence at Kyoto University (linked to entomimetic sciences).

7. Invasions and reductions

A one-day symposium on the impacts of exotic arthropods (and possibly also of plants and fungi) on native biota is planned to precede the Joint Annual Meeting in Montreal in November 2006. Work continues to catalogue all non-native arthropods of Canada. About 1700 species have been catalogued thus far and the final number is expected to exceed 2000. Additional information is being collected about each species, general distribution, origin, date and place of introduction, hosts, key references, etc. A joint BSC-CFS database will be housed by the CFS and accessible through a web site interface.

Progress on the specific project on coccinellids in the context of invasive species was reported. For now, this project is proceeding with people in individual regions publishing independently. Some forthcoming publications may stimulate interest in this project.

Other scientific priorities

1. Survey web site

The number of visitors to the BSC web site continues to increase. Routine maintenance and updates continue to be done including posting all newsletters and updating the synopsis of forest arthropod biodiversity projects (which now includes a section for projects in the northern U.S.).

The site is in the process of being redesigned and reorganized. In addition to giving the look of the site a minor facelift the focus has been on reorganizing the menu structure of the site to be more logical and with clearer labels. The revised pages will be posted when all translations and technical issues have been resolved.

2. Survey publicity

Two flags with the BSC logo were produced and made available for Committee members to use for publicity. One was used at the BioBlitz held at Waterton National Park.

3. Arthropods and fire

The symposium on arthropods and fire at the ESC meeting went well. A subcommittee, chaired by Dr. Chris Buddle, was struck to investigate the feasibility of producing a publication that would include the proceedings from the conference as well as additional papers and a synthesis.

4. Arthropods of the Gulf of St. Lawrence Islands

This project is in its early stages. A number of researchers have or are planning to do fieldwork on islands such as the Magdalen Islands, Cape Breton and PEI.

5. Databasing

There seems to be general agreement that the Darwin Core set of fields should be adopted and made congruent with GBIF standards. Global support for the concept of DiGIR sites or equivalent so that the databases can be searched simultaneously is increasing. The Canadian Arachnologist On-line Spider Database was discussed as an example of an online biodiversity database that could quickly be developed using freeware and inexpensive equipment (and see the BSC Newsletter Vol. 24(2): 53-55). However, having a community of interested people to submit data may be more of a challenge than the technical structure. Major initiatives such as the Prairie Farm Rehabilitation Agency project on databasing the National Land and Water Information System, and the

Canadian Food Inspection Agency systems to monitor invasive exotic species were discussed.

The BSC's database of important historic collecting localities continues to be compiled.

6. Biodiversity sampling brief

The Committee has proposed revising and expanding the Survey's 1994 biodiversity brief on planning a study and recommended sampling techniques, and perhaps discussing its inclusion into the revised volume 1 of the handbook series currently being planned at Agriculture and Agri-Food Canada. The Committee also discussed having a component of the Survey's web site that dealt with survey methods.

7. Other priorities

The Committee also considered potential work on endangered species, some potential future publications and other topics.

Liaison and exchange of information

Due to the location and abbreviated nature of this meeting representatives from other agencies were not able to attend. However, a written report about activities at Agriculture and Agri-Food Canada was received from Dr. Jean-François Landry.

Dr. Barry Grace is acting National Science Director for the Biodiversity Theme, to which all taxonomists working at the CNC belong. Two new research scientists (a phytophagous mite systematist and a plant nematode systematist) are expected to be hired by January 2006. Funding from a 5-year AAFC National Land and Water Information System (NLWIS) initiative will allow the hiring of six people to database entomology, botany, and mycology collections, initially focusing on invasive alien species. A Biodiversity Informatics Research Biologist will be hired to supervise system customization and data entry personnel involved in databasing the CNC through the NLWIS initiative.

Dr. Don Bright has been retired for some time from his research position on bark beetles at the CNC and will be moving permanently to Boulder, Colorado. Under an agreement with AAFC, he will maintain a responsibility for providing bark beetle identifications on an ad-hoc basis. Mr. Jim Troubridge is the new collection manager at CNC. In this new position he will be responsible for overseeing maintenance of the collection, processing of donations and acquisitions, and supply procurement.

There are plans to purchase a new high-end imaging system system before March 31, 2006. This will be a much awaited, badly needed tool for CNC systematists, whose need for high-quality digital photos requires an efficient system for capturing and processing images.

Production of new volumes in the Insects and Arachnids of Canada handbook series is continuing. The Histeridae of Canada by Bousquet and Laplante is currently in press and publication is expected before the end of 2005. The Root Weevils of Canada by Bright and Bouchard is accepted for publication with expected publication in 2006. The Ticks of Canada by Lindquist, Galloway et al. is accepted with expected publication also in 2006. Dr. Pat Bouchard and Dr. Yves Bousquet are working on a handbook of the Tenebrionidae of Canada, a project still in early draft stage. Dr. Ales Smetana continues to work on the multi-authored catalogue series of Palaearctic Coleoptera. Dr. Landry has completed a catalogue of the world Coleophoridae, co-authored with two European lepidopterists.

AAFC is one of the partners in the Barcoding of Life project, based at the University of Guelph, which includes many other players, with scientists focusing on different groups of organisms. Lafontaine, Landry and Troubridge are working closely with Paul Hebert on the Lepidoptera. Results are already very useful for working taxonomy in allowing correct sex and immature stage associations, discovering cryptic species, and confirming suspected sibling species pairs. Building a comprehensive barcode library will take several years.

Other items

1. Canadian Museum of Nature

Funds are restricted within the CMN, because of exhibit and other commitments, leading to the current abbreviated meeting without expenses for participants. Other activities may also have to be deferred.

The CMN organized an all day workshop in Ottawa during October to discuss potential development of the BSC, attended by government representatives, members of the Alliance of Natural History Museums, and scientific society representatives.

2. Other matters

The Committee also considered briefly issues such as the BSC award through the ESC, membership of the Scientific Committee, and items of more general interest from regional information.

Project Update: Symposia and Workshops Organized by the Biological Survey Of Canada

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The BSC organizes workshops or symposia from time to time in support of particular scientific initiatives. Many lead to subsequent publications about the fauna. For example, two BSC symposia took place at the recent meeting in Alberta of the entomological societies [see meeting account on page 2].

This update outlines the symposia and other meetings held to date in the context of various BSC projects. For additional information on particular projects and their publications, see the BSC web site at http://www.biology.ualberta.ca/bsc/english/scientificprojects.htm and http://www.biology.ualberta.ca/bsc/english/publicationsummary.htm.

Spatial and temporal changes in the Canadian insect fauna

A symposium with this title, organized by J.A. Downes on behalf of the Scientific Committee, took place at the Entomological Society of Canada meetings held in Ottawa in 1978. The papers were assembled for a single issue of the Canadian Entomologist and published in 1981. They sampled a wide range of processes that had contributed to the function of the present-day insect fauna of Canada.

Symposium. 1978. Temporal and spatial changes in the Canadian insect fauna. Entomological Society of Canada Joint Annual Meeting, Ottawa, ON.

Downes, J.A. (ed.) 1981. Temporal and spatial changes in the Canadian insect fauna. Can. Ent. 112 (11): 1089-1238. [1980]

Arthropod fauna of Canadian grasslands

Given the key interest and relevance of the fauna of the centre of the continent (including the origin and setting of the faunas of present day agricultural lands), the Survey initiated a project for the "Prairies" in 1979, and interest was generated by a special interest group organized by J.R. Spence and G. Pritchard at the 1981 entomological societies' meeting. The project, supported especially by an intermittent newsletter but with continuing field activities, underwent a long period of development while many cooperators were engaged in other projects, notably on the insects of the Yukon. More recently, focussed activities include an informal conference (2000) and a symposium (2002), both organized by T.A. Wheeler, which serve to underpin the preparation of a book on grassland habitats currently in preparation.

Interest Group Meeting. 1981. Arthropods of the Prairies. Entomological Society of Canada Joint Annual Meeting, Banff, AB.

Workshop. 1995. Grasslands sampling procedures (with the SAGE project). Ottawa, ON.

Contributions in A.T. Finnamore (ed.) 1996. The SAGE project. A workshop report on terrrestrial arthropod sampling protocols for graminoid ecosystems. http://www.cciw.ca/eman-temp/reports/publications/sage/intro.html

Informal conference. 2000. Arthropods of grasslands: Current status and future directions. Annual Meeting of the Entomological Societies of Canada, America and Quebec, Montreal, QC

Symposium. 2002. Arthropods of Canadian grasslands: ecology and interactions in grassland habitats. Entomological Society of Canada Joint Annual Meeting, Winnipeg, MB.

