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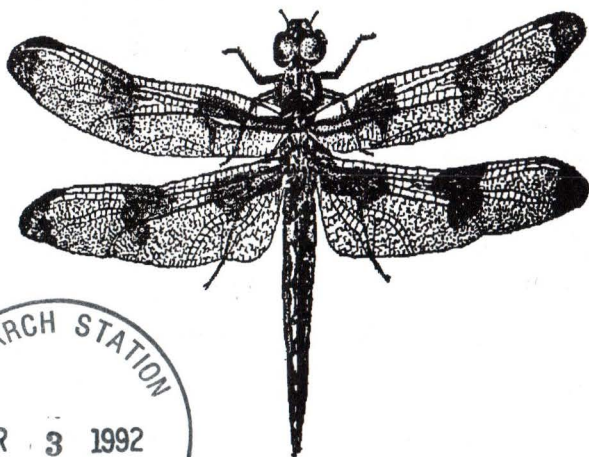
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# BULLETIN



**ENTOMOLOGICAL SOCIETY OF CANADA**  
**LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA**

ENTOMOLOGICAL SOCIETY OF CANADA  
LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA

BULLETIN

VOL 24(1) - March / mars, 1992

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Contributions and correspondence regarding the *Bulletin* should be sent to the *Bulletin* Editor.  
Faites parvenir vos contributions au *Bulletin* ou votre correspondance à l'Editeur du *Bulletin*.

Inquiries about subscriptions and back issues should be sent to the E.S.C. at:  
Pour renseignement sur l'abonnement ou les numéros passés, prière de s'adresser à la S.E.C.:

Entomological Society of Canada  
393 Winston Ave.  
Ottawa, Ontario  
K2A 1Y8

# GUEST EDITORIAL

## “Insect Rights”???

Invertebrates need love, too. That was the title of a recent news item in *Science* (255:27, Jan 3, 1992), and we can all understand the desire to preserve endangered insect species. Some people, however, have difficulty separating such worthy causes as preserving insects (dead or alive, as the case may be) from the question of “insect rights”, and their activities could result in regulation of our experiments.

I am a member of the Committee on Invertebrates of the Canadian Council on Animal Care. In December, we met in Ottawa to discuss the issue of guidelines for the use of invertebrates in experimental situations. Our work is in progress, but that does not preclude discussion within our Society, and your views are welcome.

The question is, should researchers refrain from placing invertebrates in situations that may result in stress and trauma? I think that the ethical arguments in this area have been misdirected towards the question of determining whether invertebrates, including the insects, “feel pain”. This interests me, but only because insects interest me. The answer is probably that they do not feel pain as we do, but even the alternative answer would not change my conviction that we must continue to subject insects to harsh experimental treatments in order to obtain the information we need to understand them. Relative to other matters, the possible “suffering” of insects is not a serious concern, and in my opinion nothing further needs to be done beyond ensuring our invertebrate subjects adequately supervised conditions of confinement and quick death for the survivors at the end of the experiment.

The catch that we encounter in debating the need for regulation arises from our tendency to group all invertebrates, from the lowly cnidarians and collembolans to the more complex cephalopods, into one set to which guidelines can be applied. My first reaction was to try to delineate some “special cases”, but I now feel that the only workable course of action is to exclude invertebrates from protection by a national committee, and to leave it to researchers and local committees to determine the particular methods of rearing and handling that are appropriate.

The CCAC has carefully addressed concerns regarding the treatment of vertebrates in research, as outlined in the document entitled “ETHICS OF ANIMAL INVESTIGATION”, but the terms in these guidelines have little meaning when applied to invertebrate care. Concerns for “physical comfort”, “psychological well being”, and “pain” do not apply. The statement that “cost and convenience must not take precedence over the animal’s physical and mental well-being” is absurd when applied to most invertebrate cases. What, for example, would be the optimum conditions of confinement to provide for the comfort of a housefly or an oyster? In many cases, the procedures mentioned in this document as being exceptionally invasive and requiring scrutiny, such as subjecting individuals to temperature extremes or confining them with predators, are the routine experimental treatments that must be applied in invertebrate research in order to increase scientific knowledge of their ecology and biology. There is no evidence of a need for analgesia of insects, and in most cases, application of analgesic medication would nullify the experiment. I therefore suggested at the recent committee meeting that the title of this CCAC document be changed to “ETHICS OF VERTEBRATE INVESTIGATION”. Such ethical concerns do not apply to experimentation with invertebrates. Period.

I think it is right that we leave ruling regarding the case of higher marine invertebrates, such as certain cephalopods, to the respective experts. Researchers certainly should not be required to justify the duration, intensity, or sample size of any experimental treatment applied to insects. Invertebrate

experimentation should continue without imposed ethical guidelines, and I am concerned that unless we avoid adopting regulation, we will waste time, money and talent on nit-picking issues (including, I suppose, the humane handling of nits).

There is also a problem with ad hoc guidelines in some school systems. I am aware of two cases in Alberta in which schoolchildren were told that neither insect collections nor displays of living insects would be acceptable in science projects, because the first involves killing and the second is somehow deemed to be inhumane. We would like to give the schools a clear signal that the methods of entomology are quite acceptable! Discouraging a budding entomologist (in fact discouraging any child), not causing the demise of some insects, is the crime.

What do you think? The opinions of entomologists, especially those with some experience in experimental research, would be helpful in guiding my arguments to the CCAC.

Dan Johnson  
Research Scientist  
Research Station  
Lethbridge, AB T1J 4B1  
Tel. (403) 327-4561  
Fax: 382-3156  
Agrinet LethRD::Johnson

## **SOCIETY BUSINESS / AFFAIRES DE LA SOCIÉTÉ**

### **Publications Committee**

Members are asked to note that there are two changes to "Instructions to Authors" for *The Canadian Entomologist* and the *Memoirs of the Entomological Society of Canada*. Changes are as follows:

1. Regarding taxonomic manuscripts and the placing of descriptions of new taxa in context:

*"When describing a new taxon (species or genus), authors are urged to place the taxon in proper context; provide a key, or a modified key, where possible."*

2. Regarding abbreviations of names of periodicals in the list of references of a manuscript (we currently use the "World List"):

*"The names of serials and periodicals cited in the list of references should be written out in full."*

A.B. Ewen  
Scientific Editor

## **Meeting Notices**

### **42nd Annual General Meeting**

The Annual General Meeting of the Entomological Society of Canada will be held at the Delta Bessborough Hotel in Saskatoon, Saskatchewan on September 29, 1992.

Matters for consideration for this meeting or for the Governing Board Meeting to be held at the Delta Bessborough Hotel in Saskatoon, Saskatchewan on September 26, 1992 (and, if necessary, on September 27) should be sent to the Secretary, Dr. Rick West.

### **42 Réunion Générale Annuelle**

La Réunion Générale Annuelle de la Société d'Entomologie du Canada aura lieu à l'Hôtel Delta Bessborough à Saskatoon, Saskatchewan le 29 septembre, 1992.

La Conseil de Direction sa réunira le 26 septembre, 1992 (et peut-être le 27 septembre) à l'Hôtel Delta Bessborough à Saskatoon, Saskatchewan. Tous sujets pour être considérés doivent être soumis au secrétaire, Dr. Rick West.

### **Executive Council Meeting**

The mid-term meeting of the Executive Council will be held at the Entomological Society of Canada Office in Ottawa on April 21, 1992. Matters for consideration at the meeting should be sent to the Secretary, Dr. Rick West.

### **Réunion de l'Exécutif-Conseil**

La réunion mi-semestre de l'Exécutif-Conseil aura lieu le 21 avril 1992 à Ottawa. Tous sujets pour être considérés doivent être soumis au secrétaire, Dr. Rick West.

Dr. Rick West, Secretary ESC  
Forestry Canada  
Newfoundland and Labrador Region  
P.O. Box 6028  
St. John's, Newfoundland  
A1C 5X8

Fax. 709-772-2576.

## President's Message

It seems no time at all since the annual meetings in Montreal, but I will take advantage of this opportunity to bring you up-to-date on the Society's affairs even though little has come to fruition in the interim. I have sent a letter along with the Resolution passed at the AGM concerning the sad state of affairs of Canadian systematic entomology to the Prime Minister, other relevant Ministers, Heads of government agencies, Directors of Museums and Presidents of Universities who have mandates for entomological studies and research. There have been no replies to date but I await with bated breath for the responses to flood in!

The book on *Diseases and Pests of Vegetable Crops in Canada* is almost ready to go to press. A printer has been selected, a translator for the French version has been chosen, and the joint CPS/ESC Marketing and Promotion Committee has been expanded with new members from both Societies. The revised schedule for the preparation of the book indicates that the English version should be printed some time in July 1992. I would like to take this opportunity to thank Lloyd Dosdall who has agreed to Co-Chair the CPS/ESC Marketing Committee along with Marilyn Dykstra (University of Guelph) of the CPS.

The CFBS continues to be active on our behalf. The Mid-year Board Meeting is being held in Toronto in late February, 1992. On the agenda is a full day "retreat" to discuss the structure and future of CFBS. Our representative at that meeting will be Jeremy McNeil and I expect we will have a report from him for publication in the June issue of the *Bulletin*. I would like to congratulate Bernard Philogene, an eminent member of both the ESC and the CFBS, on his ratification as Chair of the National Consortium of Scientific and Educational Societies, effective June 1992. The Consortium has an impressive list of member organizations (including CFBS) and acts mainly as a forum for the exchange of information on research and post-secondary education in Canada. We wish him well with this new and daunting task. CFBS has sent me a petition asking for our support for an initiative to promote a unified Canada - **Scientists for One Canada**. Personally I support the initiative and have asked Fiona to publish the information in this issue of the *Bulletin* so that you as members, acting within your own conscience, can support it or not as you choose.

I have talked with Peter Mason, Chair of the Organizing Committee for the up-coming meetings of the ESC and ESS in Saskatoon on 27-30 September, 1992, and have discussed the preliminary programme. The array of symposia, workshops and round table discussions that have been organized looks very interesting indeed and should give rise to some lively debate and discussion. We have agreed that the President's prizes for student submissions should be reinstated this year. I'd like to remind you that the 1993 annual meeting will be hosted by the ESO and will be held in Sault Ste. Marie.

The last volume on historical profiles of entomologists in western Canada, *Entomologists of British Columbia*, compiled by Paul Riegert and published jointly by the ESC and ESBC, has been printed and distributed to the membership of the ESBC. The remainder of ESC members should be receiving their copies soon.

Elsewhere in this issue of the *Bulletin* will be appearing: (1) a late call for nominations for the ESC Awards, (2) a summary of an M.Sc. thesis completed by Jill Johnson at the University of Guelph on the economic benefits of entomological research, and (3) a report from Gilles Boiteau, Chair of the committee established to examine the status of "Insect Transmission of Plant Diseases" in Canada.

These are just some of the issues being addressed by your current Executive Council. Other committees are pursuing their objectives and their reports will appear from time to time in future editions of the *Bulletin*. If you have any other issues which you would like to see discussed, please let me know. Have a happy and fruitful 1992.

Richard A. Ring  
President

### **Nominating Committee**

The following list of nominees for the offices in the Entomological Society of Canada has been received by the Secretary from the Nominating Committee.

Le Comité des nominations a soumis la liste des candidats suivants pour des postes de la Société d'entomologie du Canada.

#### *Second Vice President/Deuxieme Vice Président*

Les Safranyik  
Ian Smith

#### *Director-at-Large/Directeur*

Hugh Danks  
David Raworth  
Sandy Smith

#### *Fellowship Selection Committee*

Ed Becker  
Doug Eidt  
Ray Morris

Additional nominations must be signed by three members in good standing and received by **30 April 1992** by the Secretary:

S'il y a d'autres mise en candidature pour ces mêmes postes, celles-ci doivent être signée par trois membres de la Société et envoyée avant le **30 avril 1992** au secrétaire:

Dr. Rick West  
Newfoundland Forest Centre  
P.O. Box 6028  
St. John's, Newfoundland  
A1C 5X8  
Fax: (709) 772-2576

**Call for Nominations  
Achievement Awards Committee**

**Gold Medal for Outstanding Achievement in Canadian Entomology  
and  
The C. Gordon Hewitt Award**

Members of the Society are invited to nominate individuals whom they regard as eligible for these awards. Nominations should be sent in an envelope marked "Confidential" to the following address:

Achievement Awards Committee  
Entomological Society of Canada  
393 Winston Avenue  
Ottawa, Ontario  
K2A 1Y8

and should comprise: (1) the name and address of the nominee(s); (2) a statement of relevant achievements; and (3) the name of the nominator and at least one seconder. To be considered by the Achievement Awards Committee, nominations must bear a postmark no later than **April 30 1992**.

The following conditions govern these awards:

1. Outstanding contributions should be judged on the basis of
  - (a) superior research accomplishment either as a single contribution or as a series of associated endeavours and which may be either in entomology or a related field where the results obtained are of great consequence;
  - or
  - (b) dedicated and fruitful service in the fields of Society affairs, research administration or education.
2. No more than one of each award shall be granted per year but, where circumstances warrant, more than one individual may be mentioned in a single award.
3. Recipients need not be members of the Society providing their contribution is judged to have a major impact on entomology in Canada.
4. The award may be granted on different occasions to the same recipient but for different contributions to entomology in Canada.
5. Nominees for the C. Gordon Hewitt Award must be less than 40 years of age throughout the calendar year in which the award is both announced and awarded.



## Comité des décorations

### Médaille d'Or pour Contributions Exceptionnelle à l'Entomologie Canadienne et Prix C. Gordon Hewitt

La Société invite les membres à lui faire parvenir les noms des personnes qu'ils considèrent éligibles à ces deux prix. Veuillez envoyer vos nominations au:

Comité des décorations  
La Société d'entomologie du Canada  
393 Winston Avenue  
Ottawa, Ontario  
K2A 1Y8

dans une enveloppe portant la mention "Confidentiel". La nomination doit contenir: (1) le nom ainsi que l'adresse du (ou des) candidat(s) désigné(s); (2) un compte rendu des réalisations pertinentes; et (3) le nom du parrain et celui d'au moins une deuxième personne appuyant la mise en nomination. Pour être acceptées par le Comité les nominations devront porter un sceau postal d'au plus tard le **30 avril 1992**.

Les conditions suivantes régissent le choix des récipiendaires de ces prix:

1. Les contributions exceptionnelles devraient être jugées dans le contexte
  - (a) d'un accomplissement hors par en recherche, soit comme résultat d'une seule contribution ou d'une série d'efforts reliés, réalisés dans le secteur entomologique ou tout autre domaine connexe et ayant abouti à des résultats de grande valeur
  - ou
  - (b) de service dévoué et fructueux au profit de la Société, de l'administration de recherche, ou de l'éducation.
2. Chaque prix ne sera décerné qu'une seule fois annuellement, quoique, les circonstances le justifiant, plus d'une personne pourront collectivement devenir récipiendaires d'un prix.
3. Les récipiendaires ne doivent pas nécessairement être membres de la Société en autant que l'on juge que leur contribution a exercé un impact majeur sur l'entomologie au Canada.
4. Chaque prix peut être décerné à différentes occasions au même récipiendaire mais pour différentes contributions à l'entomologie au Canada.
5. Le candidat désigné pour le prix C. Gordon Hewitt doit être âgé de moins de 40 ans pour toute la durée de l'année au cours de laquelle le prix est annoncé et décerné.