Wheeler, T.A. et al. (eds.) in prep. Arthropods of Canadian grasslands: ecology and interactions in grassland habitats.

Origins of the North American insect fauna

Continuing the themes addressed in the earlier symposium, J.A. Downes organized a symposium at the entomological societies' meeting held in Toronto in 1982. These papers, many of them substantially expanded from their original form, were collected into a memoir that was published in 1988. They document a complex history and diverse origins for the North American insect fauna.

Symposium. 1982. Origins of the North American insect fauna. Entomological Societies of Canada, Ontario and America Joint Annual Meeting, Toronto, ON.

Downes, J.A., and D.H. Kavanaugh (eds.) 1988. Origins of the North American insect fauna. *Mem. ent. Soc. Can.* 144. 168 pp.

Arthropod fauna of Canadian soils

Publication in 1982 of a Survey brief that emphasized the ecological roles of the arthropod fauna of the soil and the current state of knowledge of Canadian soil arthropods, with other activities, helped to stimulate an international conference held in 1984. The conference, organized by J.R. Spence, established contact between pedologists and soil zoologists, and

led to plans for further relevant research. The conference proceedings were published in 1986. The importance of soil arthropods was also emphasized in a paper by V.M. Behan-Pelletier at the 1991 BSC symposium on systematics (see below), published in 1993.

Conference. 1984. International conference on faunal influences on soil structure. University of Alberta, Edmonton, AB.

[Spence, J.R. (ed.)] 1986. Faunal influences on soil structure. *Quaest. ent.* 21 (4): 371.1-700. [1985]

Behan-Pelletier, V.M. 1993. Diversity of soil arthropods in Canada: systematic and ecological problems. pp. 11-50 in Ball, G.E., and H.V. Danks (eds.), Systematics and Entomology: diversity, distribution, adaptation and application. Mem. ent. Soc. Can. 165.

Aquatic insects of freshwater wetlands in Canada

To help focus a project on the relatively little known arthropod fauna of the extensive and ecologically important habitat of peatlands, a conference on the aquatic insects of bogs, fens and marshes, organized by D.M. Rosenberg and H.V. Danks, was held at the St. Andrews ESC meeting in 1984, and the proceedings published in 1987. Initiatives continued in a project that included the terrestrial fauna of peatlands (see below).

Symposium. 1984. Aquatic insects of peatlands and marshes in Canada. Entomological Society of Canada Joint Annual Meeting, St. Andrews, NB.

Rosenberg, D.M., and H.V. Danks (eds.). 1987. Aquatic insects of peatlands and marshes in Canada. Mem. ent. Soc. Can. 140. 174 pp.

Arthropod fauna of freshwater springs in Canada

Following a number of activites and publications to point out the special value and interest of spring habitats, a symposium organized by D.D. Williams and H.V. Danks was held at the 1989 entomological societies' meeting to focus the available information for arthropods. The proceedings of that symposium were published with some additional papers in 1991.

Symposium. 1989. Arthropods of spring habitats. Entomological Society of Canada Joint Annual Meeting. St. John's, NL.

Williams, D.D., and H.V. Danks (eds.). 1991. Arthropods of springs, with particular reference to Canada. Mem. ent. Soc. Can. 155. 217 pp.

Systematics and entomology

The Survey's ongoing interests in the roles and value of systematics included a workshop convened by the Survey with the Biosystematics Research Centre and the Entomological Society of Canada in 1989, and a symposium, organized by G.E. Ball and H.V. Danks, held at the Entomological Societies meeting in 1990. The proceedings of the symposium were published in 1993.

Workshop. 1989. Workshop on systematics (joint workshop with the Biosystematics Research Centre, Agriculture Canada, and the Entomological Society of Canada), Ottawa, ON.

Symposium. 1990. Systematics and entomology: diversity, distribution, adaptation and application. Entomological Society of Canada Joint Annual Meeting, Banff, AB.

Ball, G.E. and H.V. Danks (eds). 1993. Systematics and entomology: diversity, distribution, adaptation and application. Mem. ent. Soc. Can. 165. 272 pp.

Insects of the arctic

A long-standing project on insects of the arctic, which help to define the Canadian fauna and its adaptations, has produced a major book and other attempts to increase work and profile for arctic invertebrate biology, including a workshop led by R.A. Ring and H.V. Danks in 1990. More recently, an active project on insects of the northern mainland included a 2003 symposium on the Canadian arctic, organized by D.J. Giberson and D.C. Currie, which treated especially results from recent expeditions to the Horton River, the Northwest Territories and the Thelon River.

Workshop. 1990. BSC Workshop on Arctic Invertebrate Biology. Entomological Society of Canada Joint Annual Meeting, Banff, AB.

Symposium. 2004. Insects of the Canadian Arctic Central Barrens. Entomological Society of Canada Joint Annual Meeting, Charlottetown, PE.

Arthropods of peatlands

Following a project on the aquatic insects, and recognizing the extent and importance of peatlands, their distinctive fauna and a lack of knowledge, several specialists agreed to contribute toward a symposium. This symposium on peatland arthropods organized by S.A. Marshall, with a variety of contributors, took place in 1991, and the proceedings were published in 1994.

Symposium. 1991. Terrestrial arthropods of peatlands. Entomological Society of Canada Joint Annual Meeting, Montreal, QC.

Finnamore, A.T. and S.A. Marshall (eds). 1994. Terrestrial arthropods of peatlands, with particular reference to Canada. Mem. ent. Soc. Can. 169. 289 pp.

Invasions and reductions

Early on the Survey recognized the importance of the topic of introduced insects, and an extensive workshop (with 11 presentations), organized by S.A. Marshall, took place in 1993. Although no focussed project emerged from these examinations, a specific project on lady beetles was established in 2002. The Survey also recognized the need for wider consideration of invasions and reductions in the fauna, including a symposium that would aim at some scientific synthesis. Such a symposium is being organized by D.W. Langor for 2006.

Workshop. 1993. Invasions and reductions in the Canadian insect fauna. Entomological Society of Canada Joint Annual Meeting, Sault Ste Marie, ON.

Symposium. 2006. [Invasive species.] Planned for November in Montreal.

Arthropods of Canadian forests

The Survey has been interested for many years in developing a project on boreal arthropods, and has published synthetic information in this area. More recently a newslettter was established and other initiatives undertaken, including a 2005 symposium on the maintenance of forest bidiversity, organized by D.W. Langor and J.R. Spence. Papers from that symposium are being prepared for publication.

Symposium. 2005. Maintaining arthropods in northern forest ecosystems. Entomological Society of Canada Joint Annual Meeting, Canmore, AB.

Langor and Spence (eds). in prep. Maintaining arthropods in northern forest ecosystems.

Arthropods and fire

Given the great importance of fire in the boreal forest, in grasslands, and in other Canadian habitats, the Survey held a symposium, organized by R.E. Roughley, at the entomological societies' meeting in 2005. The possibility of publishing some of these papers, supplemented by other synthetic material about the effects of fire on arthropods, are being investigated.

Symposium. 2005. Arthropods and fire. Entomological Society of Canada Joint Annual Meeting, Canmore, AB.

Other workshops

The BSC has also been involved in organizing workshops on other topics in conjunction with or on behalf of other organizations. These include a workshop on beetle identification, organized chiefly by R.S. Anderson, and a workshop for EMAN (Ecological Monitoring and Assessment Network) on biodiversity procedures, organized by the Survey Secretariat and others.

Workshop. 1995. Adult beetle identification workshop (joint workshop with the Canadian Museum of Nature, Agriculture Canada, and the Canacoll Foundation), Ottawa, ON.

Workshop. 1999. Procedures for monitoring biodiversity (with the Ecological Monitoring and Assessment Network, Environment Canada), Ottawa, ON.

The Quiz Page

—test your knowledge of Canada and its fauna—

1. What is the highest waterfall in Canada?

2. How long is Canada's coastline?

3. What are fire beetles?

4. Is the fourlined leafroller confined to Canada?

5. What are the both the causative pathogens and the vectors of the following diseases that are transmitted by arthropods in Canada?

   a. Babesiosis

   b. Colorado Tick fever

   c. Lyme disease

   d. Rocky Mountain spotted fever

   e.Tularemia

   f. Western Equine Encephalitis

   g. West Nile Disease

[Answers on p. 25]

Ensuring the safety of Biological Control in Canada

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Biological control is a cornerstone of pest management in many parts of the world. Use of entomophagous and phytophagous arthropods as biological control agents has resulted in important successes in reducing damage from pest species in a variety of manipulated systems and biological control has great value in sustaining environmental health, particularly through reductions in pesticide use. These attributes indicate that use of biological control agents will continue and even grow. However, debate is increasing on the need for greater regulatory oversight of biological control agents, including entomophagous species.

Expanded global trade has resulted in an astounding increase in the numbers of non-native species establishing in new habitats. Invasive alien species are responsible for estimated annual losses of US$55-248 billion to worldwide agriculture (Bright 1999). More difficult to assess are environmental costs due to habitat loss or species extirpation or extinction caused by invasive alien species (Parker and Gill 2002). Biological control is an important strategy for combating invasive alien species and it has been viewed as being 'environmentally friendly' for more than 100 years. However, during the last decade as science and society have become increasingly aware of the importance of biodiversity to human well-being, a less positive view of biological control, particularly in island environments, has emerged especially with the introduction of generalist predators and non-specific herbivores (Howarth 1991; Simberloff 1992). This perspective is based on non-target/unintended impacts and has stimulated much debate (e.g., Follett and Duan, 2000; Louda *et al.*, 2003; Schick *et al.*, 1996; Wajnberg *et al*. 2001). There is now a growing consensus that **all** deliberate introductions of non-indigenous species should be subject to impact risk assessment (Wittenberg and Cock, 2001). Furthermore, regulations for biological control agents "... are needed to provide clear guidance as to what introduction can be made legally and to define procedures to resolve any conflicts of interest that may arise." (Van Driesche and Bellows 1996). As Mason and Kuhlmann (2002) concluded, it is clear that regulations for biological control agents are necessary not only for the preservation of biodiversity but for the protection of biological control as a pest management strategy. Messing (2000) suggested that regulations would also help allay some of the concerns about introductions of exotic species that result in exaggerated estimation of the risks in doing so. International and regional plant protection organizations have provided guidance on information requirements and important efforts are being made to ensure that legislation implemented for safety will facilitate rather than impede biological control (Mason et al. 2005).

Canada has been a world leader in responding to the need to better scrutinize biological control agents. Since the early 1990's phytophagous biological control agents have been regulated by the Canadian Food Inspection Agency (CFIA). Regulation of entomophagous biological control agents was implemented in the late 1990's, also by the CFIA. Biological control agents in Canada are regulated through the Plant Protection Act (PPA) of 1990 (Department of Justice Canada

2005). In accordance with this Act, an import permit is required for importations of all exotic arthropods into Canada. Conditions attached to the permit may include such restrictions as 'for experimental use in a containment facility only'. Permits are generally valid for a 3-year period and are renewable. The permitting process is based on the provision of information relating to the source, the organism and the end-use (destination). Entomophagous biological control agents are regulated under the PPA with respect to their potential to be indirectly injurious to plants, because plant pests are loosely defined under the Act (Parker and Gill 2002). Furthermore, commercial entomophagous agents are regulated in a similar manner to classical agents and those species with a history of importation without negative effects are generally admitted under permit.

For release of a classical biological control agent or a first release of a commercial biological control agent submission of a petition (based on the NAPPO standard) justifying the release is required. The petition is reviewed by experts and representatives of other agencies, including Environment Canada (EC) and the Pest Management Regulatory Agency (PMRA) and where feasible, provincial government representatives. Petitions for phytophagous agents are also reviewed formally by the USDA-APHIS Technical Advisory Group (TAG) and Sanidad Vegetal (Mexico). Petitions for entomophagous agents are sent to USDA-APHIS and Sanidad Vegetal for comment also. The review is carried out through a Biological Control Review Committee (BCRC) and depending on the comments, a recommendation is made for or against release to the regulatory entomologists of the CFIA who review all the comments and make a recommendation to the Director of the Plant Health Division (Fig. 1). The process generally takes about 6 months from submission to notification that release is approved or not approved.

The process has worked very well because recommendations are based on the scientific merit of the petition submitted, and although reviews are done mostly on a volunteer basis, these have been completed in a timely manner. This encourages compliance by practitioners and safety of the agents based on best available knowledge. While the future of using biological control agents will be that of greater scrutiny, appropriate regulation will ensure continuing effectiveness and increased safety.

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Howarth, F.G. 1991: Environmental impacts of classical biological control. Annual Review of Entomology 36, 485-509.

Louda, S.M., Arnett, A.E., Rand, T.A., and Russell, F.L. 2003. Invasiveness of some biological control insects and adequacy of their ecological risk assessment and regulation. Conservation Biology 17, 73-82.

Mason, P.G., and Kuhlmann, U. 2002. Regulations are necessary for biological control agents. IOBC/wprs Bulletin 25, 165-171.

Mason, P.G., Flanders, R.G. and Arrendondo-Bernal, H.A. 2005. How can legislation facilitate the use of biological control of arthropods in North America? Pp. 701-714. In Hoddle, R.G. (Compiler) Proceedings of the 2nd International Symposium on Biological control of Arthropods, Davos, Switzerland, 12-16 September 2005, United States Department of Agriculture, Forest Service, Morgantown, WV, FHTET-2005-08,Vol II..

Foottit, R.G., and Kuhlmann, U. 1999. Practical use of systematic and ecological analyses to determine non-target species for host-range testing of entomophagous biological control agents. IOBC, wprs Bulletin 22, 43.

Messing, R. 2000. The impact of nontarget concerns on the practice of biological control. In "Nontarget Effects of Biological Control" (P.A. Follett and J.J. Duan, Eds.), pp. 45-55. Kluwer Academic Publishers, Norwell, Massachusetts, USA.

NAPPO. 2002. Guidelines for Petition for Release of Exotic Entomophagous Agents for the Biological Control of Pests (RSPM # 12). http://www.nappo.org/Standards/OLDSTDS/RSPM12-e.pdf (last accessed Mar. 23 2005)