## Canadian Forum for Biological Control

A workshop session has been arranged at the Annual Meeting of the Entomological Society of Canada, to discuss and approve plans for the proposed Canadian Forum for Biological Control. The proposed terms of reference for the Forum have been published in *Biocontrol News*; copies may be obtained from the address below. The workshop will be held on the morning of Wednesday, September 30, 1992, at the Delta Bessborough Hotel, Saskatoon. It will be open to those attending the ESC Annual Meeting, the Western Committee on Crop Pests, and all others interested in biological control. The program will include:

- Discussion and approval of terms of reference of the Forum
- Selection of contact persons for areas of biological control
- Poster session on biocontrol research projects

Abstracts of posters must be received not later than August 21, 1992. Abstracts, and requests for further details of the workshop, should be sent to:

R. Makowski  
Agriculture Canada  
PO Box 440  
Regina, Saskatchewan S4P 3A2  
Tel: (306) 780-7400  
Fax: (306) 780-7453

### Status of Entomological Research on Insect Transmitted Plant Diseases<sup>(1)</sup>

In 1988, the Science Policy Committee of the Entomological Society of Canada identified insect transmission of plant diseases as one of the neglected areas of entomological research. A preliminary inquiry led to the discovery that only two or three entomologists were presently or then working in the field. In late 1989, an ad hoc committee was formed and given the mandate to prepare a brief on the issue. The committee was asked to evaluate the status of entomological research in relation to the major problems faced by Canadian farmers and foresters, the impact on crop production, and the potential major research requirements.

Committee members were chosen to represent the various sections of the various geographical areas of Canada. Early discussions confirmed the lack of factual information with respect to insect vector research. It was then decided to survey the status of the research efforts in agricultural and forestry laboratories using a standard questionnaire. The questionnaire utilized can be found in Appendix 1. Each committee member was asked to contact 10 scientists in his area who were known to conduct or to have conducted insect transmission studies. Each contact was interviewed by phone and asked to provide factual information and opinions. Reports from each committee member were then produced and collated to produce this final report.

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<sup>(1)</sup> A brief prepared by the Insect Transmission of Plant Diseases Committee

A total of 39 scientists including committee members, participated in the survey. Almost one third of those were pathologists working in pathology laboratories or entomologists with professional training in pathology. The survey was addressed primarily to entomologists, but it would have been impossible to obtain a complete picture of research requirements in many regions without including some pathologists.

### Major Problems

One of the most important problems in Canada and world wide is likely to be the barley yellow dwarf virus of cereals and grasses transmitted by aphids. On cereals and forage crops, there are also problems with the streak mosaic viruses transmitted by mites, the aster yellows, the verticillium wilt transmitted by aphids, and other forage insects and a new rhabdo virus of winter wheat likely transmitted by leafhoppers. A variety of virus diseases of legumes and fruits were also reported as problems. These diseases are carried by aphids, leafhoppers, plant bugs, and thrips. On cucurbits, aphids transmit the cucumber mosaic virus and the potato virus Y. On legumes, a myco plasm is transmitted by leafhoppers. On onions, thrips transmit diseases such as OYDV. Thrips are especially important vectors of diseases in greenhouse crops. For example, they transmit the spotted wilt of tomatoes. On carrots, aphids can transmit a variety of luteoviruses and leafhoppers will transmit yellows. On potato, known and unknown species of aphids transmit non persistent viruses such as potato virus Y<sup>O</sup> and Y<sup>N</sup> and the persistent potato leafroll virus. On strawberries and raspberries, there are many virus diseases transmitted by unknown species of aphids or related insects. *Fusarium* species can be a problem in corn and the vectors are unknown. In forestry, the dutch elm disease is the best known and the most important. Beetles will transmit a variety of fungal and bacterial diseases. Two of these diseases are the lodgepole pine blight and the oak wilt. Hemiptera can transmit elm yellows, a disease caused by myco plasm.

### Impact of Problems

There are generally no precise data available but a lot of indications that losses are significant for many problems, as follows. The barley yellow dwarf virus is the most important plant disease worldwide but its estimated losses can vary widely within Canada from two percent on the average in oats, barley, and wheat but with greater losses during the years of widespread epidemic. On carrots, losses are around 1 percent for the early crop and up to 10 percent for the late crop. On cucumbers, losses average 5 percent. Potato virus Y in potato can cause up to 30 percent loss in the table commodity, but its impact on the seed potato industry can be much more significant. The recent introduction of the PVY<sup>N</sup> in eastern Canada has, for example, endangered the future of the seed potato exports towards the United States. In forestry, dutch elm disease reaches 65 to 80% incidence in Quebec alone.

### Current Status of Research

Research on transmission of plant diseases by vectors is not the priority any more. In the monitoring programs, the presence of vectors or suspected vectors initiates control on crops that begin the season virus free.

Today, we identify most agents of diseases without much entomological input and control the pathogen without the additional knowledge about transmission mechanics. In the 1950's and 1960's, entomologists and pathologists required vectors to identify many plant pathogens.

As a result, research on the biology and ecology of vectors or pathogens has become very limited. Entomology has not succeeded in taking advantage of the biotechnological developments and has been left out. Pathology has embraced biotechnological developments and become involved almost entirely in the development of detection techniques.

The mechanisms that result in observed vector-pathogen-plant specificity remain poorly researched. Important advances could be made using the molecular methods now available in conjunction with transmission studies. If more were known about the molecular basis of the specificity, production of transgenic resistance to specific viruses and to entire virus groups might be more effectively done.

With rare exception, we know little about what may be called the population dynamics or life cycle of plant viruses in nature. The effect of temperature in the field on symptom expression, pathogen latency, and availability to vectors is poorly known. However, those are important attributes of the rate of damage development and spread of pathogens.

The key to understanding and controlling plant diseases transmitted by insects is to go one step beyond simple monitoring of vectors. It is essential to consider insect transmitted plant diseases as the union of the population dynamics of the vector, the replication, and the cycle in physiology of the plant and the weather regime. This type of study, by its nature, can only be done by a team of researchers from various disciplines. The team members need not all be at the same location.

One member of the committee referred to this integrated approach as epiphytology of insect transmitted plant diseases. In fact, the introduction of new terminology, epiphytology, or other terms, might be quite helpful in bringing back to life this area of research involving many disciplines.

The movement of insects is one of the least well understood aspects of insect ecology. Our lack of understanding is partly caused by the practical difficulties of performing experiments over suitable areas. Many insect transmitted plant diseases become epidemic in Canada as a result of northerly movement of large numbers of vectors. This is the case with diseases such as barley yellow dwarf virus and potato leafroll virus. Similarly, there is a great deal of knowledge missing on the role of local population dynamics, micro scale weather, etc. These are only known well enough to explain the situation after the fact but not to forecast epidemics.

Pest control programs presently assume that all vector species are carrying the pathogen. The molecular methods have now been developed to detect the presence of virus in single vectors. Together, the use of these methods eliminates the need to assume that all vector species are carriers.

There is a need to do research in insect transmission of diseases. This can be best done through the cooperation of entomologists and plant pathologists working as a team to solve a problem or answer a question. Unfortunately, collaboration between individuals trained in different disciplines such as entomology and plant science is likely to remain exceptional. Most researchers are trained and hired for their individual abilities. The conditions of promotion and recognition for contributions to science favour individual efforts, not group effort. We have a structural problem both at training and research levels. Tendency now in government institutions is to contract out research which fractionates efforts, negates sustained programs, and exacerbates the problem. Textbooks tell us that integrated pest management is the way of the future. Monitoring advisory networks are encouraged. Is it possible for the institutions to follow?

## Training

Entomologists make naive pathologists and pathologists make naive entomologists. Could the problem be resolved by improving the training in the respective disciplines?

There was unanimous agreement that there is no need for new training programs in insect transmitted plant diseases in the entomology or the pathology curricula. The subject is covered adequately in general plant pathology or protection courses both helping agricultural and forestry levels. Many commented that there would be no point in training individuals since there are no positions available.

When considering this area of research, it is important to realise that the symptoms of disease are the most apparent part of the problem from the agricultural or forestry stand point. As a result, the issue has been one primarily for plant pathologists. The insect side of the problem is not as well recognised or perceived adequately.

Enrichment of plant pathology courses and economic entomology courses would seem to be of short- and long-term benefit for the two types of professionals and to their clients. Pathologists surveyed have commented that entomologists are entirely unaware of the basic fundamentals of pathogens and are interested only by the insect biology. On the other hand, entomologists have stated that pathologists neglect the important contribution of insect behaviour and dispersal to the epidemiology of plant diseases. This is somewhat supported by the statement of a plant pathologist that the life cycle and biology of most insect vectors are known and that, therefore, there is no need for further entomological contribution. Evidently, there is place for some bridging. As far as could be established, there is only one graduate course in vector entomology offered in Canada, at the University of British Columbia. The course is offered every other year and includes lectures on the full range of vectors and diseases. The content includes pathology, population dynamics, evolution, and transmission characteristics. Perhaps this course could be used as a model by other universities in other areas of the country.

## Publications

*The Canadian Entomologist* has published results of studies on the biology of vectors of insect transmitted diseases to agricultural and forest crops. The number has been limited. Most of our respondents considered the coverage of *The Canadian Entomologist* too large, too general, and poorly adapted. They would prefer to publish in a journal of horticultural research or plant pathology.

## Conclusion

Insect transmitted plant diseases cause major problems to the Canadian agricultural and forestry industries. The economic importance of most of the diseases has not been scientifically established. Plant pathologists have developed detection techniques that allow crop managers to control most of those diseases effectively with a minimum of information on the identity and/or number of vectors.

The field of insect transmitted plant diseases offers challenging studies for entomologists. The mechanisms by which insects acquire and transmit pathogens are almost entirely unknown. The ecology of insect dispersal is also understudied. With the increasing interest of agriculture and forestry for

sustainable development, it will become essential that mechanisms underlying pathogen transmission by insects be understood. The dominance of plant pathologists over entomologists in this field resulted partly from the absence of adequate training in biotechnology for entomologists.

The committee recommends that the entomology curricula be enriched by paying more attention to plant science and plant pathology and encourages the promotion of entomology in plant pathology departments to create an awareness of the complexity of vector-pathogen life systems. The agencies providing research funding need also to be made aware that plant disease epidemiology cannot be understood fully if it is only studied from the plant pathology angle.

#### Appendix 1 - Questions for the Phone Questionnaire

1. What proportion of your job is devoted to research? To extension?
2. What proportion of your research effort is devoted to:
  - a. Ecology of insect vectors of plant pathogens?
  - b. Epidemiological studies of insect vectored diseases?
  - c. Studies of disease transmission?
  - d. Control of diseases vectored by insects?
3. Is there anyone else at your establishment working on vectors of plant pathogens?
4. What are the major problems in your province or area regarding plant disease organisms vectored by insects (agricultural and/or forestry)?
5. What is the impact of insect transmitted disease in your province or area? Yield loss? Cosmetic effects?
6. Where have you published research related to insect transmission of disease organisms? Same trend for your colleagues?
7. What programs of control or extension education are provided in your area?
8. Where did you receive your training in the area of insect vectored plant pathogens?
  - a. By formal education? Location?
  - b. Through research establishments or workshops?
  - c. On your own?
9. Is there training available in your area? Should there be?

Report prepared by:  
Gilles Boiteau (Committee Chair), Agriculture Canada, Fredericton, N.B.  
Rick Butts, Agriculture Canada, Lethbridge, Alberta  
Lloyd Chiykowski, Agriculture Canada, Ottawa, Ontario  
Conrad Cloutier, Université Laval, Quebec, P.Q.  
Bryan Frazer, Agriculture Canada, Vancouver, B.C.  
Mark Sears, University of Guelph, Guelph, Ontario

**JOINT ANNUAL MEETING of THE ENTOMOLOGICAL SOCIETY OF CANADA and  
THE ENTOMOLOGICAL SOCIETY OF SASKATCHEWAN**

**Saskatoon, 27-30 September 1992  
Delta Bessborough**

**Saturday, 26 September 1992**

9:00 - 17:00 Board Meeting - E.S.C.  
20:00 - 23:00 President's Reception for the Board

**Sunday, 27 September 1992**

17:00 - 21:00 Registration  
19:00 - 20:00 Students meet the Board  
21:00 - 24:00 Wine & Cheese Reception

**Monday, 28 September 1992**

8:00 - 14:00 Registration  
9:00 - 12:00 Opening Ceremonies  
E.S.C. Awards  
Heritage Lecture  
10:00 - 17:00 Exhibits  
13:00 - 17:00 Symposium: "The Role of Entomology in Sustainable Agriculture" - K. Pivnick  
13:00 - 17:00 Poster Session  
19:00 - 21:00 Round Table: "Regulation of Natural Enemies for Use in Biological Control" - J. Laing  
19:00 - 21:00 Slide Show and Discussion: "The World of Nature - A Closer Look at Insects" - Tom Webb - Photographer

**Tuesday, 29 September 1992**

9:00 - 12:00 Workshop: "Integrated Pest Management of *Brassica* Crops" - G. Gerber  
9:00 - 12:00 Workshop: "Integrated Pest Management in Livestock Entomology" - T. Lysyk  
9:00 - 12:00 Scientific Communications  
10:00 - 17:00 Exhibits  
13:00 - 16:00 Workshop: "Economic Thresholds" - N. Holliday  
13:00 - 17:00 Scientific Communications  
16:00 - 18:00 E.S.C. Annual General Meeting  
18:30 Banquet

**Wednesday, 30 September 1992**

9:00 - 12:00 Forum: "Biological Control of Insects, Weeds and Diseases" - R. Makowski  
9:00 - 12:00 Workshop: "Aquatic Insects - What Makes a Good Environmental Impact Study?" - D. Lehmkuhl  
9:00 - 12:00 Scientific Communications  
9:00 - 12:00 E.S.S. Annual General Meeting  
12:00 - 15:00 E.S.C. Governing Board Luncheon Meeting

**For further information please contact:**

**Peter Mason (Chairman)**  
Agriculture Canada, Saskatoon Research Station  
107 Science Place  
Saskatoon, Saskatchewan S7N 0X2  
Tel: (306) 975-7014/Fax: (306) 242-1839

**Ken Pivnick (Scientific Program; Symposium: "The Role of Entomology in Sustainable  
Agriculture")**  
Agriculture Canada, Saskatoon Research Station

**Julle Soroka (Local Program)**  
Agriculture Canada, Saskatoon Research Station

**John Doane (Finance)**  
Agriculture Canada, Saskatoon Research Station

**Dennis Lehmkuhl (Workshop: "Aquatic Insects - What Makes A Good Environmental  
Department of Biology Impact Study?")**  
University of Saskatchewan  
Saskatoon, Saskatchewan S7N 0W0  
Tel: (306) 966-4408/Fax: (306) 966-4461

**Neil Holliday (Workshop: "Economic Thresholds")**  
Department of Entomology  
University of Manitoba  
Winnipeg, Manitoba R3T 2N2  
Tel: (204) 474-6024/Fax: (204) 275-0402

**George Gerber (Workshop: "*Brassica* Integrated Pest Management")**  
Agriculture Canada Research Station  
195 Dafoe Road  
Winnipeg, Manitoba R3T 2M9  
Tel: (204) 983-1460/Fax: (204) 983-4604