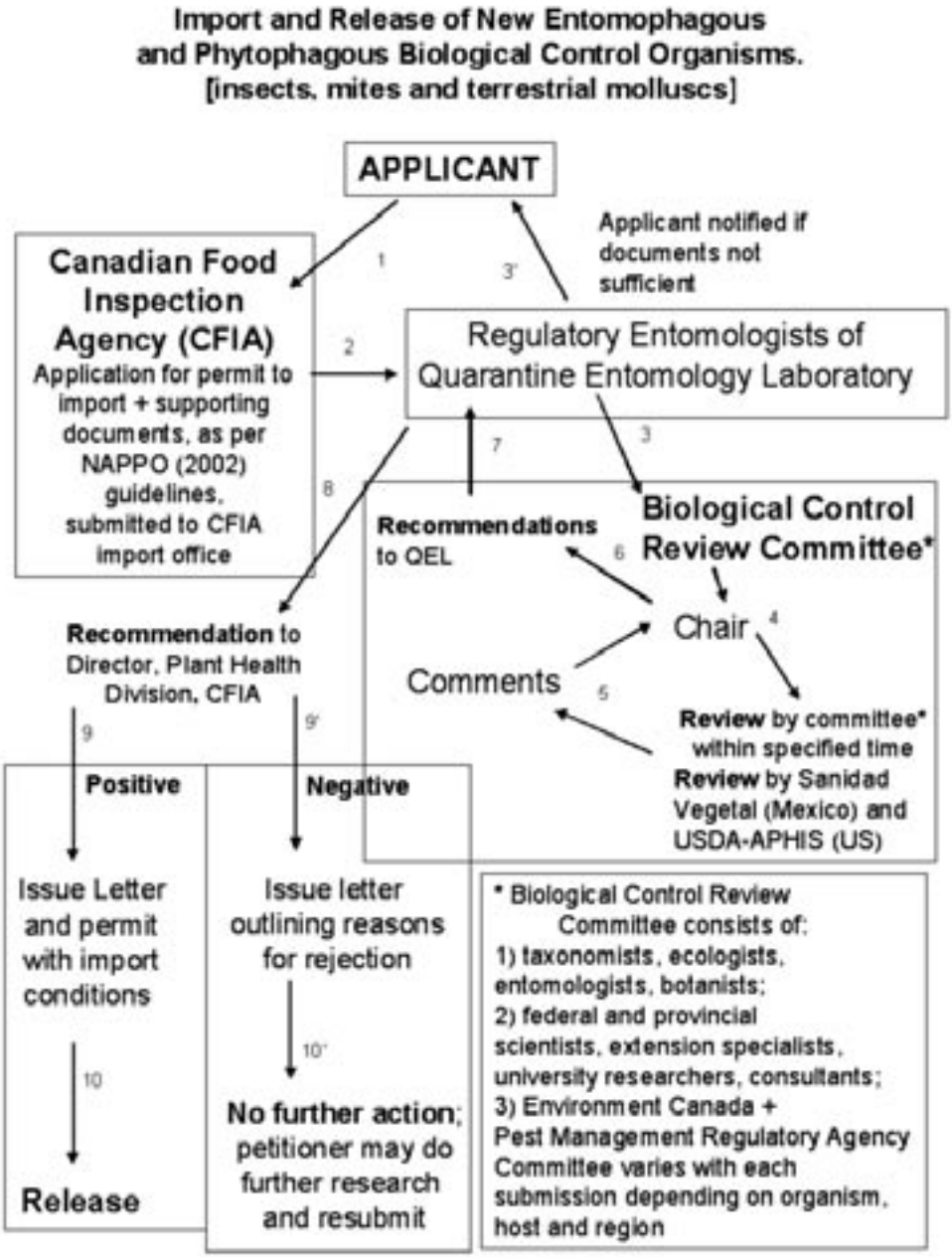

Figure 1. Canadian process for scrutiny of submissions for import and release of organisms for biological control. CFIA = Canadian Food Inspection Agency; CPQP = Centre for Plant Quarantine Pests; EC = Environment Canada; PHDP = Plant Health and Production Division; PMRA = Pest Management Regulatory Agency.

Parker, D.J. and Gill, B.D. 2002: Invasive species and biological control. In "Biological Control Programmes in Canada 1981-2000" (P. G. Mason, and J. T. Huber, Eds.), pp 1-4. CABI Publishing, Wallingford, Oxon, UK.

Schick, K., Eliason, E.A., Whittaker, P., Chenot, A., Riehle, M. and Voss, K. 1996: The United States has been negligent in regulating the importation, release, and use of generalist natural enemies. In "Environmental issues associated with enhancing the impact of biological control agents: A student debate" (F. Gould, G. Kennedy, and R. Kopanic, Eds.), pp 161-164. American Entomologist 42.

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Wittenberg, R. and Cock, M.J.W. (Eds.). 2001. "Invasive Alien Species: A Toolkit of Best Prevention and Management Practices". CAB International, Wallingford, Oxon, UK.

Web Site Notes

Arthropods of Canadian Grasslands Online

The annual newsletter *Arthropods of Canadian Grasslands* no longer appears in a printed format. Instead articles that might otherwise have appeared in the newsletter are posted on this web site. Submissions to date (http://www.biology.ualberta.ca/bsc/english/grasslandarticles.htm) include:

Beres, B. L., J. R. Byers, and H. A. Cárcamo. 2005. The wheat stem sawfly – a nursery tale from the shortgrass prairie

Henderson, D.C. 2006. Entomological opportunities in Grasslands National Park – an invitation

BioBlitz 2006

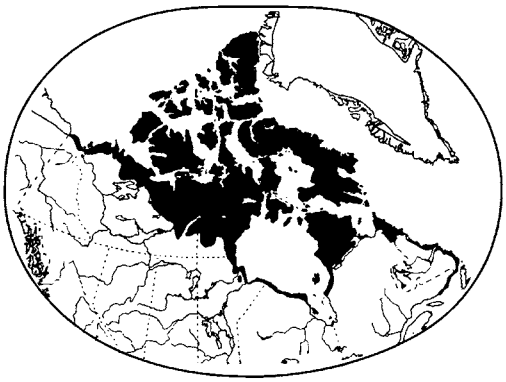
As noted on page 1 of this newsletter, the 2006 Biological Survey of Canada BioBlitz will be held in Gros Morne National Park, Newfoundland, July 5-10, 2006. For updates watch http://www.biology.ualberta.ca/bsc/english/bioblitz.htm.

Canadian Journal of Arthropod Identification

The Canadian Journal of Arthropod Identification will be launched this spring on the BSC web site. The e-journal will be devoted to the publication of richly illustrated guides to Canadian arthropods. The first submissions of digital keys and associated products that will contribute significantly to the identification of Canadian insects are now under review. The BSC anticipates that the new e-journal will soon grow into a major repository of user-friendly, up-to-date tools for the identification of the Canadian arthropod fauna. Look for an announcement of the launch soon on the Survey's home page: http://www.biology.ualberta.ca/bsc/bschome.htm.

New Look

The BSC web site will have an updated look this spring. Although much of the content will remain the same, the menu structure will be reorganized and simpler to follow.



ARCTIC CORNER

News about studies of arctic insects

Introduction

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

A preliminary assessment of Subarctic black fly diversity (Diptera: Simuliidae) in Norman Wells and environs, Northwest Territories

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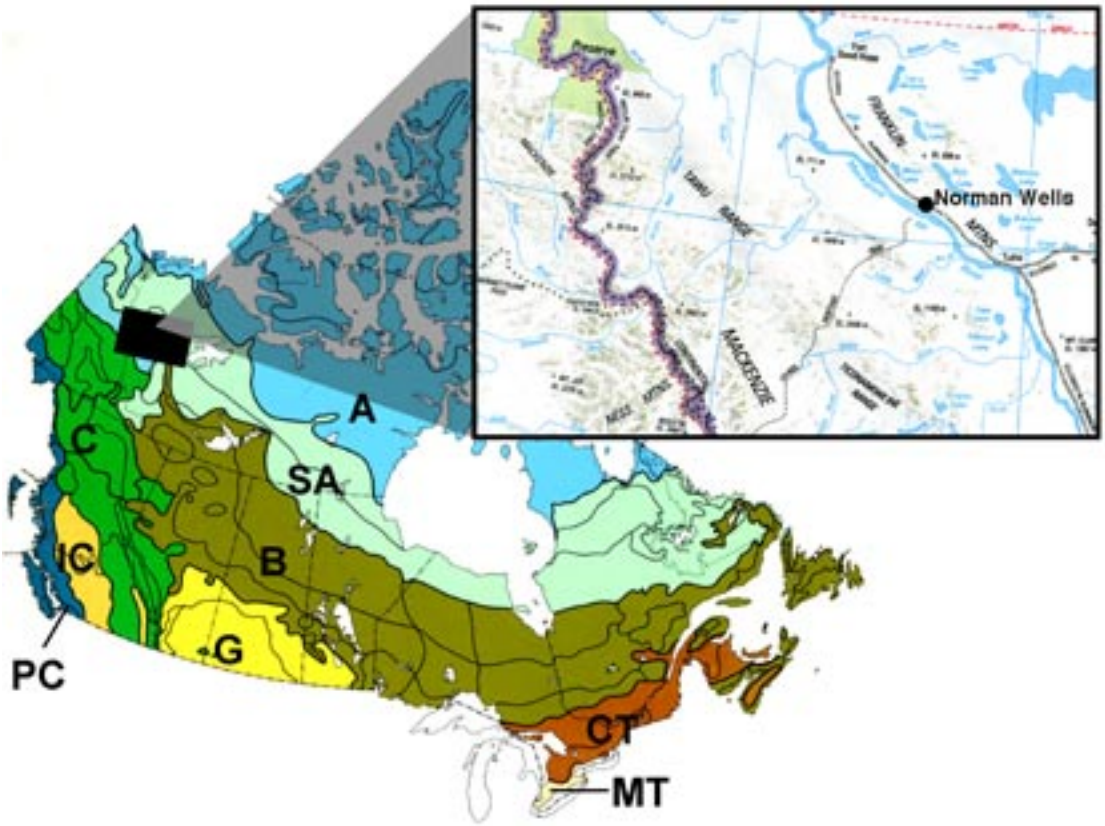
Introduction

The Biological Survey of Canada's current Insects of the Arctic project was initiated in 2000 to document entomological diversity in the vast and sparsely surveyed territory between the Mackenzie River and Hudson Bay. Led by Donna Giberson (University of Prince Edward Island) and Doug Currie (Royal Ontario Museum), a total of 4 expeditions have been conducted at strategic localities throughout the Canadian Central Barrens (Currie and Adler 2000, Currie et al. 2000, Currie et al. 2002, Giberson and Currie 2004, Giberson 2005). Although emphasis has been placed on particular target groups of insects — in particular the Ephemeroptera, Plecoptera, Trichoptera, aquatic Coleoptera, and Diptera: Simuliidae — a common pattern has emerged: that current knowledge about the diversity and distribution of Arctic insects is woefully inadequate. For example, the 43 species of black flies (Simuliidae) collected during just three expeditions nearly doubled the previous estimate for that family (22 species) for all of Arctic Canada east of the Mackenzie River. The current database of Arctic black flies provides a much sounder base from which to interpret biogeographical patterns.