**Tim Lysyk (Workshop: "Integrated Pest Management in Livestock Entomology")**  
Agriculture Canada Research Station  
Box 3000, Main  
Lethbridge, Alberta T1J 2W1  
Tel: (403)327-4561/Fax: (403)382-3156

**John Laing (Round Table: "Regulation of Natural Enemies for Use In  
Department of Environmental Biology In Biological Control")**  
University of Guelph  
Guelph, Ontario N1G 2W1  
Tel: (514)824-4120/Fax: (519) 837-0442

**Roberte Makowski (Forum: "Biological Control of Insects, Weeds and Diseases")**  
Agriculture Canada Research Station  
P.O. Box 440  
Regina, Saskatchewan S4P 3A2  
Tel: (306) 780-7402/Fax: (306) 780-7453



**RÉUNION CONJOINTE de LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA et de LA  
SOCIÉTÉ D'ENTOMOLOGIE DE LA SASKATCHEWAN**

**Saskatoon, 27-30 septembre 1992  
Delta Bessborough**

**Samedi, 26 septembre 1992**

9h00 à 17h00 Réunion d'affaires, conseil d'administration de la S.E.C.  
20h00 à 23h00 Réception de la Président pour le conseil d'administration

**Dimanche, 27 septembre 1992**

17h00 à 21h00 Inscription  
19h00 à 20h00 Rencontre des étudiants avec le conseil d'administration  
21h00 à 24h00 Réception de cocktails

**Lundi, 28 septembre 1992**

8h00 à 14h00 Inscription  
9h00 à 12h00 Cérémonies d'ouverture  
Décorations de la S.E.C.  
Allocution du héritage  
10h00 à 17h00 Exhibits  
13h00 à 17h00 Symposium: "Le Rôle d'Entomologie dans l'Agriculture Soutenable" -  
K. Pivnick  
13h00 à 17h00 Session de posters  
19h00 à 21h00 La table ronde: "La Régulation des Ennemis Naturels Utilisés en Contrôle  
Biologique" - J. Laing  
19h00 à 21h00 Présentation et discussion de diapositives: "Le Monde de la Native - Une  
Perspective des Insectes de Plus Près" - Tom Webb - Photographer

**Mardi, 29 septembre 1992**

9h00 à 12h00 Atelier: "La Lutte Intégrée des Insectes des Plantes Cultivée du Genre  
*Brassica*" - G. Gerber  
9h00 à 12h00 Atelier: "La Lutte Intégrée des Insectes de Bétail" - T. Lysyk  
9h00 à 12h00 Communications scientifiques  
10h00 à 17h00 Exhibits  
13h00 à 16h00 Atelier: "Les Seuils Economiques" - N. Holliday  
13h00 à 17h00 Communications scientifiques  
16h00 à 18h00 Assemblée générale annuelle de la S.E.C.  
18h30 Banquet

**Mercredi, 30 septembre 1992**

9h00 à 12h00 Forum: "Le Contrôle Biologique des Insectes, des Mauvaises Herbes, et  
des Pathogènes" - R. Makowski  
9h00 à 12h00 Atelier: "Les Insectes Aquatiques - Qu'est-ce qu'une Bonne Étude  
d'Impact Environmental?" - D. Lehmkuhl  
9h00 à 12h00 Communications scientifiques  
9h00 à 12h00 Assemblée générale annuelle de la S.E.S.  
12h00 à 15h00 Réunion de dîner, conseil d'administration de la S.E.C.

**Pour plus d'informations veuillez entrer en contact avec:**

**Peter Mason (Président)**  
Agriculture Canada, Saskatoon Research Station  
107 Science Place  
Saskatoon, Saskatchewan S7N 0X2  
Tel: (306) 975-7014/Fax: (306) 242-1839

**Ken Pivnick (Programme scientifique; Symposium: "Le Rôle d'Entomologie dans l'Agriculture  
Agriculture Canada, Saskatoon Research Station Soutenable")**

**Julle Soroka (Programme local)**  
Agriculture Canada, Saskatoon Research Station

**John Doane (Finance)**  
Agriculture Canada, Saskatoon Research Station

**Dennis Lehmkuhl (Atelier: "Les Insectes Aquatiques")**  
University of Saskatchewan  
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Tel: (306) 966-4408/Fax: (306) 966-4461

**Nell Holliday (Atelier: "Les Seuils Economiques")**  
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Tel: (204) 474-6024/Fax: (204) 275-0402

**George Gerber (Atelier: "La Lutte Intégrée de *Brassica*")**  
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Tel: (204) 983-1460/Fax: (204) 983-4604

**Tim Lysyk (Atelier: "La Lutte Intégrée du Bétail")**  
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Lethbridge, Alberta T1J 2W1  
Tel: (403)327-4561/Fax: (403)382-3156

**John Laing (La Table Ronde: "La Régulation des Enemis Naturel Utilisés en Contrôle  
Department of Environmental Biology Biologique")**  
University of Guelph  
Guelph, Ontario N1G 2W1  
Tel: (514)824-4120/Fax: (519) 837-0442

**Roberte Makowski (Forum: "Le Contrôle Biologique des Insectes, des Mauvais Herbes, et  
Agriculture Canada Pathogènes")**  
P.O. Box 440  
Regina, Saskatchewan S4P 3A2  
Tel: (306) 780-7402/Fax: (306) 780-7453

JOINT ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF CANADA AND THE  
ENTOMOLOGICAL SOCIETY OF SASKATCHEWAN

Saskatoon, 27-30 September 1992

REGISTRATION FORM

Check one: Regular  or Student

Name: \_\_\_\_\_ Title: \_\_\_\_\_  
Last First Initial

Address: \_\_\_\_\_

City: \_\_\_\_\_

Province/State: \_\_\_\_\_

Postal code: \_\_\_\_\_ Telephone: \_\_\_\_\_ (FAX): \_\_\_\_\_

Registration, fees, figures are in \$ Cdn (including banquet ticket and G.S.T.). Late registration (after 15 August 1992) add \$15.00 to each fee. Please make cheques payable to "1992 ESS/ESC Joint Meeting".

Registration, regular	\$100	_____
Registration, student	\$60	_____
Registration, accompanying	\$50	_____
_____		
Name of accompanying person	TOTAL	_____

ACCOMODATIONS: A limited number of rooms have been set aside at the Delta Bessborough Hotel for the conference. Rates for those making reservations prior to August 28, 1992 are as follows: single or double occupancy \$75. Please make your own reservations through: Delta Bessborough, 601 Spadina Crescent East, Saskatoon, Saskatchewan, Canada S7K 3G8 Telephone: (306) 244-5521 Reservations: 1-800-268-1133 (toll free).

Please return this form and registration fees to:

Dr. J. Soroka  
Joint Meeting 1992, E.S.C.-E.S.S.  
Agriculture Canada Research Station  
102 Science Place  
Saskatoon, Saskatchewan, Canada, S7N 0X2

RÉUNION CONJOINTE DE LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA ET DE LA SOCIÉTÉ  
D'ENTOMOLOGIE DE LA SASKATCHEWAN

Saskatoon, 27 - 30 septembre, 1992

FORMULAIRE D'INSCRIPTION

Indiquez: Régulier  ou Etudiant

Nom: \_\_\_\_\_ Titre: \_\_\_\_\_  
nom de famille prénom initiales

Adresse: \_\_\_\_\_

Ville: \_\_\_\_\_

Province/Etat: \_\_\_\_\_

Code postal: \_\_\_\_\_ Téléphone: \_\_\_\_\_ (FAX): \_\_\_\_\_

Frais d'inscription en \$Can. (Incluant les frais de banquet et de la T.P.S.). Inscription tardive (après le 15 août 1992) ajoutez \$15.00. Prière d'écrire les chèques au nom de: "1992 ESS/ESC Joint Meeting".

Frais d'inscription, régulier \$100 \_\_\_\_\_

Frais d'inscription, étudiant \$60 \_\_\_\_\_

Frais d'inscription, conjointe \$50 \_\_\_\_\_

\_\_\_\_\_ Nom du conjointe TOTAL \_\_\_\_\_

**LOGEMENT:** Un nombre limité de chambres ont été réservées à l'Hôtel Delta Bessborough pour la réunion. Les taux pour ceux réservant avant le 28 Août, 1992 sont les suivants: occupation simple ou double \$75. Prière de faire vos réservations directement auprès de: l'Hôtel Delta Bessborough, 601 Spadina Crescent East, Saskatoon, Saskatchewan, Canada S7K 3G8 Téléphone: (306) 244-5521 Réservations: 1-800-268-1133 (sans frais).

Veuillez retourner ce formulaire ainsi que les frais d'inscription à:

Dr. J. Soroka  
Réunion conjointe 1992, S.E.C.-S.E.S.  
Station de Recherches, Agriculture Canada  
107 Science Place  
Saskatoon, Saskatchewan, Canada, S7N OX2

JOINT ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF CANADA AND  
THE ENTOMOLOGICAL SOCIETY OF SASKATCHEWAN

Saskatoon, 27-30 September

SUBMITTED PAPER, STUDENT PAPER AND POSTER PRESENTATION REPLY FORM

Please return to:

Dr. Ken Plvnick  
Joint Meeting 1992, E.S.C.-E.S.S.  
Agriculture Canada Research Station  
107 Science Place  
Saskatoon, Saskatchewan, Canada, S7N 0X2

Deadline: Postmarked on or before June 30, 1992

Title (not to exceed 15 words): \_\_\_\_\_  
\_\_\_\_\_

Author's Name(s): \_\_\_\_\_  
\_\_\_\_\_

Institution and Address: \_\_\_\_\_  
\_\_\_\_\_

To be presented by: \_\_\_\_\_

Abstract (not to exceed 50 words):

Form of presentation desired (check one):

Regular

President's Prize\*

Oral presentation of 12 minutes plus 3 minutes discussion

Poster Presentation

Projection Equipment: A Kodak Carousel projector and an overhead projector will be available for each session. Slides should be provided in a carousel. Please contact the program chairman if equipment is required.

\*Students are eligible for the President's Prize if they meet the following criteria: (1) They must be enrolled in a graduate degree program or have graduated from the program less than six (6) months prior to the meeting; (2) they must be registered at the Meeting; (3) they must be the principal investigator and sole author of the paper.

RÉUNION CONJOINTE DE LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA ET DE LA SOCIÉTÉ  
D'ENTOMOLOGIE DE LA SASKATCHEWAN

Saskatoon, 27 - 30 septembre, 1992

FORMULAIRE DE PARTICIPATION: COMMUNICATIONS ORALES RÉGULIAR ET ETUDIANT, ET  
COMMUNICATIONS POSTERS

Veillez retourner à:

Dr. Ken Plvnick  
1992 ESS/ESC Joint Meeting  
Agriculture Canada Research Station  
107 Science Place  
Saskatoon, Saskatchewan, Canada, S7N 0X2

Date limite: au plus tard le 30 Juin 1992

Titre (maximum de 15 mots): \_\_\_\_\_

\_\_\_\_\_

Auteur(s): \_\_\_\_\_

\_\_\_\_\_

Organisme et adresse: \_\_\_\_\_

\_\_\_\_\_

Présenté par: \_\_\_\_\_

Résumé (maximum de 50 mots):

Format de présentation (ne cocher qu'un choix):

Régulier    Le Prix du Président

Communication orale de 12 min. et de 3 min. de discussion

Présentation d'un Poster

Équipement audio-visuel: un projecteur Kodak pour diapositives de 35 mm et un rétroprojecteur seront disponibles à chaque session. Veuillez contacter le responsable du programme si vous avez besoin d'équipement additionnel.

Les étudiants sont éligibles pour le Prix du Président s'ils satisfont les critères suivants: 1) Ils doivent être inscrits dans un programme d'étude post-graduée ou avoir gradué d'un tel programme dans les six (6) mois précédent la Réunion Conjointe; 2) Ils doivent être inscrits à la Réunion Conjointe; 3) Ils doivent être le chercheur principal et le seul auteur de la communication.

## **Diseases and Pests of Vegetable Crops in Canada**

The proposed book, a joint publication of the Entomological Society of Canada (ESC) and the Canadian Phytopathological Society (CPS), should be available in English this summer and in French by year's end.

The manuscript, now in the final stage of editing, will be reviewed in its entirety by members of the ESC and CPS Steering Committees.

Author's changes will be accepted until March 31.

Printing and translation contracts should have been let by the time you receive this *Bulletin*.

A joint ESC/CPS Marketing Committee exists for this book. Its ESC Co-Chair is Dr. Lloyd Dosdall, Alberta Environmental Centre, Vegreville, Alberta. Please contact him for pre-publication information. Telephone: (403) 632-8211.

J.A. Garland  
ESC Steering committee, Chair

### **Report from the Entomological Society of Saskatchewan**

The 39th Annual Meeting of the Entomological Society of Saskatchewan was held in the Conference Room of the Canada Agriculture Research Station, Saskatoon, Saskatchewan, on 1-2 November 1991.

The Opening Session comprised a Symposium on the theme: *Biological Control Theory, Practices, and Problems*. Speakers included: Peter Harris - Regina Research Station (Biocontrol of Weeds); Peter Mason - Saskatoon Research Station (Biocontrol of Insects); John Doane - Saskatoon Research Station (Biological Control Projects of Field Crop Insects); Herb Cerezke - Northern Forestry Centre, Edmonton (Biological Control of Forest Insect Pests); Richard Dysart - U.S.D.A., A.R.S., Sydney, Montana (An Australian *Scelio* spp., a Candidate Grasshopper Biocontrol Agent).

Twelve scientific papers were presented, including "Polymerase chain reaction approaches to phylogenetic studies of grasshoppers" by University of Regina student Rick Martel, that won the best student paper award. The traditional post-session banquet was celebrated as a dinner featuring author Harvey Mawson, who delighted the audience with the reading of some of his western, cowboy-style poems.

One of the highlights of the meeting was the resplendent display of seven drawers of tropical insects - principally Lepidoptera - collected by John Kozial (see *Bull. Ent. Soc. Can.* **22**:34-38. 1990) in Costa Rica. It was an excellent reminder that the work of amateur entomologists deserves our unreserved encouragement and support.

The meeting in 1992 will be the 40th Annual Meeting of the Saskatchewan Society. It will be held in conjunction with the Annual Meeting of the Entomological Society of Canada in Saskatoon on 27-30 September 1992.

P.W. Riegert

# ARTICLES

## **The Canadian National Collection (CNC) of Insects and Arachnids: Past, Present and Future <sup>(1)</sup>**

P.T. Dang <sup>(2)</sup>

The Canadian National Collection  
of Insects and Arachnids  
Biological Resource Division  
Centre for Land & Biological Resources Research  
K.W. Neatby Building, Central Experimental Farm  
Ottawa, Ontario K1A 0C6

The Canadian National Collection of Insects and Arachnids is the national repository for these groups of organisms, with current holdings of well over 15,000,000 specimens, of which 80% are curated. Most specimens in the CNC are dry and mounted on pins. They are stored and systematically arranged in 1,200 well-sealed steel cabinets that hold 34,800 U.S. National Museum type drawers. Specimens of larvae, most aquatic insects, spiders, and many mites are in liquid preservative, mainly ethyl alcohol. They are stored in approximately 200,000 3-dram vials and in a large number of 250 and 450 ml jars which in turn are systematically arranged in steel cabinets designed for this purpose. There are significant CNC holdings of larval specimens of various orders, particularly Lepidoptera, Coleoptera, Diptera and Hymenoptera. Certain groups such as aphids, scale insects, lice, fleas, midges, mites, etc., and dissected body parts of studied specimens, mostly male and female genitalia, are mounted on microscope slides in Canada balsam, euparal, or Hoyer's medium. There are approximately 400,000 such slides which are systematically arranged and stored in wooden slide cabinets or slide boxes. The majority of specimens in the CNC represent the insect and arachnid diversity in Canada. Eighty percent of the species represented in the CNC are from the Nearctic region. The remaining species are from various other biogeographical regions.