A number of black fly species encountered during our Arctic surveys are exceedingly rare, being represented in North America by just a handful of collections. And one species in particular — *Simulium* (*Schoenbauria*) *giganteum* — is currently known in North America from just a single specimen collected near Arviat, Nunavut (Adler et al. 2004). Whether such "Arctic" species are truly rare, or are more abundantly represented in the Subarctic Ecoclimatic Region, is currently not known. Unfortunately, the Subarctic zone of Canada remains largely unsurveyed due to lack of roads and communities – the same problems that have traditionally plagued collecting efforts in Arctic Canada. In this respect, the Subarctic Ecoclimatic Region remains among the last frontiers of Canadian entomology. In this article I reveal what insights can be gained from just a single, brief, collecting trip to the Subarctic zone of the westernmost Northwest Territories.

Norman Wells and Logistics

Situated on the east bank of the Mackenzie River between the Mackenzie and Franklin Mountains, the town of Norman Wells is a hub for oil drilling and exploration in the western Northwest Territories. There is no road access except for a winter road that that connects the community with Wrigley to the south. For most visitors, access is available year-round by regularly scheduled flights from Edmonton. Accommodations are rather limited with only 3 hotels and a Bed and Breakfast listed for Norman Wells. It is recommended that you make your reservations well in advance as rooms can become scarce during the summer. The community has a small road network that extends for a short distance north and south along the bank of the Mackenzie River; and a longer road that extends some 10 kilometers east to Jackfish Lake in the Franklin Mountains. A rudimentary campground is situated at the terminus of the road, but its distance from Norman Wells perhaps renders this option untenable for the long run. To explore the region fully one must be prepared for backcountry travel, which requires either the assistance of a licensed outfitter, or the support of local government officials. I was fortunate enough to receive the latter through the generous support of Alastair Veitch, a wildlife biologist with the Northwest Territories Department of Environment and Natural Resources, Sahtu Region. In fact, it was Alastair who contacted me after having found a previous Arctic Corner article by me on the web. Although his main responsibility is to monitor wildlife populations and health in the Sahtu Region, he maintains a keen interest in all aspects of the ecology of the region. In fact, he has already started collaborations with other entomologists including Ross Layberry



The Ecoclimatic Regions of Canada, with an inset map of Norman Wells and environs. Abbreviations: A = Arctic; SA = Subarctic; B = Boreal; B = Grassland; CT = Cool Temperate; MT = Moderate Temperate; C = Cordilleran; IC = Interior Cordilleran; and PC = Pacific Cordilleran

(Lepidoptera) and Paul Catling (Odonata). At his invitation I visited Norman Wells twice in 2005 to survey black flies: once in late May to set up a Malaise trap and to collect immatures, and once again in late September to retrieve Malaise-trap samples and to give a series of presentations to students at the Mackenzie Mountain School.

Collecting

Although my Spring visit to Norman Wells was relatively short (3 days), I was able to maximize my collecting efforts by using various means of transportation. I easily surveyed most of the local streams — the breeding sites of black flies — by using a truck to navigate the drivable portions of the road network. Equally effective was the use of a boat to ply the Mackenzie River. The main channel was far too deep and swiftly flowing to make collections from the river itself, but the boat made it possible to visit a variety of smaller-sized tributaries at their confluence with the Mackenzie. Getting helicopter time was fortuitous as I was able to take advantage of an empty seat on a government-sponsored flight to the site of a fuel spill. The helicopter stopped at several sites along the affected waterway, and I was able to make collections of immature black flies at each stop. In addition to making collections of immature black flies, I set a Malaise trap along the margin of the Mackenzie River to capture adults of species that were inaccessible as larvae. A local student was hired to monitor the trap and to change the head once a week from late May until late September.

Preliminary results

Results presented here pertain only to the Spring collections as the May - September Malaise trap samples have yet to be analyzed. Eighteen collections of immature black flies were taken over a 3-day period in Norman Wells and vicinity. Morphological examination yielded 19 species or species-complexes divided among 6 genera as follows: *Helodon* (1), *Prosimulium* (1), *Greniera* (1), *Stegopterna* (1),

Sampling black fly larvae at the outlet of Jackfish Lake. (D.C. Currie)

Metacnephia (1), *Simulium* s.l. (14). Although most of the species or species-complexes could reasonably be expected in the Norman Wells area based on current knowledge of black fly distributions, at least two records stand out. *Simulium* (*Nevermannia*) *fionae* was previously known from New Brunswick to eastern Saskatchewan, south to Michigan, Pennsylvania and New Jersey. Its presence in Norman Wells indicates that *S. fionae* is much more widely distributed than previously supposed. Equally remarkable was the discovery of *Simulium* (*Psilozia*) *argus*, a species that was previously known to occur abundantly in western North America from southern British Columbia to southern Mexico. That such a widely distributed species could escape detection in the intensively surveyed area between southern British Columbia and northern Northwest Territories seems remarkable.

Discussion

The Canadian Subarctic zone is so sparsely surveyed that even a short, 3-day, collecting trip can provide dramatic new insights into the distribution and diversity of northern black flies. It is intriguing to ponder what might be revealed by a more intensive collecting effort, or by subjecting the known sibling-species complexes to cytological scrutiny. It is clear that much work remains to be done — not only in Norman Wells, but across

the entire Subarctic zone of Canada. The unsorted Malaise-trap samples will no doubt hold additional surprises, and they will also provide valuable new insights about the phenology and succession of large-river species of black flies. But the available collections represent only a fraction of the potential simuliid fauna from the western Northwest Territories. The Mackenzie Mountains, which rise directly across the river from Norman Wells, have never been subjected to a rigorous collecting program. This chain represents the easternmost boundary of Beringia, and unquestionably supports Beringian endemics that have yet to be recorded from the Northwest Territories. This fact alone is sufficient inducement to plan a return visit to Norman Wells in the near future.

Epilogue

Recent studies confirm that the rate of warming in the Arctic is twice the global average. Profound, and perhaps irreversible, changes are beginning to be documented as a change from arctic to subarctic conditions is underway, with a concomitant shift of more temperate-adapted organisms to the north (e.g., Grebmeier et al. 2006; Sturm et al. 2001). Insects have unparalleled potential to track ecological changes due to their reproductive capacity and sensitivity to changes in temperature; however, the current state of knowledge is so inadequate that it is difficult to assess what represents a 'change' and what represents the status quo. Additional baseline data on the Subarctic entomofauna are needed in order to track the changes that will inevitably influence the Arctic landscape. Anyone interested in conducting entomological research in the Norman Wells area is encouraged to contact Alasdair Veitch and his colleagues in the Department of Environment and Natural Resources. Their hospitality and generous assistance make any visit to the region worthwhile.

Thick layers of ice persist along the banks of the Mackenzie River after spring break-up. (D.C. Currie)

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Grebmeier, J.M., J.E. Overland, S.E. Moor, E.V. Farley, E.C. Carmack, L.W. Cooper, K.E. Frey, J.H. Helle, F.A. McLaughlin and S.L. McNutt. 2006. A Major Ecosystem Shift in the Northern Bering Sea. Science 311: 1461-1464.

Sturm, M., C. Racine, and K. Tape. 2001. Increasing shrub abundance in the Arctic. Nature 411: 546-547.

From the ASTIS database

The Arctic Science and Technology Information System (ASTIS) database contains over 58,000 records describing publications and research projects about northern Canada. ASTIS is maintained by the Arctic Institute of North America at the University of Calgary, and is part of the Canadian Polar Information Network.

Publications recently listed, with abstracts include:

2004 moth survey for southwestern Yukon
Schmidt, C. 2005. [Whitehorse, Yukon : Dept. of Environment], 15, 1, 2, 3 p. : ill., maps ; 28 cm.