The collection is located at the K.W. Neatby Building, Central Experimental Farm, Agriculture Canada, Ottawa.

### Historical Development of CNC

Historically, the CNC comprises two insect collections, one from the Department of Agriculture starting from 1887 and the other from the National Museum, presently known as the Canadian Museum of Nature containing collections dating as far back as 1883. The Museum collection was transferred to the Department of Agriculture in 1916 to make room for the House of Commons that had to occupy the Victoria Building temporarily, after the burning of the Parliament Buildings. The amalgamation of the two collections formed the National Collection of Insects, which has since remained under the custodianship of the Department of Agriculture.

The collection grew gradually reaching 4,000,000 specimens during the first 62 years. It started growing spectacularly in 1949, increasing to over 15,000,000 specimens during the next 42 years, correlated with a substantial increase in the number of entomological professionals (Fig. 1).

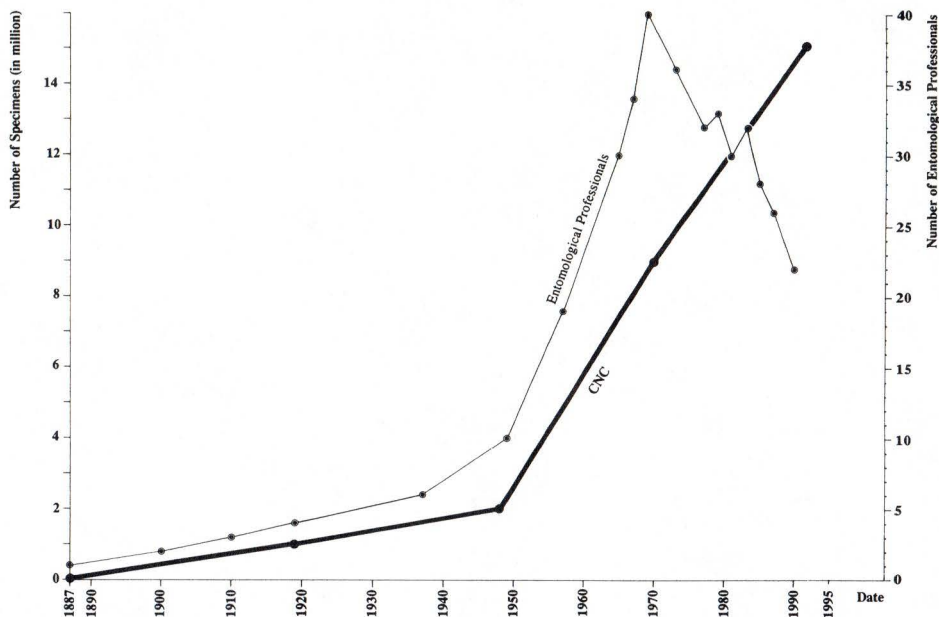
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<sup>(1)</sup> presented at the ESC Annual Meeting in Montreal, October 20-23, 1991.

<sup>(2)</sup> Chair, BRD Zoology Curatorial Committee



## DEVELOPMENT OF THE CNC



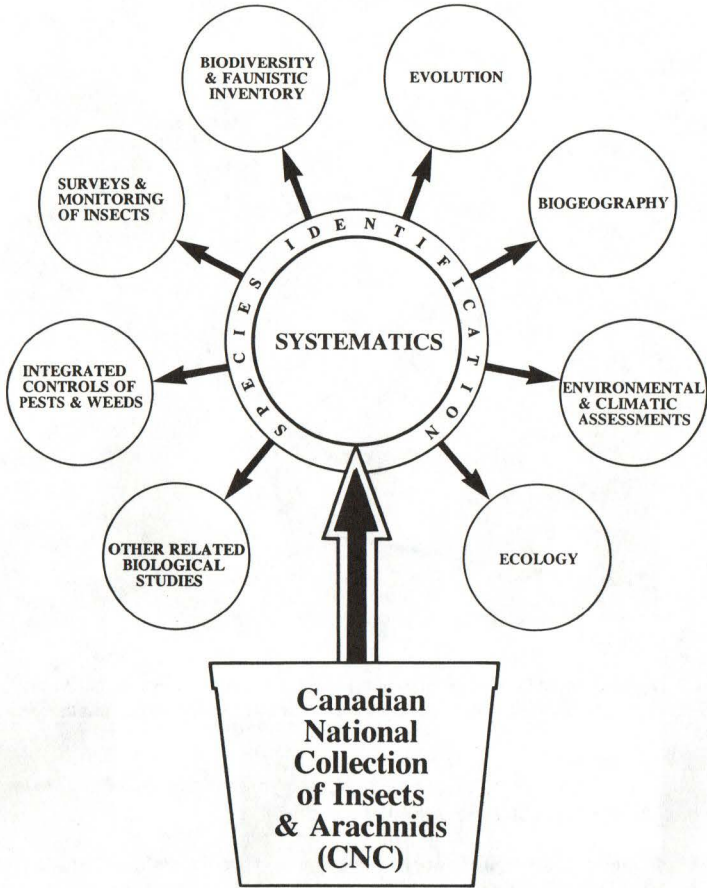
**Figure 1.** Development of the CNC in relation to the number of professional staff in the Biological Resource Division (formerly known as Entomological Research Institute, Biosystematics Research Institute, and Biosystematics Research Centre).

Currently, the CNC is ranked among the world's largest and best collections in terms of species representation, number of specimens and level of curation.

The development of the CNC has been funded mainly by Agriculture Canada. The following are important contributors to the CNC: (1) The entomological professionals of the Biosystematics Research Centre, formerly the Entomology Research Institute and the Biosystematics Research Institute, now known as the Biological Resource Division (BRD) of the Centre for Land and Biological Resources Research, have been the principal builders; (2) Forestry Canada has substantially contributed to the CNC since the mid 1930's both in person years and insect specimens collected across Canada, most of them reared by Forest Insect and Disease Survey personnel; (3) scientists from universities and other institutions in Canada and abroad; and (4) the general public has supported the CNC in the form of donations of specimens as well as actual funding; an excellent example in this case is the contribution of the CanaColl Foundation to the CNC. The CanaColl Foundation is a nonprofit private organization founded in 1973 to promote systematic research and to support development of the CNC.

### Uses

The CNC is a dynamic database for research in systematics, and is a reference base for identification of insects and arachnids upon which many biological fields depend (Fig. 2).



**Figure 2.** Role and uses of the Canadian National Collection of Insects and Arachnids. The chart here shows the Canadian National Collection as a flower pot that supports and feeds the root in order for the plant to develop and flourish; systematics comprises the main body, or the core, supporting other parts of the flowers which represent other biological fields. In other words, the CNC, as with other natural history collections, is the fundamental tool for biological research. It should be well maintained and developed for current and future use.

The CNC has been developed comprehensively to support agricultural research in a broad sense, and also research in other biological disciplines concerned with natural resources such as forests, freshwater systems and other environments, wildlife, and health of animals and people. The Department of Agriculture has had the implicit (although formally undocumented) national responsibility for developing the CNC to the present level, which benefits its own research programs as well as those of other agencies outside the Department. This fact has been well recognized and appreciated by entomological communities in Canada and abroad.

## Difficulties

Recently, the CNC has experienced difficulty in getting adequate support due in part to the fact that its breadth of importance and relevance to agencies beyond a narrowed concept of agriculture has been questioned by higher management within the Department. Besides a shortage of funds and other resources, there are various other factors that endanger the well being of the collection, even threatening its integrity:

(1) The status of the CNC as the national repository of insects and related arthropods in Canada has never been officially delegated to, and accepted as a responsibility by, the Department of Agriculture.

(2) As with all other natural history collections, the CNC supports research in systematics and in a number of related biological fields beyond the field of agriculture. This ability is a positive strength of the collection, however, it also creates problems for the collection itself, because Agriculture Canada wants to restrict the scope of the CNC to curb costs, and to some extent, to limit the space used to house the collection. As a result, the CNC is not encouraged to develop in areas unrelated to agriculture nor to develop collections from geographic regions outside Canada.

(3) Perception of the CNC by various levels of management in Agriculture Canada is an important factor. The decline in the number of entomological systematists in Agriculture Canada, from 1969 to date, suggests an unfavorable perception of systematic research by higher management, consequently affecting collection development (Fig. 1); note that strong collection growth continues due in part to a lag effect (continued processing of uncurated specimens) and more efficient collecting techniques in spite of substantial staff reduction. However, staff reduction will eventually adversely affect both the level of collection maintenance and growth. The recent amalgamation of the Biosystematics Research Centre with the Land Research Centre to form the Centre for Land and Biological Resources Research again potentially suggests another downward trend of support for systematic and faunistic research within Agriculture Canada. However, the new management team in the Centre for Land and Biological Resources Research has shown a positive attitude towards the CNC and an appreciation of its value as a fundamental research tool for systematics. One would hope that the future level of support for the CNC and research in systematics may recover, or at least stabilize at the present level.

The CNC has always been in a rather unstable and insecure situation, because it has had neither an official status, nor a well-defined role that its custodian is obliged to support. The problem began emerging as the CNC grew to world class level, and consequently, increased funding was necessary to support the maintenance and further development of the collection. Agriculture Canada has become more and more uneasy about the continued expenditure to maintain the CNC. In a recent review of the Biosystematics Research Centre instigated by Agriculture Canada, there is a telling statement with regard to the collection: *“...collections of insects that are not significant to Canadian agriculture should only be maintained if external sponsors to whom the insects are significant provide resources for its maintenance or maintain it themselves”*. This is a clear indication that the integrity of the CNC is being threatened.

## Remedies

In light of these difficulties, it is time for the scientific community in general, the entomological staff of the BRD and other interested parties in Canada, to actively seek constructive ways to help preserve and secure the integrity and the well being of the CNC. The Centre for Land and Biological Resources

Research is planning a workshop on systematics to be held in the Spring of 1992 in Ottawa, in which the CNC will be one of the issues to be discussed.

The following points that I consider very important should be tabled for consideration and implementation, so that the CNC will be secured in a new environment:

(1) The question, "Who owns the CNC?" has often been raised. The answer is obviously "the people of Canada". However, "Who is responsible for the CNC?" is actually the question of crucial importance here, because the custodian of the CNC has the task of maintaining and developing the collection. The custodian of the CNC therefore, should be formally designated.

(2) The status of the CNC, as the national repository of insects and arachnids, should be officially recognized by Agriculture Canada in conjunction with other interested departments and agencies.

(3) Funding and other support of the CNC from government departments and other establishments in Canada, which have special interests in the CNC, must be realized and formally agreed upon.

(4) A set of guidelines for the CNC, including (a) a statement of the official status of the CNC as the national repository of insects and related arthropods, and (b) a set of well-defined objectives and functions of CNC, should be developed and put in place.

(5) Recognized stakeholders of the CNC (contributors in point 3), should participate in initiating the guidelines in point 4, and co-sign a "Memorandum of Understanding" with regard to their mutual commitments to support the CNC.

I propose 3 reasonable options for the future of the CNC, the first two of which require official adoption and implementation of points 1 to 5 above:

(a) Agriculture Canada continues its responsibility as the custodian of the CNC, with cooperation and funding from various stakeholder departments, agencies and institutions in Canada.

(b) Agriculture Canada chooses to phase out its responsibility, and another custodian of the CNC is designated.

(c) A separate identity is given to the CNC, with direct funding from the federal government, and an autonomous management representing interested stakeholders.

## Conclusion

The CNC must remain as one entity to retain its full and integrated scientific value. Its integrity must not be permitted to be jeopardized because of short-termed vision. The CNC either remains with the Department of Agriculture, as its delegated custodian, or it goes to another custodian as one whole. Agriculture Canada has had the honour of being the custodian of this national scientific treasure for 75 years. It has been successful in developing the collection to the present world class level, and it should be encouraged and supported to continue this task. Having seen the difficulties that the CNC has encountered, it is only fair to say that now is the time for all parties that have major interests in the CNC

to join forces with Agriculture Canada in sharing financial and operational responsibilities to help maintain and develop this national database and treasure. It is unquestionable that the CNC has a role of utmost importance in biological research in Canada and the world. It is the responsibility of Agriculture Canada, the present custodian of the CNC, to initiate necessary arrangements and agreements with other Canadian establishments, in order to promote, and to obtain their support and participation in, the common efforts of maintaining and developing the CNC for the continued advancement of biological science.

## **The Economic Returns to Canadian Entomological Research: An Analysis of the Costs and Risk-Reducing Benefits <sup>(1)</sup>**

Jill Johnson  
Guelph University  
Guelph, Ontario

Entomological research plays an important role in the development of pest control practices. In 1987, the Canadian government supported about 150 person-years of entomological research at a cost of about \$35 million. With the current emphasis on the reduction of the federal deficit, a broad range of programs are under scrutiny. Since the benefits of research are an important criterion in the allocation of funds, it is important to know the impact of the research undertaken. Thus, this study was conducted to measure the impact of Canadian entomological research on agricultural production and to determine the distribution of benefits among producers and consumers.

In this study, entomological research is analysed as a risk-reducing and cost-saving input in agricultural production. The model used is a variation of the economic surplus approach which measures the producers' and consumers' benefits which are gained as a result of entomological research.

The study estimated the benefit-cost (B/C) ratio for six selected commodities over a five year period (1982-1987). Entomological research on fresh apples was estimated to produce benefits of \$12.6 million with a B/C ratio of 3.12. On processing apples, the benefits were estimated to be \$1.3 million with a B/C ratio of 1.65. The estimates for the beef industry showed benefits of almost \$6.4 million with a B/C ratio of 2.21. It was estimated that grain corn producers benefited by \$7.6 million with a B/C ratio of 2.84. On potatoes, benefits from entomological research were estimated at \$6.8 million with a B/C ratio of 1.54. On rapeseed, benefits from entomological research were estimated at \$10.2 million with a B/C ratio of 2.15. Entomological research on wheat was estimated to generate \$9.9 million of benefits with a B/C ratio of 2.35. The benefits gained from entomological research on these commodities totalled more than \$54.2 million. The consumers' group gained in all but two cases (grain corn and rapeseed), and even for these commodities the consumers' group broke even. The producers' group lost part of its surplus in the apple market with entomological research. For all the other commodities, the producers' group gained benefits. The costs of Canadian entomological research on these commodities totalled \$24.2 million per year and thus represents about 70% of the total cost of entomological research.

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<sup>(1)</sup> This is the Abstract for a Master's thesis in Agricultural Economics at Guelph University

# La Recherche Entomologique et la Politique

par

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## Introduction

La recherche entomologique s'est trouvée liée à la politique - c'est-à-dire aux lois du parlement, ses politiques et ses programmes - depuis ses modestes débuts, il y a plus de cent ans, jusqu'aujourd'hui. Nous croyons qu'à ce titre, elle a précédé toutes les autres activités de sciences biologiques qui furent par après supportées par le gouvernement fédéral. Les forces initiales de sa création et de son développement ont pris naissance dans la sagesse des autorités légitimes de l'époque qui avaient compris l'urgence d'enrayer les fléaux d'insectes qui ravageaient les fermes d'un bout à l'autre du pays. Depuis, la recherche entomologique a fait preuve de ses réussites au service des secteurs primaires des industries de la nation. Mais, sa croissance, son évolution et son développement ont connu des phases difficiles dues aux fluctuations budgétaires restreignant les recherches, leurs applications et même le moral des chercheurs. Au centre de l'interaction "politique-recherche" se situent les budgets du gouvernement canadien pour toutes les sciences, entomologiques ou autres. A cette fin, cette communication traitera de ce qui suit: (I) le support du gouvernement consacré au secteur R&D dans le passé et le présent; (II) la réaction de notre Société à la suite des restrictions budgétaires; (III) l'entomologie de l'avenir; (IV) la R&D au Canada dans l'industrie et le secteur privé; et (V) nos conclusions.

## I - LE SUPPORT DU GOUVERNEMENT CONSACRÉ AU SECTEUR R&D DANS LE PASSÉ ET LE PRÉSENT

### A - Un bref aperçu du passé

La recherche entomologique au Canada a été lancée très formellement par le gouvernement fédéral à l'occasion de la nomination du Dr James Fletcher comme "entomologiste honoraire" auprès du Ministère de l'agriculture du Canada le 1er juin 1883. Cette démarche était une reconnaissance officielle des grands besoins des pionniers de l'agriculture au Canada. Antérieurement, il y avait eu la formation de la Société d'entomologie du Canada en avril 1862. Ses documents officiels datent en fait du 26 septembre 1863. Aussi, à cette époque, le gouvernement d'Ontario avait sollicité de notre Société son expertise pour créer des moyens de défense propres aux cultures en Ontario. A cette fin, une subvention annuelle fut créée qui devait durer jusqu'en 1972. De 1884 jusqu'à sa mort en 1908, le Dr Fletcher a préparé des rapports annuels sur "Les insectes dommageables aux cultures" et suggéré des moyens de défense contre les insectes.

A la suite de l'adoption d'une loi en 1886 créant un premier réseau de fermes expérimentales, le Dr William Saunders, un entomologiste, en devint son premier directeur. Il organisa la recherche agronomique en cinq groupes de disciplines: a) Entomologie et Botanique; b) Grandes cultures et Zootechnie; c) Céréales; d) Chimie; e) Horticulture. Au cours des ans, des chefs entomologistes tels que Fletcher, Hewitt, Gibson, Swaine, Crawford, Prebble, Arnason, Holland, Glen, Smallman, LeRoux,

Cartier etc. ont à travers les méandres de l'administration réussi à recruter des équipes de chercheurs compétents, maintenir des budgets adéquats et à créer un esprit de corps remarquable chez les entomologistes.

Il y eut plusieurs réorganisations de 1900 à 1960 qui accentuèrent la compétition pour l'obtention de fonds et de ressources humaines à l'intérieur du Ministère. Inévitablement d'autres Ministères tels que la Forêt, les Pêcheries, la Faune, les Musées, l'Environnement, l'Énergie Mines et Ressources, la Santé nationale et le Bien-être, la Science et la Technologie, les Transports et un certain nombre de Conseils tels que le Conseil national des recherches, Science et Génie, Recherche médicale, Sciences sociales et Humanités et l'Énergie atomique au Canada se retrouvèrent tous dans l'arène des ressources gouvernementales consacrées à la R&D.

En conséquence, la recherche entomologique qui, de 1883 à 1914, avait pour ainsi dire accaparé tout le panier des ressources gouvernementales à elle seule, dut subir des réductions de budget, surtout de 1920 à 1940. Le support à la recherche s'est de nouveau accru au cours de la période 1940-1960 et connut un déclin de 1960 à 1980. Ces coupures résultaient généralement des changements de gouvernements et des nombreuses enquêtes sur le secteur R&D au Canada que les politiciens utilisaient pour justifier leurs décisions. Vous vous souviendrez d'un certain nombre que nous trouvons les plus pertinentes:

1. la Commission Massey de 1951
2. la Commission Glassco de 1962
3. le Groupe d'étude fédéral sur l'agriculture de 1969
4. le Rôle du gouvernement fédéral dans les subventions à la recherche dans les Universités canadiennes - (un rapport du Conseil des sciences) en 1969
5. le Rapport du comité du Sénat sur la politique des sciences (1972-73): rapport Lamontagne
6. le Rapport Neilsen (rapport D'Ailly sur la recherche agricole) sur les dépenses du gouvernement fédéral, 1984-85

D'autres rapports conseillant le gouvernement sur le secteur R&D continuèrent d'apparaître en nombres croissants et surtout au cours des années '70 et '80. Ils venaient de partout et se prononçaient sur les urgences nationales en R&D, Technologie et Éducation. Les scientifiques fédéraux ont vu leurs budgets diminuer et se sentirent pris dans une tourmente insensée et sans fin de remises en question aux mains d'une bureaucratie implacable: ce furent tour à tour le MESST, le Conseil du trésor, des comités ministériels et tout récemment un rapport préparé pour le Premier Ministre par un Groupe Conseil National sur la science et la technologie (GCNST).

## B - Le présent

Le rapport Lortie (GCNST) présenté au Premier Ministre en mai 1991 recommande encore une fois de "revitaliser la S&T dans le gouvernement canadien" et propose des changements fondamentaux et nocifs dans les systèmes de gestion de la R&D et des ressources humaines. Il y est question de mandats mieux définis, d'une administration moins bureaucratique et plus productive et de techniques de gestion améliorées. Le rapport voit dans la Fonction publique actuelle un système de gestion propre à une administration des ressources humaines en général et tout à fait impropre à la gestion de scientifiques et d'ingénieurs qui, comme vous en conviendrez, constituent une ressource hautement spécialisés pour la conduite des activités de S&T dans les organismes fédéraux. Il suggère la formation d'une "nouvelle

superstructure plus dynamique qui inclurait tout le système fédéral de la R&D''. Il y aurait:

- a) l'établissement d'Instituts de S&T en organismes distincts, un pour chaque ministère à vocation de recherche;
- b) ces Instituts seraient pourvus de systèmes de responsabilité de la gestion, d'évaluation, de mise en application et de budgets propres.

Le rapport voit ces changements mis en place dans les prochains cinq ans même si, comme vous vous en doutez bien, les dépenses de S&T doivent être gardées en deçà du taux d'inflation de 3% suivant les exigences du budget fédéral de février 1991.

Le rapport Lortie nous apparaît donc comme une tentative du gouvernement canadien de s'extirper d'un dilemme dans lequel il s'est inscrit dès son arrivée au pouvoir en 1984. A ce moment, en effet, le Premier Ministre voyait dans la R&D une des clés du développement du Canada. Il la situait au plus haut point de l'échelle des priorités de son agenda. Aujourd'hui, même si les projections du rapport anticipent un accroissement des dépenses en R&D du niveau actuel de 1.3% du Produit National Brut (PNB) vers un nouveau niveau de 2.5%, la situation continue d'évoluer en sens contraire puisque les statistiques les plus récentes des dépenses totales en R&D (DTRD) équivalent seulement à 1.295 du (PNB).

### C - Les intrigues politiques et l'allocation des ressources

On peut être assuré d'une chose lorsqu'arrive le temps des décisions dans les sphères politiques. C'est le pragmatisme de ceux qui doivent faire face aux demandes multiples provenant des Universités, de la Défense, de l'Habitation, du Bien-être etc. Est-ce qu'un kilo de science en plus rapportera plus de votes qu'un kilo de construction de routes? Ou alors, la biologie a-t-elle autant de valeur que la physique? Ne savons-nous pas que les politiciens sont toujours préoccupés par les besoins de la nation dans son ensemble? En réalité, il est rare que la Chambre des communes entretienne des débats de qualité sur l'éducation, la recherche et la science. Nous avons constaté, au contraire, que quand il est question de science, le public n'y tient pas et les politiciens n'osent pas. C'est tout simplement une piètre performance! Est-ce là une particularité du présent gouvernement? Loin de là! Nous avons été témoins de l'inertie des quatre derniers gouvernements qui ont manqué misérablement de vision et de volonté ferme face aux problèmes de la science au Canada. Les trucs de dernière heure, en particulier à la veille d'une élection générale, ont dans le passé et continuent encore de nos jours de détourner l'attention vers des projets supposément prestigieux tels qu'un "accélérateur de particules à hautes énergies", ou "une station spatiale", le tout devant être créé à partir des budgets courants des laboratoires fédéraux...en certains milieux, on appelle cela "du courage"!

## II - LA RÉACTION DE NOTRE SOCIÉTÉ A LA SUITE DES RESTRICTIONS BUDGÉTAIRES

Pour comprendre l'ampleur des diminutions du nombre d'entomologistes fédéraux et de leurs activités de recherches, il faut examiner les effectifs en place au cours des dernières décades. En 1963, année de notre Centenaire, il y avait environ 500 entomologistes professionnels canadiens parmi les 722 membres en liste. Près de la moitié de ces derniers étaient à l'emploi du gouvernement fédéral. Les autres étaient, par ordre décroissant, au service des institutions d'enseignement, des gouvernements provinciaux et de l'industrie en général. A ce moment, les 2/3 des entomologistes à l'emploi du gouvernement fédéral



étaient âgés de plus de 44 ans. Aujourd'hui, nos effectifs sont de 545 dont 300 au plus dans les services fédéraux. A Agriculture Canada, la diminution est de 46%. Au Ministère des forêts, l'équipe de recherche sur la tordeuse du bourgeon de l'épinette, à elle seule, a été réduite de 50%. L'exode massif se continue sans espoir de voir des remplaçants.

En 1970, à titre de Président de notre société, le Dr LeRoux a exprimé ses inquiétudes au Premier Ministre Trudeau. Le Dr G.S. Cooper refit la même démarche en votre nom en 1976. Ces efforts furent futiles. Cela dit tout sur l'efficacité de notre Société agissant seule dans l'arène politique. Il est bon de rappeler qu'alors avec le rapport de la Commission Lamontagne et présentement avec le rapport Lortie, le gouvernement fédéral recevait encore de ce temps-ci des suggestions visant à confier sa R&D au secteur privé. Cela se traduisait par l'expression peu élégante de l'époque du FAIRE ou DU FAIRE FAIRE.

Il est donc clair qu'il fallait à tout prix nous décider de conjuguer nos efforts avec les moyens plus considérables d'une plus grande société représentant tous les biologistes du pays si nous voulions essayer de sauvegarder, pour le bien de la nation, une précieuse continuité et une certaine stabilité dans la recherche entomologique au Canada. En conséquence, nous nous sommes associés en 1990 à la Fédération canadienne des sociétés de biologie (FCSB). La Fédération a un bureau à Ottawa; elle représente 6000 scientifiques de tous les domaines biologiques d'importance pour le pays et constitue un lobby qui devrait avoir plus de poids pour soutenir notre cause.

Certains d'entre vous se souviendront aussi de nos démarches antérieures dans le cadre du Conseil canadien de biologie (CCB) et de l'Association des groupes d'ingénieurs et techniciens du Canada (AGITC). Le point faible de ce regroupement a été le petit nombre de scientifiques qui y travaillèrent réellement. Il y eut même beaucoup de résistance à l'idée de devoir payer un surplus de 15¢ par membre pour le privilège d'appartenir à un organisme capable de parler au nom de la science. Il en fut de même lorsque le gouvernement convoqua les scientifiques à l'Université d'Ottawa dans le cadre de la Commission Lamontagne. Peu daignèrent se déplacer. Un membre du parlement remarqua la timidité des délégués et conclut qu'il ne pouvait prendre leur cause au sérieux si la collectivité scientifique ne pouvait d'elle-même créer une impression forte au nom de la science.

### III - L'ENTOMOLOGIE DE L'AVENIR

Les demandes du public pour protéger les milieux naturels de la pollution et, en particulier, les exploitations agricoles, remontent au début des années '70. Une des réactions du gouvernement fédéral fut de créer le Ministère de l'environnement. Bien qu'on puisse diverger d'opinion sur les multiples façons de redresser une écologie à la dérive, il apparaît que la chaîne alimentaire, les terres fertiles et nos ressources forestières sont au Canada des secteurs prioritaires où la recherche entomologique est appelée à jouer un rôle essentiel. Le public s'attend à trouver au moment opportun des méthodes de défense de nos productions animales et végétales qui soient conformes aux critères de qualité du milieu ambiant. L'intégrité de la chaîne alimentaire sur notre planète et le sort de tous les organismes vivants exposés à tant de pollution dans tous les milieux est en jeu.

Un examen critique de la recherche entomologique des derniers cinquante ans prouve bien que les méthodes de lutte contre les ennemis des cultures ont assuré aux consommateurs un approvisionnement acceptable et suffisamment sécuritaire. Nous concédons que dans certaines situations la contamination

du milieu peut avoir atteint un point critique. Par exemple, on sait que la pyrale du maïs cause des dommages de l'ordre de plusieurs centaines de millions de dollars chaque année en Amérique du nord. La recherche sur des agents autres que chimiques, tels les parasites d'insectes et leurs prédateurs, a eu un impact restreint sur les populations du ravageur. Le plein effet de populations d'ennemis naturels se perpétuant par eux-mêmes n'a pas encore été atteint. Il semble que les entomopathogènes, les bactéries, les protozoaires et certains virus pourraient permettre d'atteindre des plus hauts niveaux de répression que les méthodes traditionnelles d'utilisation de parasites. Ils peuvent être produits en élevage, se propager naturellement et demeurer compatibles avec les milieux naturels. Ainsi, le Bacillus thuringiensis a été très utile dans la lutte contre la pyrale de la pomme et la tordeuse du bourgeon de l'épinette. Nous souhaitons voir de telles stratégies appliquées à beaucoup d'autres situations.

A notre connaissance, la recherche biologique est encore aujourd'hui à un stade d'avancement comparable au point où étaient la physique et la chimie il y a 100 ans. Les instruments merveilleux qui résultent d'une technologie en pleine évolution et dont disposent de plus en plus de biologistes devraient permettre d'accéder aux secrets les plus profonds des structures cellulaires et en particulier des gènes. Ainsi, des scientifiques du CSIRO en Australie ont transféré un gène du Bacillus thuringiensis dans la structure chromosomique du coton. Ce gène produit la toxine qui cause la mort du vers gris Heliothis. Les chenilles de vers gris qui, à elles seules, causent plus de 80% des dommages au coton en Australie, s'attaquent aussi à d'autres cultures tel que le maïs, la fève soja, le sorgho et le tournesol.

Le génie génétique offre donc de très grandes possibilités permettant d'apporter des solutions originales aux problèmes actuels et à venir causés par les insectes. Il devrait être intégré aux pratiques courantes d'amélioration génétique des plantes cultivées de manière à incorporer aux plantes elles-mêmes les moyens de résister aux insectes et aux maladies d'une façon naturelle. La résistance génétique des plantes demeure donc un des moyens très efficaces et naturels de contenir les fléaux d'insectes et de maladies. Cependant, ce procédé exige une pleine interaction des améliorateurs de plantes et des autres disciplines tel que l'entomologie, la pathologie et la statistique. Les résultats permettent de réaliser des économies considérables et sont toujours compatibles avec l'environnement.