As a directed effort to further document moths of limited geographic occurrence, an initial inventory of the southwestern Yukon was conducted in 2004. Survey efforts focused on habitats known to harbor species of limited occurrence, particularly sand dunes and low elevation grasslands / steppe. Alpine tundra was also surveyed, but to a lesser extent owing to the fact that many of the Beringian endemic species have a biennial life cycle and fly only in odd-numbered years (Lafontaine & Wood 1997). Although Yukon's boreal habitats are undoubtedly home to many species not yet documented from this territory, the boreal fauna is generally transcontinental in distribution, and survey work was not explicitly carried out to sample boreal habitats (although many of the species reported here for the first time from the Yukon are boreal species). One-hundred and twenty-two species were identified from the 2004 survey work, representing 13 families. Ten species are here considered to be of special interest, with a known distribution either entirely restricted to the Yukon, or having geographically disjunct populations in the Yukon. The only lepidoteran species currently thought to be restricted to sand dunes in the Yukon include several species of Gnorimoschema, found only in areas with active dunes. Twenty-seven species are reported for the first time from the Yukon. Owing to the lack of taxonomic information available for many of the lesser-known microlepidoptera, a number of species still await identification, and many of these species will also undoubtedly represent new records for the Yukon; only about 11% of the micro-moths expected to occur in the territory have been documented (Lafontaine & Wood 1997).

Xeric, rocky south-facing slope above the northwest shore of Kusawa Lake. (B.C. Schmidt)

Grammia sp. nr. *nevadensis*. Kusawa Lake, north shore YT. 27 June 2004. (B.C. Schmidt)

Conservation status assessment of the butterflies and skippers of Yukon
Guppy, C.S. and Kondla, N.G. 2005. Whitehorse, Yukon, NatureServe Yukon, [70] p.; 28 cm.

The National Accord for the Protection of Species at Risk, signed in 1996 by provincial, territorial and federal government Ministers

responsible for wildlife, states a commitment to prevent species in Canada from becoming extinct as a consequence of human activity. In the past, only selected species were evaluated, but the National framework for the Conservation of Species at Risk requires an evaluation of all wild species, which includes all species of fauna (invertebrate and vertebrate), and flora (vascular and nonvascular). The process provides a preliminary assessment (ranking) of species and subspecies that are Extirpated (Conservation Data Centre rand X), At Risk (S1, S1S2, S2), May be at Risk (S1,S2, S1S2, S1S3, S2S3), Sensitive (S3, S3S4), Not at Risk (S4, S4S5, S5, SZN, SZB, Introduced (SE) or Casual/Accidental (SA). This report provides the results, ranking criteria, methods and information sources of an assessment of al known species and subspecies of Yukon butterflies and skippers. Methods: We complied a completely updated checklist of the butterfly species and subspecies known to occur in the Yukon, based on literature sources ad our personal expertise. Published literature was cited as appropriate, and a full bibliography of literature relevant to the Yukon was compiled. For each taxon, we completed substantial ranking forms (Appendix 2) in accordance with the format, criteria and guidelines provided by Yukon NatureServe. The criteria and resultant subnational (Yukon) ranks follow as a largely verbatim quote from NatureServe. These are the criteria formerly used; the present criteria are much more complex and finely divided. Using the present criteria would have increased the complexity of the assessment process, increased uncertainties due to estimation, and not increased the quality of the final recommended status S-rank. Ranking Procedures: We applied the rating and ranking system (Section 2.2.) on the basis of (1) our extensive personal knowledge of Yukon butterflies, (2) professional judgment, and (3) available written information. As well, we have experience with butterfly conservation and resource management. We made a distinction between localized impacts and threats to a taxon at the provincial scale.

Yukon butterfly inventory, 2005

Kondla, N.G. 2005. Whitehorse, Yukon : NatureServe Yukon, 29 p. : ill., 1 map ; 28 cm.

This brief report summarizes the results of mostly-volunteer butterfly inventory work conducted for Yukon NatureServe in June and July of 2005. The purpose of the work was to: Search for additional new populations of 'at risk' butterflies as identified in Guppy and Kondla (2005), Provide additional distribution information for all butterfly taxa, Secure study specimens for DNA analysis and ongoing taxonomic review. This report only provides basic information and some highlights. A more robust analysis of the new information and its implications will only be possible when the specimens have had DNA analyzed, genitalic dissections are undertaken and phenotypic characters are scored as part of structured comparisons. Identification of some of the specimens will undoubtedly change when they are spread for study. A total of 59 unique locations were searched at least once. Some sites were searched more than once, for a total of 73 site/date combinations (sampling stations). Windy Pass in the Ogilvie Mountains was treated as one site even though collections were made at various locations along several kilometers of roadside. It was considered impractical to distinguish discrete sites in such a case of linear transects and the habitat was visually similar. A total of 1210 specimens were collected (see Appendix). These represent 51 nominal species, more than one half of the presently recognized butterfly species known from Yukon (Table 1). The Appendix provides an overview of the collections. A spreadsheet, which also includes geographic coordinates and brief habitat descriptions, is provided to the client as a separate digital file.

Selected Future Conferences

Organization	Date	Place	Contact
ENTOMOLOGICAL CONFERENCES			
Entomological Society of Canada	**2006,** 18-22 Nov.	Montreal, QC	with la Société d'entomologie du Québec; http://www.seq.qc.ca/
	2007, 30 Sept. - 3 Oct.	Saskatoon, SK	with the Entomological Society of Saskatchewan
	2008	Ottawa, ON	with the Entomological Society of Ontario
Entomological Society of America	**2006**, 10–14 Dec.	Indianapolis, IN	ESA, 9301 Annapolis Rd., Lanham, MD 20706-3115; meet@entsoc.org
	2007, 9-13 Dec.	San Diego, CA	ESA, see above
North American Forest Insect Work Conference	**2006**, 22-26 May	Asheville, NC	http://kelab.tamu.edu/NAFIWC06/
XII International Symposium on Trichoptera	**2006**, 18-22 June	Mexico City	http://www.ibiologia.unam.mx/barra/congresos/entomolo/index.htm
10th International Symposium on Tardigrada	**2006**, 18–23 June	Catania, Italy	http://www.tenth.tardigrada.symposium.unimo.it/
6th International Congress of Dipterology	**2006**, 23–28 Sept.	Fukuoka, Japan	http://apollon.nta.co.jp/6icd/perl/jouhou.pl?&mode=other&jouhou_id=1209
Conférence Internationale Francophone d'Entomologie	**2006**, 02-06 July	Rabat, Maroc	http://www.israbat.ac.ma/SemPub/cife6/circulaire2-cife6.htm
OTHER SUBJECTS (especially those relevant to Survey projects)			
North American Benthological Society	**2006**, 4–9 June	Anchorage, AK	http://www.benthos.org/Meeting/index.htm
Joint Annual Meeting of the Natural Science Collections Alliance and the Society for the Preservation of Natural History Collections	**2006**, 23-27 May	Albuquerque, New Mexico	http://www.nscalliance.org/
Eastern CANUSA Forest Science Conference	**2006**, 19-21 Oct.	Québec, QC	http://www.mrnf.gouv.qc.ca/ecanusa/
REGIONAL SOCIETIES			
Acadian Entomological Society	**2006**, 11-13 June	Kentville, NS	http://www.acadianes.org/

Answers to Faunal Quiz

[see page 13]

1. The highest waterfall in Canada is Della Falls, British Columbia, 440 metres high. [Although Niagara Falls is more famous, because it has a very large flow (estimated mean annual flow 6000 cubic metres per second) and is closer to human populations, its height is only 57 metres, placing it 12th among Canadian waterfalls.]

2. The coastline of Canada totals 202,080 kilometres in length, the longest coastline in the world.

3. Fire beetles are certain buprestids such as *Melanophila acuminata* that are attracted to the heat from forest fires and oviposit in fire-damaged trees. [Also, the term is used for various brightly coloured beetles, including fire-coloured species and tropical American elaterids with bright luminous spots].

4. Although the moth *Argyrotaenia quadrifasciana* occurs widely in North America, the name fourlined leafroller is used only in Canada, and in the United States the species is called the fourbanded leafroller.