C'est dans ces sentiers nouveaux de la recherche que nous suggérons de vous engager pour apporter des alternatives originales dans les productions animales et végétales contemporaines. Notre survie collective n'en demande pas moins.

#### IV - LA R&D AU CANADA DANS L'INDUSTRIE ET LE SECTEUR PRIVÉ

Comme nous l'avons déjà mentionné, l'objectif du Premier Ministre qui projetait de doubler les activités en R&D au cours de son premier mandat de 1984-89 ne s'est pas réalisé. Il en est de même des espoirs qu'il avait mis dans des programmes destinés à amener le secteur privé à reprendre les programmes abandonnés par le gouvernement. Nos désappointements se sont même accentués lorsque, tout dernièrement, le ministre responsable des secteurs scientifiques, M. William Winegard, déclarait que "la façon de régler le problème n'était pas d'investir plus de fonds dans la recherche gouvernementale". Par ailleurs, il se plaint du fait que "le secteur privé canadien n'a pas fait sa part de R&D et devrait en faire davantage". En vérité, nous sommes très déçus de M. Winegard qui, après avoir occupé le poste prestigieux de Président de l'Université de Guelph, montre si peu de compréhension de la nature et des besoins du secteur scientifique canadien. La portée de tels propos ne peut que compromettre davantage la base même du développement technologique au Canada.

Notre point de vue est d'autant plus juste que des représentants de l'industrie nous disent "qu'ils ont besoin de l'aide du gouvernement et qu'ils ne peuvent progresser aussi longtemps que l'effort du gouvernement en R&D demeurera inférieur à celui des autres nations industrialisées". De plus, le point de vue de John Macdonald, qui dirige une entreprise en informatique à Vancouver, est que le gouvernement est devenu schizophrène sur ce sujet. Il souligne qu'un programme d'aide à l'industrie de près de \$23 millions par année et qui était très bien vu par l'industrie et qui donnait un rendement de 10 pour 1 sur les fonds publics investis chez eux, fut tout simplement rayé des budgets en avril 1989.

Voici d'ailleurs le témoignage de David Vice, qui, au nom de l'Association canadienne des manufacturiers, admet que "les industries canadiennes n'ont pas accru leur effort en R&D parce qu'elles n'y étaient pas contraintes. Elles se sont enrichies à même nos richesses naturelles. Étant donné aussi que 46% des corporations canadiennes sont possédées par des capitaux étrangers, les recherches se font surtout chez eux". Cette situation n'est pas près de s'améliorer quand on constate que le gouvernement des États-Unis vient de mettre en vigueur des exemptions fiscales qui privilégient les activités de R&D faites au pays plutôt qu'à l'étranger. Ajoutez à cela les conséquences du "libre échange" canado-américain et il n'y a plus de quoi se réjouir! Et voilà que certains politiciens découvrent un autre "truc". A les entendre, il suffirait d'importer la technologie et de la développer chez nous. Ils y voient même une économie de temps et d'argent. Naturellement, nous savons tous que le Japon a importé beaucoup de technologie de l'étranger. Mais nous savons aussi que cela leur convenait dans la phase initiale de leur développement de l'après-guerre. De nos jours, avec une Cité de la science à Tsukuba et à la pointe du développement technologique mondial, le Japon est à la tête du peloton. Il nous apparaît tout à fait ridicule de vouloir reprendre une formule qui coïncidait avec leurs buts et objectifs nationaux. Nous constatons d'ailleurs qu'une enquête conduite par le "Conférence Board du Canada" (Roland Anderson : Globe and Mail, 1986) auprès des centres de R&D canadiens a constaté que 77% d'entre eux ne pourraient substituer la technologie acquise aux innovations de notre création.

## V - CONCLUSIONS

Les faits révélés dans notre présentation nous amènent aux conclusions suivantes:

1. Le présent gouvernement, retenu par une dette nationale énorme et des déficits lourds, ne reviendra pas sur ses coupures dans le secteur de la R&D. Nous croyons que la sagesse d'une majorité de canadiens et un fort appui de l'industrie, réunis dans une volonté commune d'aller de l'avant, constitueraient un consensus national permettant d'accroître nos efforts en R&D plutôt que de les réduire. Notre point de vue se voit renforcé d'autant plus que les scientifiques n'ont pas été bien servis par le Ministère d'État pour la science et la technologie. Ses moyens sont de plus en plus réduits et sa crédibilité auprès des scientifiques est devenue extrêmement ténue.

2. Les programmes du gouvernement, destinés à attirer le secteur privé dans des secteurs dont il se retirerait, n'ont pas eu beaucoup de succès. L'industrie est très fragmentée, se trouve en grande partie dans les mains de capitaux étrangers, n'est pas très intéressée si ce n'est à recevoir des subventions gratuites et sans lendemains, et subit comme tout le monde des taxes de plus en plus lourdes. Nous sommes prêts à admettre que certaines compagnies pharmaceutiques sont allées de l'avant. Mais il ne s'en trouve aucune qui ait investi des capitaux dans les sciences de l'environnement pourtant si essentielles au maintien de nos ressources naturelles renouvelables. Enfin, l'industrie ne peut accroître

ses recherches pendant que s'effondrent les laboratoires du gouvernement qui avaient été mis en place précisément pour assister et rendre viable l'industrie canadienne.

3. Les entomologistes ne peuvent plus se battre seuls dans le combat pour leur survie. Nous devons joindre nos efforts à ceux de la Fédération canadienne des sociétés de biologie. Sa stratégie pré-électorale nous semble particulièrement intéressante. Elle recommande aux biologistes et par le fait même aux entomologistes de:

(a) rencontrer les candidats à la prochaine élection fédérale, dans les comtés en particulier où il y a des universités, et de s'enquérir de leur attitude vis-à-vis de la R&D;

(b) joindre les rangs des partis politiques et participer activement aux débats des questions scientifiques;

(c) se porter candidats aux élections de manière à porter directement à la Chambre des communes le message de la survie de la R&D fédérale au pays.

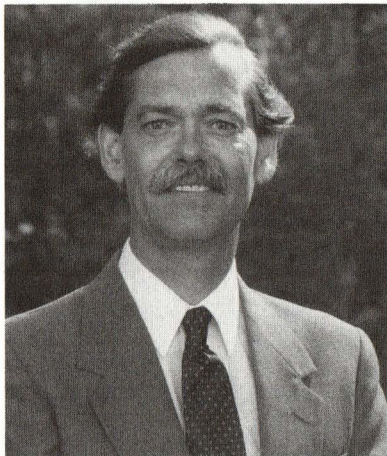
4. Pendant que le gouvernement fédéral réduit les effectifs entomologiques, les problèmes de la contamination de l'environnement qui ont des incidences entomologiques demeurent et vont en s'accroissant. A cet égard, il faut développer de nouvelles stratégies de lutte contre les ennemis des plantes cultivées, des forêts et de la faune si nous voulons garder saines nos sources alimentaires et le milieu environnant. En lançant cet appel à nos dirigeants, nous devons nous affirmer avec conviction afin qu'ils reviennent à des sentiments réalistes, constatent le recul subit depuis de trop nombreuses années et remettent en meilleure condition le moteur de la R&D au Canada. **Ce moteur c'est l'ensemble des structures de recherche fédérale. Ce sont les seules qui appartiennent réellement au peuple canadien.**

Au Canada, le secteur de recherches fédérales est le seul champ d'action qui s'offre à la nouvelle génération de biologistes chercheurs au service du public.

Notre conclusion générale est que le gouvernement fédéral doit reprendre l'initiative perdue et réinvestir dans le secteur R&D dans des proportions dépassant même les efforts des autres nations très industrialisées. Il ne peut et ne doit surtout pas abdiquer son rôle de leader car il est inévitable qu'il demeure l'arbitre des initiatives en R&D dans notre pays. Notre société s'attend à mieux que des poussées sporadiques si la R&D doit faire partie de notre identité nationale.

De plus, étant donné que les gouvernements de bien d'autres pays supportent généreusement la R&D du secteur biologie, ce sont eux et non le Canada qui se trouveront en tête des progrès technologiques requis pour rester compétents et compétitifs dans les productions animales et végétales. Étant donné que les E.U.A. accordent à la recherche fondamentale des fonds considérables, ils resteront sans doute à la fine pointe du progrès, particulièrement en biotechnologie. Le Canada aurait donc tout à gagner et pourrait ainsi assurer un avenir plus prometteur non seulement à l'agriculture mais aussi à toutes les industries sous-jacentes qui doivent survivre et améliorer en même temps notre patrimoine national souvent très oublié...notre milieu de vie.

## MEMBERS IN THE NEWS



**Peter E.A. Teal**

Dr. Peter E.A. Teal of Gainesville, Florida, has been awarded the "Outstanding Early Career Scientist of the Year" by the USDA Agricultural Research Service. The honour is accompanied by a \$4,000 cash award and \$25,000 in extra funding for his research.

Teal has been a physiologist with the U.S. Department of Agriculture agency since 1986 and has discovered a chemical that puts young female cotton bollworm moths and tobacco budworm moths through "premature menopause". Normally, old virgin females nearing death release the compound causing them to stop producing pheromones. Teal is now working to identify the compound that stops pheromone production in the two insect pests. He eventually wants to reproduce it synthetically.

"Using a replica of the chemical to shut down the pheromone factory or inducing the insect to begin producing it earlier would be an environmentally safe population control for the cotton bollworm," said ARS administrator R. Dean Plowman. "The bollworm and its cousin, the tobacco budworm, cost farmers billions of dollars per year."

His research at the Insect Attractants, Behavior and Basic Biology Research Laboratory in Gainesville has yielded other results cited in the award. He developed a blend of the tobacco budworm moth's pheromone that exactly replicates the one produced by the real insect. The chemical currently used in insect traps is not an exact replica. If developed, the new blend could offer farmers a more precise tool for monitoring the buildup of insects to time pesticide spraying and so reduce pesticide use.

He also discovered the enzymes that female bollworm and budworm moths use to produce pheromones. He later detailed this system in a sterile hybrid of the budworm moth and a close relative. These hybrids have the potential to control budworm populations when released in large numbers.

The studies showed that sterile hybrid females produce the same sex pheromone as the wild females. This information is crucial in planning a sterile release program because it indicates that the sterile females will compete for mates as well as wild females.

Teal's studies have provided a "much needed picture of the communication system that leads to mating and reproduction in tobacco budworm moths," Dr. Plowman said. That will enable scientists to know if their tactics for interfering with the process are working.

This award is Teal's second recognition by ARS. During an earlier postdoctoral appointment at the Gainesville lab, he was part of a team that in 1983 received USDA's Superior Service Award for isolating, identifying and synthesizing insect pheromones.

He is a member of the Entomological Society of Canada, the Entomological Society of America and the American Chemical Society. He has 41 journal articles and nine book chapters to his credit.

A native of Richmond, Ontario, near Ottawa, Teal received his bachelor's and master's degrees in biology from the University of Ottawa. Teal left Canada to finish his studies at the University of Florida, Gainesville, doing his graduate research at the ARS lab. He received his doctorate in 1981 and the award of excellence from the University's Institute of Food and Agricultural Sciences for that research.

From 1983 to 1986, he was assistant professor of insect physiology at the University of Guelph in Ontario. He then returned to Gainesville as an associate research scientist with the University of Florida, working at the ARS lab. He officially became an ARS research scientist in 1990 and teaches an occasional class at the university under the title of courtesy professor.

## NEWS OF ORGANIZATIONS

### International Commission on Zoological Nomenclature

Applications published in the *Bulletin of Zoological Nomenclature*

The following applications were published on 19 December 1991 in Vol. 48, Part 4 of the *Bulletin of Zoological Nomenclature*. Comment or advice on these applications is invited for publication in the *Bulletin of Zoological Nomenclature* and should be sent to the Executive Secretary, I.C.Z.N., c/o The Natural History Museum, Cromwell Road, London SW7 5BD.

Case 2731 *Planoplatyscelis* Kaszab, 1940 (Insecta, Coleoptera): proposed designation of *Platyscelis margelanica* Kraatz, 1882 as the type species

L.V. Egorov

Zoological Institute, U.S.S.R. Academy of Sciences, St Petersburg 199034, U.S.S.R.

**Abstract.** The purpose of this application is to designate *Platyscelis margelanica* Kraatz, 1882 as the type species of *Planoplatyscelis* Kaszab, 1940 (a subgenus of *Bioramix* Bates, 1879) in accordance with accepted understanding and usage. At present this tenebrionid subgenus has a misidentified type species.

Case 2780 *Platyscelis* Latreille, 1818 (Insecta, Coleoptera): proposed designation of *Tenebrio hypolithus* Pallas, 1781 as the type species, so conserving *Oodescelis* Motschulsky, 1845

L.V. Egorov

Zoological Institute, U.S.S.R. Academy of Sciences, St Petersburg 199034, U.S.S.R.

**Abstract.** The purpose of this application is to designate *Tenebrio hypolithus* Pallas, 1781 as the type species of the tenebrionid beetle genus *Platyscelis* Latreille, 1818, which includes a number of agricultural pest species, in accordance with universal understanding and usage. The nominal genus *Oodescelis* Motschulsky, 1845, which also includes a number of pest species, will also be conserved.

Case 2773 *Schizopus* Le Conte, 1858 (Insecta, Coleoptera): proposed conservation

G.H. Nelson

College of Osteopathic Medicine of the Pacific, College Plaza, Pomona, California 91766-1889,  
U.S.A.

**Abstract.** The purpose of this application is the conservation of the name *Schizopus* Le Conte, 1858 for a buprestid beetle genus. It is threatened by the homonym *Schizopus* Claparède & Lachmann, 1858, an unused name for a genus of hypotrichous ciliate protozoan.

Case 2749 *Eristalis* Latreille, 1804, *Helophilus* Fabricius, 1805, *Xylota* Meigen, 1822 and *Eumerus* Meigen, 1822 (Insecta, Diptera): proposed conservation

Tadeusz Zatwarnicki

Department of Zoology, Agricultural University, ul. Cybulskiego 20, 50-205 Wrocław, Poland

**Abstract.** The purpose of this application is to conserve the names of four genera of hover-flies (family SYRPHIDAE): *Eristalis* Latreille, 1804, *Helophilus* Fabricius, 1805, *Xylota* Meigen, 1822 and *Eumerus* Meigen, 1822. The first three names are threatened by senior objective synonyms and *Eumerus* by a senior homonym. It is proposed to fix *Musca pendula* Linnaeus, 1758 as the type species of *Helophilus* Fabricius, 1805 in accordance with universal usage. All four genera are found almost world wide.

Case 2730 *Cheilosia* Meigen, 1822 and *Pyrophaena* Schiner, 1860 (Insecta, Diptera): proposed conservation

A.V. Barkalov

Biological Institute, Siberian Branch of the Academy of Sciences of the U.S.S.R., Novosibirsk  
630091, U.S.S.R.

I.M. Kerzhner

Zoological Institute, Academy of Sciences of the U.S.S.R., St Petersburg 199034, U.S.S.R.

**Abstract.** The purpose of this application is to conserve the names of two genera of hover-flies, *Cheilosia* Meigen, 1822 and *Pyrophaena* Schiner, 1860 (family SYRPHIDAE). Both names are threatened by the unused senior name *Cheilosia* Panzer, [1809], as a homonym and as an objective synonym respectively. It is proposed to fix *Syrphus flavipes* Panzer, 1798 as the type species of *Cheilosia* Meigen in accordance with existing usage. *Cheilosia* Meigen includes approximately 350 species in the Palaearctic, Nearctic and Oriental regions. It is the type genus of the tribe CHEILOSIINI Shannon, 1922. Species included in the genus have economic importance as pollinators, pests of weeds, and as causing damage in the timber of some American coniferous trees. *Pyrophaena* Schiner, 1860 includes some 10 species, distributed in the Palaearctic and Nearctic regions.

## Biological Survey of Canada (Terrestrial Arthropods) Survey Report

The Scientific Committee met in Ottawa on 17-18 October 1991. A full account of the meeting appears in the Spring 1992 issue of the Newsletter of the Biological Survey of Canada (Terrestrial Arthropods).

### Notes on scientific projects

#### 1. *Arthropods of peatlands in Canada*

A successful symposium on peatland arthropods was held at the 1991 Entomological Societies meeting in Montreal. Papers from the symposium are being edited for publication.

#### 2. *Arctic invertebrate biology*

The Survey's arctic project, including field studies, continues to develop. Scientists from the USSR Academy of Sciences were involved in the 1991 programme in the Canadian arctic, and a reciprocal visit to the USSR is planned in 1992. A second arctic newsletter (which includes information on current projects) was published after the Scientific Committee meeting, and a scientific article on arctic insects as indicators of environmental change is in press.

#### 3. *Arthropod fauna of the Yukon*

Manuscripts dealing with individual groups of arthropods in the Yukon are being edited, as a basis for introductory and synthetic chapters in a planned volume on the area.

#### 4. *Arthropod fauna of springs*

Following publication of a symposium volume on the arthropod fauna of springs (*Mem. Ent. Soc. Can.* 155) the springs project was considered to have reached a suitable staging point, now requiring only general encouragement rather than specific initiatives by the Survey.

#### 5. *Other discussions*

A substantial review of past, current, and potential future projects took place. Plans were made to develop a project on old-growth forests, to evaluate ways to assemble information on invasions and reductions in the fauna, and to consider further themes related to freshwater habitats.

### Other scientific priorities

#### 1. *Research collections of arthropods*

Steps were taken to ensure that the Survey's brief "Importance of research collections of terrestrial arthropods" (*Bull. Ent. Soc. Can.* 23(2), Suppl.) receives wide notice and circulation. An article entitled "Museum collections: fundamental values and modern problems" (*Collection Forum* 7(2): 95-111) was published after the Scientific Committee meeting.

#### 2. *Systematics and entomology*

Editing of the proceedings of a symposium on "Systematics and entomology: diversity, distribution, adaptation and application" (held at the 1990 ESC meeting) was completed after the meeting. Resolutions proposed by the Biological Survey, and developed in detail after the meeting, were adopted at the 1991 Annual General Meeting of the Entomological Society of Canada. The Committee made plans to consider other possible initiatives related to systematics and entomology at its next meeting.



### 3. *Global change, the environment, biodiversity and related topics*

The Committee discussed information pertaining to long-term research, the Global Change Program of the Royal Society of Canada, and the Canadian Environmental Agenda. The Survey continues to monitor relevant developments, and also plans to draft a brief concerning the techniques and context for studies of biodiversity.

### **Liaison and exchange of information with other organizations**

#### 1. *Canadian Museum of Nature*

Dr. P. Colgan, Assistant Director for Collections and Research of the Canadian Museum of Nature, reported on several recent developments, including the following. The Museum's Board of Trustees has authorized the establishment of separate divisions of Collections and of Research, and has also established a task force on research. The first phase of a move of the Museum's collections and associated staff to the Macoun Nature Centre in Aylmer, Quebec (the former NorTel building) has been completed. The CMN has established linkages with several museums in Quebec, forming a consortium that will collaborate on expertise. The Museum intends to replace Dr. G. Gibson, now retired, with another parasitologist.

In response to enquiries from the Committee, Dr. Colgan noted that the basic purpose of the separate Collections and Research divisions lies within the managerial philosophy of the Museum, to enhance the responsibility with which individuals looking after collections and research can account for their activities to senior management. Collections and Research therefore have been separated for administrative purposes.

#### 2. *Biological Resources Division of the Centre for Land and Biological Resources Research*

Dr. R. Asselin, Director of the Centre for Land and Biological Resources Research (CLBRR) reported on recent developments including the following. The Biosystematics Research Centre was recently amalgamated with the Land Resource Research Centre, becoming the Biological Resources Division (BRD) of the CLBRR. This action permits a streamlining of administration and a reduction in senior management, and will enhance collaboration between Land Resources and Biological Resources. The BRD has responsibilities that transcend the responsibilities of Agriculture Canada itself. A recent review of BRC had identified problems with respect to mandate, and a workshop to discuss biosystematics of insects, plants and fungi in Canada, with particular reference to the roles of the BRD, will be held during spring or summer 1992. Dr. P. Marriage, Executive Deputy Director for BRD, pointed out that the review of BRC had discovered very positive responses, although the review had emphasized the requirement to focus on agrifood priorities .

In response to the concerns of the Committee that there are conflicts between agrifood priorities and broader national research priorities, Dr. Asselin pointed out that the conflict perceived by the Department is one of funding, whereby the Department would like to be assured that activities of BRD that are outside Agriculture will be funded by other interested parties. He added that nevertheless no changes in programmes have yet been made, pending the results of the 1992 workshop.

#### 3. *Entomological Society of Canada*

Dr. R.A. Ring, President-elect [now President] of the Entomological Society of Canada, reported on Society achievement award recipients, recently elected officials, the joint societies meeting (Montreal, October 1991), and some documents in progress.

#### 4. *Canadian Parks Service*

Mr. D. Rivard, Environmental Conservation Section, Canadian Parks Service, noted that negotiations are in progress on the basis of a signed Memorandum of Understanding between the Survey and the Parks Service [see *Other items* below]. Mr. Rivard circulated a copy of the public consultation package on the CPS proposed policy, on which comments are invited. He noted that according to the revised policy, Parks will do or encourage research that helps manage the Parks and will encourage basic research that addresses Parks' mandate.

#### 5. *Natural Sciences and Engineering Research Council*

Ms. B. Conway, Programme Officer, Life and Earth Sciences, Natural Sciences and Engineering Research Council, reported that no significant changes are taking place at the Council. She noted some aspects of the Operating Grants Programme being considered by the Council, and the "Health of the Discipline" documents being developed by the Grant Selection Committees. Ms. Conway also pointed out that NSERC's communications department is trying to get researchers more involved in public relations and lobbying, to emphasize the importance of science to the country, and the need for increased funding for scientific activities.

#### 6. *Canadian Society of Zoologists*

Dr. B. MacKinnon, Parasitology Section, Canadian Society of Zoologists, accompanied by Dr. A. Shostak of the same section, reported on a number of projects of inventory and research initiated by the incipient parasitology module of the Survey.

#### 7. *Other organizations*

The Survey remains in touch with other agencies and organizations, including the Geological Survey of Canada (Dr. J.V. Matthews, Terrain Sciences Division, attended the meeting as a representative), the Canadian Federation of Biological Societies (Dr. I.M. Smith chairs the Subcommittee on the Environment of the Science Policy Committee of the CFBS), and the Canadian Council on Ecological Areas.

### **Other items**

#### 1. *Regional developments*

Information from different parts of the country was presented by various members of the Committee, including recent developments in several entomology departments, and matters related to graduate students, collections, and faunistic projects.

#### 2. *Entomological research in Parks*

Pursuant to the Memorandum of Understanding between the Biological Survey of Canada and the Canadian Parks Service, discussions continue about general guidelines for entomological work in Parks, and about a long-term research plan, a draft of which was discussed and approved in principle by the Committee.

#### 3. *Other matters*

The committee also discussed membership of the Scientific Committee, eventual publication of the Yukon book by the Biological Survey Foundation and recent publications of interest.

H.V. Danks  
Canadian Museum of Nature  
Ottawa

## Eagle Hill Wildlife Research Station

### Entomology Field Seminars on the Main Coast, Summer 1992

Opportunities for advanced field studies with leading national and regional authorities are again being offered at Eagle Hill Wildlife Research Station, located just "downeast" of Bar Harbor and the Schoodic Point section of Acadia National Park. Seminars of interest to entomologists include:

#### Culicidae - Mosquitoes of Maine / May 24-30

Emphasis: field collection, lab rearing and preparation of specimens; use of keys for adult and larval stages; comparative specimens from other regions; lectures and discussions on diversity, morphology, classification, biology, behavior and medical importance

Dr. Ralph E. Harbach - manager, Walter Reed Biosystematics Unit, Smithsonian Institution; author of *Taxonomist's Glossary of Mosquito Anatomy* and many other technical papers; current research in Neotropics

E. L. Peyton - Walter Reed Biosystematics Unit; leading authority on the collection, identification and study of mosquitoes of the Neotropical and Oriental regions; numerous taxonomic papers; current research on malaria vectors in Southeast Asia

#### Odonata - Dragonflies and Damselflies / June 14-20

Emphasis - taxonomy, ecology and behavior, field identifications; odonates as indicator species; discussions of habitat preferences, endangered species and migrations

Paul S. Miliotis - curatorial affiliate, Peabody Museum, Yale U; extensive experiences with odonates from North and Central America; consultant, lecturer and expedition leader

#### Field Entomology / June 21-27

Emphasis - entomology for teachers and others with special interests in practical field experiences, specimen collection and identification; insects of woodlands, old fields; larger moths; discussions of life histories, predator-prey relationships, plant feeding strategies, ecology, behavior, forest entomology.

Richard Dearborn - senior entomologist with the Maine Forest Service; exceptional field entomologist; specialist on life histories of most species groups, especially beetles

#### Chironomids - Midges / July 26-August 1

Emphasis - importance of chironomids in water quality monitoring; overview of methods for preserving, mounting and identifying larvae, pupae and adults; field trips, lab exercises, identifications to genus; discussions of life stages, natural history and ecology

Dr. Leonard C. Ferrington - dir. of Water Quality and Freshwater Ecology Progr. of Kansas Biological Survey; research programs in ecology, taxonomy and systematics

#### Other Seminars

May 17-23	Field Ornithology	Dr. Richard Eakin
May 31-June 6	Field Ethnobotany	Dr. James A. Duke
June 28-July 4	Wetland Vegetation Patterns of the Northeast	Dr. William A. Niering
July 12-18	Sedges	Dr. Anton A. Reznicek
July 19-25	Mycology: Techniques	Dr. Richard Homola
July 19-25	Aquatic Mycology	Dr. Joyce Longcore
August 23-29	Lichens	Dr. Sharon Gowan
Aug 30-Sept 5	Field Pteridology - Ferns and their Allies	Dr. Warren (Herb) Wagner
Sept 6-12	Peatland Ecology, Reclamation & Restoration	Norman Famous
Sept 13-19	Mosses and Liverworts. I	Dr. Howard Crum
Sept 20-26	Mosses and Liverworts. II	Dr. Howard Crum

Eagle Hill Wildlife Research Station is known for exceptional advanced study opportunities for an advanced and professional adult audience and for well-qualified university and college students. Graduate (and undergraduate) university credits and teacher recertification credits are available. Scholarships for the station's very intensive one-week seminars are available.

For more information, please contact: Eagle Hill Wildlife Research Station, Steuben, Maine 04680  
Tel. 207-546-2821.

## **News from CFBS**

### **Scientists for One Canada**

In the belief that tolerance, understanding, diversity of experience, cooperation, and caring for others are desirable virtues,

In the belief that knowledge of more than one language and experience with varied cultures is both enriching and advantageous,

In the belief that distinct differences currently exist between one part of our country and another, and that these differences have been recognized for many years in law (for example, the Quebec Civil Code and the Indian Act),

In the belief that the current debate on the future of Canada has been dominated by vocal minorities who wish to promote intolerance, and that the impact and the role of science and education in the future of Canada has not been adequately addressed in the debate so far,

In the belief that science and education are concerns of paramount importance for any developed country, and the views of scientists need to be heard,

We wish to say to other Canadians that we of the scientific and professional community from across Canada stand for a united Canada, where there may well exist distinct geographic areas (including Quebec as a focus for the francophone population, part of the north as a focus for the Inuit people, etc.).

We believe that constitutional evolution to allow distinct groups to be "maîtres chez eux" is both needed and possible within a framework where movement of all Canadians within our country is unrestricted, and where equality of access to employment, health care, and other provincial and federal programs will occur irrespective of race, religion, age, sex, disabilities, and language (with exceptions only in the case where specific language qualifications are an essential attribute to the position).

We believe that assemblies elected by the people are and should continue to be the foundation of our democratic society. It seems likely that future political development may require an elected Senate chamber to ensure more equitable and effective regional input into national goals.

We believe that doors should be open rather than closed, and that Canada should be a land of opportunity where individuals and groups can pursue and attain their hopes and aspirations within our collective society given that it is built on a basic framework of human rights, and principles of fairness and justice. We hope and believe that it will continue to be possible to work together in such a way that all Canadians can feel at home wherever they are within our great country, and that a renewed spirit of cooperation will continue to build a nation where tolerance, diversity, and caring for others are hallmarks.

## Scientists Seek Support From Across Canada

We ask for your support for an initiative to promote a unified Canada. The objective of this exercise is not the production of a technical document defining a new Canada. Rather, we believe that it is time for the silent majority of scientists to have an opportunity to state clearly their desire to live in a unified country. We urge our elected representatives to make this possible through the necessary compromises and constitutional changes. We ask for the signatures of fellow scientists as a sign of support for this initiative. We intend to present this petition and the signatures to the Dobbie-Beaudoin committee, and to attempt to get appropriate national media coverage to emphasize the position of scientists.

For further information, please contact:  
Pour plus d'information, veuillez contacter:

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NAME

SIGNATURE

CITY/PROVINCE

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Please return the signed form to either Dr. Deapree or Dr. Gerrard as soon as possible.

# PUBLICATIONS

## BOOK REVIEWS

**Manly, B.F.J. 1990. *Stage-structured populations: sampling analysis and simulation*. Chapman and Hall. New York, N.Y. xii + 187pp. \$(Can.) 124.95.**

Manly's book is a comprehensive synopsis on sampling and analysis of stage-structured data. Although the examples used to illustrate the methods were from animal (mostly insect) populations, many of these techniques are applicable to plant populations and the growth of modular organisms such as trees.

The book opens with three overview chapters describing what stage-structured populations are, sampling for estimation and maximum-likelihood estimation. This is one of the best precis of these topics that I have read. The most rewarding, if not most difficult, part of the book follows in the two chapters on analysis of multi-cohort and single-cohort stage-structured data. A useful table compares various methods used to analyze stage frequency data. The listing provides the reader with a summary of methods which allow estimation of one or several of: the number of individuals entering each stage; time spent in and distribution of stages, mean time of entry to each stage, and stage-specific survival rates. A subset of these methods is discussed in detail and illustrated with examples derived from the literature. In the next two chapters, applications of projection matrices and key factor analysis are described. However, Manly extends the treatment beyond the level commonly found in most introductory population ecology textbooks. The final chapter is a collection of case studies. The section on A.J. Nicholson's classic *Lucilia cuprina* experiments ends with an indication on how the analysis could be extended. The treatment of the other cases is brief.