5. The causative pathogens and the arthropod vectors are as follows:

    a. Babesiosis is caused by the protozoan *Babesia*, transmitted by *Ixodes* ticks

    b. Colorado tick fever is caused by an *Orbivirus*, transmitted by *Dermacentor* ticks

    c. Lyme disease is caused by the *Borrelia burgdorferi*, transmitted by *Ixodes* ticks

    d. Rocky Mountain spotted fever is caused by *Rickettsia rickettsii*, transmitted by ticks

    e. Tularemia is caused by the highly infectious bacterium *Francisella tularensis*, transmitted by ticks and other organisms

    f. Western Equine Encephalitis is caused by an *Alphavirus* transmitted by mosquitoes, chiefly *Culex*.

    g. West Nile Disease is caused by a *Flavivirus* transmitted by mosquitoes, chiefly *Culex*.

Quips and Quotes

If you can tell the difference between good advice and bad advice, you don't need advice.
(Anon)

Think today and speak tomorrow.
(Proverb)

Entities should not be multiplied unnecessarily.
(William of Ockham)

Winnow while the wind is blowing.
(Japanese saying)

Ideas are like rabbits. You get a couple and learn how to handle them, and pretty soon you have a dozen.
(John Steinbeck)

As a matter of fact

An unexpected fact is less readily absorbed than one which was expected.
(Norman F. Dixon)

The facts we see depend on where we are placed, and the habits of our eyes.
(Walter Lippmann)

People see only what they are prepared to see.
(Ralph Waldo Emerson)

Data will arrange themselves to fit preconceived conclusions.
(George E. Reedy)

We want the facts to fit the preconceptions. When they don't, it is easier to ignore the facts than change the preconceptions.
(Jessamyn West)

List of Requests for Material or Information Required for Studies of the Canadian Fauna 2006

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

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

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

(**denotes address reference; listed from p. 33)

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
1	Acari (free living and parasitic terrestrial and aquatic mites)	Anywhere, but especially subarctic and arctic Canada, Canadian grasslands	Berlese-Tullgren funnel extraction from subaquatic substrates, from grasses and sedges, and from bird and mammal nests, would be especially fruitful (preserve in 75% ethanol +5% glycerine).	V.M. Behan-Pelletier; E.E. Lindquist; I.M. Smith	1
2	Acari from family Uropodidae	Anywhere	Free living and parasitic terrestrial, preserve in 75% ethanol	C. Constantinescu	2
3	Adelgidae (conifer woolly aphids)	Anywhere	Preserve insects and bark, needles or galls in 70% ethanol. Specimen records and host plant records	R. Foottit	1
4	Aleyrodidae (whiteflies)	North America	Preserve insects and host plant material in 70% ethanol. Adults may be dried. Specimen records and host plant records. (Canadian National Collection deficient in all species, including pest species)	R. Foottit	1

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
5	Anthomyiidae	North America	Specimens with biological data (especially reared specimens) in the genera *Fucellia* (seaweed flies), *Chiastochaeta* (Trollius flies), and *Botanophila* in the wide sense (incl. *Pegohylemyia*) [of diverse life histories, including groups whose larvae are saprophagous, phytophagous (mainly stem-borers or seed-feeders) or fungivorous (especially on *Epichloe* parasites of grasses).	G.C.D. Griffiths	3
6	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	4
7	Aphididae (aphids)	Anywhere	Preserve in 70% ethanol. Specimen records and host plant records.	R. Foottit	1
8	Asilidae (robber flies)	North America	Pinned adults	R.A. Cannings	5
9	Braconidae	Anywhere	Pointed or in ethanol.	M. Sharkey	6
10	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	7
11	Butterflies (see also 33, 34, 35)	Arctic	Preserve papered or pinned (collecting / preserving information supplied on request) [for Alaska Lepidoptera Survey]	K.W. Philip	8
12	Cerambycidae	Canada and Alaska	Adults pinned or in ethanol, host plant data if available	D.B. McCorquodale	9
13	Ceratopogonidae	Anywhere in Canada	Send in fully topped-up vials of 70% ethanol. Reared material is especially valuable; provide type of substrate or habitat if material is reared.	A. Borkent	10
14	Cercopidae (froghoppers, spittlebugs)	Canada and Alaska	Specimens (preferably not in ethanol if possible), records and host records.	K.G.A. Hamilton	1

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
15	Chalcidoids, especially Eupelmidae	Holarctic	Incl. sweep-net samples (see also 42) (collect into ethanol). Reared material is especially useful.	G.A.P. Gibson	1
16	Chironomidae: *Larsia* (Tanypodinae)	Nearctic and Palearctic fresh waters	Reared material preferred but will accept all stages in ethanol or on slides.	B. Bilyj	11
17	Chironomidae: *Eukiefferiella*, *Tvetenia* (Orthocladiinae)	All areas, especially Ontario	Include sampling method, habitat information	W.B. Morton	12
18	Chrysomelidae (leaf beetles)	Anywhere, but especially in Canada	Mounted or unmounted and preserved in acetic alcohol (70 ethanol: 25 water: 5 parts glacial acetic acid). Include accurate (species level) host plant information.	L. LeSage	1
19	Cicadellidae (leafhoppers)	Canada and Alaska	Specimens (preferably not in ethanol), records and host records.	K.G.A. Hamilton	1
20	Coccoidea (scale insects)	North America	Preserve insect and host plant material in 70% ethanol. Specimen records and host plant records.	R. Footit	1
21	Cynipidae: insect galls from domestic and wild roses	Anywhere	Maturing to mature galls. Remove galls from plants and place in plastic bags. Try to segregate galls of different species. Preserve any emergents in 70% ethanol.	J.D. Shorthouse	13
22	Cynipidae: galls on oak	Anywhere	Collect mature galls (spring gen: most in June; autumn gen: late August – October) into plastic bags, separating gall species. Preserve emergents in 70% ethanol. Please note oak species (at least a guess at oak section - red or white oaks; leaf, bud and acorn samples also useful).	S. Digweed	14
23	Dermaptera: *Forficula auricularia* (perce-oreille européen / European earwig)	Amérique du Nord et autres régions si possible	A sec ou dans l'alcool	J.C. Tourneur	15

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
24	Diprionidae (diprionid sawflies)	North America	Living diprionid sawflies of any species, identified or unidentified. Record foodplant. Contact in advance about shipping.	L. Packer	16
25	Eupelmidae: *Anastatus*	North America	Reared materials with associated sexes are particularly important, regardless how few in number.	G.A.P. Gibson	1
26	Formicidae (ants)	Anywhere	Record type of habitat and nest site. Include brood if possible (preserve in ethanol).	A. Francoeur	17
27	Fungal pathogens of insects (esp. of deuteromycetes and ascomycetes)	Anywhere	Place any fungus-infected specimens in a vial. (Identification of the fungus available on request.)	D. Strongman	18
28	Halictidae (sweat bees) brown and black spp. only	North America	Particularly from blueberries. Pinned or preserved. Include flower record if available.	L. Packer	16
29	Hemiptera: Heteroptera (bugs)	Anywhere	Aquatic and semi-aquatic Heteroptera from acid waters (an indication of pH would be useful). Terrestrial Heteroptera from bogs. Preserve in ethanol.	G.G.E. Scudder	19
30	Insects on snow	Especially western mountains	*Chionea* (Tipulidae), *Boreus* (Mecoptera), Capniidae (Plecoptera): preserve in 70% ethanol.	S. Cannings	20
31	Isoptera (termites)	N. America incl. Mexico	Preserve in 75% ethanol; try to collect as many soldiers as possible.	T.G. Myles	21
32	Leiodidae (=Leptodiridae)	Northern forest and tundra areas; prairies and grasslands	Most easily collected by window traps or flight intercept traps; and car nets (Can. Ent. 124: 745, 1992) (collect into ethanol).	S.B. Peck	22
33	Lepidoptera (see also 11)	Arctic	For revisionary work on the holarctic fauna	J.D. Lafontaine	1
34	Lepidoptera	Manitoulin and surrounding islands	Records for use in monograph of the region. Information on old records from collections would be particularly welcome.	J.K. Morton	23
35	Lepidoptera	Areas not previously sampled in western Canada	Standard collecting methods	N. Kondla	24

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
36	Lygaeidae	Anywhere	Material can be collected in ethanol.	G.G.E. Scudder	19
37	Mallophaga	Anywhere	Preserve specimens in 70% ethanol; host species is extremely important.	T.D. Galloway	25
38	Microlepidoptera (excluding Pyralidae and Tortricidae)	North America, esp. west in dry/arid habitats and prairies (CNC deficient in all western species)	Include collecting method and time of day collected. Kill with ammonia fumes. Field-pin; instruction leaflet and field kit available on request.	J.F. Landry	1
39	Odonata (dragonflies)	North America	Include 2-3 word habitat description. Adults preferably in envelopes or papered, prepared by immersing in acetone for 24 hours, then dried; larvae in 70% ethanol.	R.A. Cannings	5
40	Odonata (dragonflies and damselflies)	Ontario, Northwest Territories, Nunavut, Canadian prairies	Dried quickly in paper or glassine envelopes with or without prior immersion of envelope in acetone for one day to retain colour. Include habitat and collection notes and numbers observed in pencil on envelopes. Larvae in 70% ethanol.	P.M. Catling	26
41	Opiliones (harvestmen)	Canada and adjacent states	Preserve in 75% ethanol, especially adults with notes on habitats.	R. Holmberg	27
42	Parasitic Hymenoptera	Anywhere	Including selected unsorted Malaise, suction, pan or pitfall trap collections (pan trap kits and instructions supplied free on request).	L. Masner	1
43	Phoridae	Anwhere; especially boreal	Collect into 70% ethanol: especially interested in Malaise trap samples from boreal forest.	B.V. Brown	28
44	Pipunculidae (bigheaded flies)	Anywhere; especially boreal	Adults can be pinned, pointed or preserved in ethanol.	E. Georgeson	29
45	Pseudoscorpions	Canada	Preserved in 90% ethanol is preferrred, please include collection information (method, habitat)	C. Buddle	30
46	Psyllidae	North America	Preferably preserve in glycerine or dried. Specimen records and host plant records	R. Foottit	1

	Material Requested	Areas of Interest	Collecting Methods, Notes	Name of Requester	**
47	Pteromalidae: *Pachyneuron*	North America	Reared materials with associated sexes are particularly important, regardless how few in number.	G.A.P. Gibson	1
48	Salticidae (jumping spiders)	Canada	Adult specimens preserved in 70% ethanol. Include habitat information, specific location of collection, collecting method.	D. Shorthouse C. Buddle	31 30
49	Scelionid egg parasites of Orthoptera	Anywhere	Especially from Grylloidea; preserve in ethanol.	L. Masner	1
50	Sciomyzidae	Anywhere	Preferably pinned	L. Knutson	32
51	Simuliidae (black flies)	North America, esp. western and northern species	Preserve larvae in Carnoy's solution (1 glacial acetic acid: 3 absolute ethanol). Reared adults with associated pupal exuviae preferred. Instructions available on request.	D.C. Currie	33
52	Siphonaptera (fleas)	Anywhere	Preserve specimens in 70% ethanol; host species is extremely important	T. D. Galloway	25
53	Solpugida (sun spiders)	Canada	Preserve in 75% ethanol, especially adults with notes on habitat.	R. Holmberg	27
54	Sphaeroceridae	Anywhere, esp. arctic or high elevations	Collect into ethanol. Acalyptrate fraction of trap samples welcomed.	S.A. Marshall	34
55	Symphyta (sawflies)	Boreal and arctic Canada	Larvae and adults collected by Malaise trap, sweeping, etc. (collect into 70% ethanol). Identify larval food plant as far as possible.	H. Goulet	1
56	Thysanoptera (thrips)	North America	(Preserve in 70% ethanol). Specimen records, habitat, host plant records where applicable.	R. Foottit	1

Cooperation Offered

a	Identification of groups of interest in return for a sample of duplicate specimens.	Most but not all of entries in list above.
b	Willing to sort material from certain residues, bulk samples, etc.	See entries 6, 15, 42, 55 above
c	Field kits or instructions available on request	See especially entries 38, 42, 51 above
d	Exchange of specimens	Several requesters, including entries 8, 39, 52 above.
e	Limited collecting in Coppermine area, N.W.T., if particular material required.	A. Gunn (address 35 below).
f	Caterpillars, larval sawflies, aphids and mites available on request from trapnests for solitary bees and wasps [and see *Am. Bee. J*. 2001, pp. 133–136, 441–444].	P. Hallett (address 36 below)
g	Insect material from grassland and adjacent habitats at Onefour, Alberta, is available for examination.	D.L. Johnson (address 37 below)

List of Addresses

1. Agriculture and Agri-Food Canada, Central Experimental Farm, KW Neatby Bldg., 960 Carling Ave., Ottawa, ON K1A 0C6
   V.M. Behan-Pelletier . . . . . behanpv@agr.gc.ca
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   I.M. Smith . . . . . smithi@agr.gc.ca
   R. Foottit . . . . . foottitrg@agr.gc.ca
   K.G.A. Hamilton . . . . . hamiltona@agr.gc.ca
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   L. Masner. . . . . (email n/a)
   H. Goulet . . . . . gouleth@agr.gc.ca

2. Natural History Museum of District Arges, Armand Calinescu Street, No. 44, Cod: 110047, Arges, Romania; cristinactinescu@yahoo.com

3. P.O. Box 1380, Athabasca, AB T9S 2B2; gcdgriff@telusplanet.net

4. Canadian Forest Service, 1219 Queen St. E., Sault Ste. Marie, ON P6A 5M7; kbarber@nrcan.gc.ca

5. Royal British Columbia Museum, P.O. Box 9815, Stn. Prov. Govt., Victoria, BC V8W 9W2; rcannings@royalbcmuseum.bc.ca

6. Department of Entomology, University of Kentucky, 5 - 225 Agricultural Science Center North, Lexington, KY 40546-0091, U.S.A.; msharkey@uky.edu

7. 482 Montée de la Source, Cantley, QC J8V 3H9

8. University of Alaska, Institute of Arctic Biology, P.O. Box 757000, Fairbanks, AK 99775-7000 U.S.A.; fnkwp@uaf.edu

9. Dept. of Biology, University College of Cape Breton, Box 5300, Sydney, NS B1P 6L2; david_mccorquodale@uccb.ca

10. 691 - 8th Ave., SE, Salmon Arm, BC V1E 2C2; aborkent@jetstream.net

11. 12 Westroyal Road, Etobicoke, ON M9P 2C3; biotax@interlog.com

12. 3 Woodridge Drive, Guelph, ON N1E 3M2;

13. Department of Biology, Laurentian University, Sudbury, ON P3E 2C6; jshorthouse@nickel.laurentian.ca

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15. Département des Sciences biologiques, Université du Québec à Montréal, C.P. 8888, Montréal, QC H3C 3P8; tourneur.jean-claude@uqam.ca

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17. Département des Sciences fondamentales, Université du Québec à Chicoutimi, 9555 boul. de l'Université, Chicoutimi, QC G7H 2B1; andre_francoeur@uqac.ca

18. Department of Biology, St. Mary's University, 923 Robie St., Halifax, NS B3H 3C3; doug.strongman@smu.ca

19. Department of Zoology, University of British Columbia,Vancouver, BC V6T 1W5; scudder@zoology.ubc.ca

20. NatureServe Yukon, Yukon Territorial Government, Box 2703, Whitehorse, YT Y1A 2C6; syd.cannings@gov.yk.ca

21. Faculty of Forestry, University of Toronto, 33 Willcocks, Toronto, ON M5S 3B3; t.myles@utoronto.ca

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23. Department of Biology, University of Waterloo, Waterloo, ON N2L 3G1; jkmorton@sciborg.uwaterloo.ca

24. P.O. Box 244, Genelle, BC V0G 1G0; colias@shaw.ca

25. Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2; terry_ galloway@umanitoba.ca

26. Agriculture and Agri-Food Canada, Research Branch, Wm. Saunder Bldg., Central Experimental Farm, Ottawa, ON K1A 0C6; catlingp@agr.gc.ca

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

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

30. Department of Natural Resource Sciences, McGill University, Macdonald Campus, 21,111 Lakeshore Road, Ste.Anne-de-Bellevue, QC H9X 3V9; chris.buddle@mcgill.ca

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33. Department of Natural History, Royal Ontario Museum, 100 Queen's Park, Toronto, ON M5S 2C6; dcurrie@zoo.utoronto.ca

34. Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1; samarsha@uoguelph.ca

35. Wildlife and Fisheries Division, Resources, Wildlife and Economic Development, Government of the Northwest Territories, Box 1320, Yellowknife, NT X1A 3S8; anne_gunn@gov.nt.ca

36. Department of Physiology and Zoology, University of Toronto, 144 Hendon Avenue, Willowdale, ON M2M 1A7; peter.hallett@utoronto.ca

37. Department of Geography, University of Lethbridge, 4401 University Drive West, Lethbridge, AB, T1K 3M4; dan.johnson@uleth.ca

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