A valuable feature of the book is the presentation of whole data sets used in the examples discussed. This not only permits the reader to explore methods by way of the exercises at the end of each chapter, but it permits the development and testing of one's own computer programs. More importantly, most of the examples are drawn from published studies, providing the reader with an opportunity to deal with some of the difficulties usually encountered in field studies.

The book is short. There are only 167 pages of text, but understanding the material will require some familiarity with the methods of mathematical statistics. The opening chapters help in describing some of these techniques. A chapter on the design of studies on stage-structured populations would have been a useful way to end this book.

The book would be appropriate for a graduate course on quantitative methods in population ecology. Others who will find this book useful are researchers and statisticians interested in applications of statistics to population systems. Any one seriously interested in estimating population parameters should consult this book. The price, at \$124.95 in Canada, will deter many from acquiring it.

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Crosskey, R.W. *Natural history of black flies*. J. Wiley & Sons, Chichester, England, 1990. ix + 711pp. Hard cover, \$(U.S.) 167.00.

*And the black flies, the little black flies,  
Always the black fly no matter where you go.  
I'll die with the black fly a-pickin' my bones  
In North Ontario.. io, in North Ontario.*

Refrain from "The black fly song" (Wade Hemsworth 1949).

Let's face it ... black flies have a serious image problem. No where is this more evident than on the Canadian Shield, where outbreaks in the late spring and early summer can severely restrict outdoor activity. Mere mention of the name brings fear and loathing to most individuals, and inspires accounts of martyrdom suffered in the northern woods during "black fly season". I wonder if attitudes would be so one-sided if we had a better appreciation of the morphological, ecological, and behavioural diversity of these remarkable insects. *Natural History of Black Flies* is a brilliantly written and fascinating account of all life history stages of the family. Intended to bridge the gap between the specialist and those requiring a more general level of information, the book demonstrates that there is more to black flies that meets the eye (or any other exposed flesh, for that matter).

Dr. Crosskey's early experience as a field entomologist in West Africa, and later as a research scientist at the British Museum (Natural History), makes him uniquely qualified to write a comprehensive account of the natural history of black flies. With 110 figures and 1200 citations, the author successfully brings together a vast and scattered literature of the family, and presents it in a form that is readily accessible to a wide audience. The book consists of 19 chapters arranged in 4 parts: Introduction to black flies; Life in the water; Aerial life; and Black flies and mankind.

Chapter 1 is a list of facts that the non-specialist might need for quick access to information, such as relationship of black flies with other animals, the number of species, geographical distribution, aspects of life history, and medical and veterinary importance. The list indicates chapters where readers can obtain more detailed information about particular subjects. Chapter 2 is a fascinating account about the historical development of knowledge about black flies. Although early humans were undoubtedly familiar with anthropophilic forms, the first written accounts of black flies can be attributed to European explorers. Excerpts from the journals of Champlain, Humbolt, Agassiz, Bates, and Cook give an appreciation of the misery suffered by the early inhabitants of North and South America, and New Zealand. Summaries are given about the growth of scientific knowledge during the eighteenth, nineteenth, and twentieth centuries, including photographs of 4 notable contributors to black fly biology during the present century. Although I cannot find fault with inclusion of any of the individuals so honoured, it seems a pity that the late Dr. Klaus Rothfels (University of Toronto) was not recognized for his pioneering work on speciation in black flies. I am hard pressed to think of anyone whose work has had a more profound influence on black fly cytogenetics, systematics, and ecology during this century. Chapters 3 and 4 are concerned with taxonomy and zoogeography, respectively. It should be understood from the outset that Dr. Crosskey's approach to systematics is very much steeped in the classical traditional. As in previous reviews of the subject, he staunchly defends his division of black flies into two main groups - the derivative "simuliines" (consisting of *Austrosimulium* and *Simulium s.lat.*) and the primitive "prosimuliines" (consisting of all other black fly genera except *Parasimulium*). Although it has long been recognized that prosimuliines is an unnatural group (eg., Wygodzinsky and Coscarón 1973), the author maintains that a pragmatic approach is called for because of the medical, veterinary, and socioeconomic importance of black flies. The relative merits of natural versus unnatural

classifications have been debated thoroughly elsewhere and need not be revisited here. However, sound evolutionary and zoogeographic interpretations must be founded on a phylogenetic framework. Certain interpretations in chapters 2 and 3 (and elsewhere) can be questioned in view of the distinction between prosimuliines and simuliines, as defined.

Part II contains 7 chapters devoted to the immature stages: Elements of larval structure and function; Larval development and feeding; Larval anchorage and movement; The Lotic environment and larval habitats; Development on other aquatic animals - a special ecology; Natural enemies of the aquatic stages; and, The pupa and adult fly emergence. Here, and in Part III on features of the adult, the author exhibits his extraordinary command of the black fly literature. Those interested in specific areas will find reference to most of the important works on the subject, but will also benefit from Crosskey's insightful analysis. I found chapter 11 on the pupa and adult fly emergence to be especially interesting. Despite an impressive array of morphological and behavioural adaptations, the pupa (including the remarkable pharate pupal stage) remains the least studied stage of black fly life history. Part III covers various aspects of adult life, including: Elements of adult fly structure and function; Sexual meeting and mating; Flight and migration; Host animals, biting and bloodsucking; Maturing and laying the eggs; and, Natural enemies of adult flies. Again, the author successfully distills the most important aspects of each subject into a form that is readily comprehended by most readers. The section on mating provides information about one of the most neglected aspects of black fly biology. Unfortunately, no mention was made of the bizarre mating behaviour of *Parasimulium*, as outlined in detail by Wood and Borkent (1982). This is one of the very few instances where a relevant reference was found to be missing. Part IV consists of 2 chapters on the relationship between black flies and humans: Pests of man and domestic animals; and Black flies and human disease. The first of these covers the proximal or physical effects of black flies on humans, along with summaries of the most notorious pests world wide. Also included are sections on pests of poultry, cattle, and other livestock. The last chapter is concerned primarily with human onchocerciasis or 'river blindness' - a disease of tropical Africa and parts of Latin America. It ends with a short but interesting section on black flies wrongly and dubiously associated with human diseases.

It is difficult to provide a comprehensive review of all aspects of the book in the space allowed. I have endeavoured to at least mention each of the chapters to give an indication of the full depth and breadth of the book. The suggested retail price may dissuade all but the most committed simuliidologist from purchasing his or her own copy. However, it is a "must read" for any student of the family, and is worth the investment for anyone interested in aquatic biology or medical and veterinary entomology. Although readers still may find the blood-feeding habits of black flies abhorrent, they may at least learn to appreciate the remarkable morphological, ecological, and behavioural diversity exhibited by all life history stages of the family.

#### References

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- Wygodzinsky, P. and S. Coscarón. 1973. A review of the Mesoamerican and South American black flies of the tribe Prosimuliini (Simuliinae, Simuliidae). *Bulletin of the American Museum of Natural History*. 151: 129-199.

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Vancouver, B.C.



**Emmet, A.M. and J. Heath. (Eds.) 1991. *The moths and butterflies of Great Britain and Ireland. Vol. 7, Pt. 2, Lasiocampidae to Thyatiridae, with life history chart of the British Lepidoptera. Colour illustrations by Richard Lewington. Harley Books, Martins, Great Horkeley, Colchester, Essex, England. 400 pp. Hard cover. £55.00.***

The second part of volume 7 of *The moths and butterflies of Great Britain and Ireland* (Part 1 was reviewed in *Bull. Ent. Soc. Can.* 22(2):110-111, 1990) extends the excellent species-by-species accounts of this series to the British Lasiocampidae, Saturniidae, Endromidae, Drepanidae and Thyatiridae. However, most of the book consists of more general material, because these families include only 31 British species that are covered, in the established format for this series, in less than 50 pages. The fine colour illustrations that characterize Part 1 also are evident here, comprising 86 life-size figures of species and important variations, on 4 plates. As in Part 1, the British distribution of each species is mapped in detail, including records through 1990.

The other material in the book deals with the Lepidoptera more widely, treating the classification of the order, reviewing resting positions of the adults, and providing a summary of life history information.

A chapter on "Classification of the Lepidoptera" by M.J. Scoble (35 pp.) includes historical perspectives. It provides a good summary of the subject of higher level classification and of the relevant literature, and will be especially useful for non-specialists. The chapter demonstrates that even though the Lepidoptera are relatively well known, especially at the species level in Britain, much work remains before the phylogeny of the order is fully understood. Most of the current views of classification discussed in this review are incorporated on p. 305 of this volume into a revised classification of the British Lepidoptera that differs somewhat from the scheme published in the first volume of the series.

A short chapter (15 pp.) by M.W.F. Tweedie and A.M. Emmet discusses "Resting posture in the Lepidoptera". Although the text is based on an earlier publication (Tweedie, *Br. J. Ent. Nat. Hist.* 1: 1-8, 1988), the chapter is illustrated with 64 excellent photographs of 61 species. Resting position was used as a basis for classification in the earliest systematic works on the Lepidoptera and is broadly indicative of affinity, but there are many exceptions because of individual adaptations.

More than half of the book (about 240 pages) comprises a chart showing the life history and habits of the British Lepidoptera, by A.M. Emmet. All of the butterflies and moths in the British list, some 2,595 species, are tabulated with information on: Life history (with occurrences of the stages indicated by month using key abbreviations such as *lm*, larva, mining, *pC*, pupa in a silken cocoon); Status (*A*, adventive, *R*, resident, etc.); Distribution (based on 11 regions, and vice-counties); Habitats (eg., *2h*, woodland margins, *4a*, acid grassland); Flight time of the adults (*A*, afternoon, *C*, crepuscular, etc.); and Foodplants and other remarks. The codings are relatively complex, and an enormous amount of information is summarized. Using the chart therefore requires some effort; a separate plasticized card bearing a guide to the abbreviations is included with the book. The chart also includes short but very useful summaries of information for each family or subfamily. For example, introductory remarks for the Plutellinae report that "The larvae are solitary and feed in spun leaves, mainly of trees. They are spindle-shaped and wriggle violently if dislodged. They pupate in cocoons that are often boat-shaped, i.e. with the ends tapered only in the horizontal plane and with the vertical edge resembling the bow of a boat. The adults rest with their antennae porrect, in the same manner as the Coleophoridae."

The book concludes with 34 pages of indexes: five indexes to the life history chart (foodplants, species, etc.), and two general indexes.

Part 2 of Volume 7 of *The moths and butterflies of Great Britain and Ireland* maintains the excellent standard set by Part 1. Many lepidopterists and other entomologists will find information of interest to them, as well as ideas for recording data. British entomologists in particular have a readily accessible reference for a conspicuous part of their fauna.

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Biological Survey of Canada  
(Terrestrial Arthropods)  
Canadian Museum of Nature  
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**Bailey, W.J. 1991. *Acoustic Behaviour of Insects: An Evolutionary Perspective*. Chapman and Hall, New York, 225 pp, \$(Can) 109.00, \$(US) 87.50.**

Winston Bailey has written a very readable and informative book on insect acoustical behaviour. The first chapter is an overview of the evolution of acoustical signalling and captures the reader's interest immediately by descriptions of the complicated and often fantastic behaviour involved in insect sound production. The next two chapters examine male and female strategies in aggregations and temporal interactions in insect singing, the essence of what R. D. Alexander termed "specialized chorusing behavior." Chapters four, five and six deal with more proximate aspects of insect acoustics including the physical characteristics of sound and substrate vibrations, and the manner in which insects produce and receive sounds. The remaining chapters cover mate recognition, sound patterns, sound localization, avoiding predation and a concluding chapter on sexual differences in calling, and the evolution of complex signals. This organization and the area covered are appropriate. Although some chapters are a slight detour from the evolutionary perspective, information on proximate mechanisms and characteristics of sound are essential to an understanding of insect acoustical behaviour. Indeed, as John Alcock points out in the foreword, the interaction of proximate and ultimate thinking is a "special virtue" of Bailey's book. Those chapters on the mechanisms of acoustical behaviour are very well written and the coverage of bioacoustics is most understandable by anyone with a general background in biology.

The book is well prepared. There are many illustrations and photographs. Bailey uses a case study approach to illustrate some fundamental principles and detailed studies such as Boake's work on *Amphiacusta maya*, a male cricket that sings primarily to other males. Bailey describes some of his own work, but almost all of the coverage is on the work of others. The book also highlights areas that need work, such as synchronous chorusing in cicadas and the behavioural and neurological problems involved in males listening to their own songs. This is an especially useful aspect of the book for beginning graduate students who are thinking about possible research projects.

The book is most useful for upper level undergraduates, graduate students and professionals interested in invertebrate song or working in other areas where an understanding of insect acoustical behaviour is useful. Although I learned much from reading the book, I don't believe it is intended for researchers working on the evolution of insect acoustical behaviour. There is no attempt to review all of the literature in the area. Although the area of coverage is just right, there are many examples that Bailey did not cover. This is more an observation than a criticism since I think the book is more attractive to the audience described above as a result of the limited number of examples. Indeed, in the Preface Bailey tells his reader that the book is not a synthesis but a view or a perspective derived from his own interests and interactions with evolutionary ecologists and neurobiologists.

The book would be especially useful in the classroom. It might be used as supplemental reading in an advanced entomology course, or as the core of a senior or graduate level seminar course around which other readings could be organized. My one reservation about the book is the price (especially the Canadian price) when considered in the context of the classroom. Since it probably could not be used as the only text in a course, the price is too high for what would be a supplemental text.

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Brock University  
St. Catharines, Ontario

**Ross, K.G. & R.W. Matthews (Eds). *The Social Biology of Wasps*. Comstock Publishing Associates, Cornell University Press, Ithaca, New York. 678pp. Numerous photographs, line drawings etc. Paperback \$(US) 34.95, hardcover \$(US) 72.50.**

The term "wasp" is a rather vague one. Broadly speaking it refers to all apocritan Hymenoptera that are not colloquially called something else - ants or bees. Thus, "wasp" does not denote a monophyletic group. However, all but one of the chapters in this book deal with vespid wasps which certainly are a monophyletic group. Indeed, largely thanks to the efforts of Jim Carpenter, the Vespidae is, perhaps, better understood phylogenetically than any other hymenopteran family. Books dealing with the biology of the two other major social hymenopteran groups are already available (Michener's *The Social Behavior of the Bees* and Holldobler and Wilson's *The Ants*). The social biology of wasps edited by Ross and Matthews fills a gap in the in-depth modern treatment of social Hymenoptera and fills it extremely well.

The book is divided into two parts. The first is a systematic treatment of the social biology of vespid wasps. It begins with Carpenter's overview of the phylogeny of the Vespidae with a cladistic test of West-Eberhard's polygynous family model of wasp social evolution. The second chapter (Cowan) describes the solitary and presocial vespids. The remaining six chapters of part 1 deal with the social vespids more or less group by group: the Stenogastrinae (Turillazzi), *Polistes* (Reeve), independent-founding polybiines (Gadagkar), swarm-founding polybiines (Jeanne), *Vespa* and *Provespa* (Matsuura) and *Vespula* and *Dolichovespula* (Greene). Most of these chapters have sections on systematics, distribution, colony cycles, nest architecture, mating behaviour and natural enemies.

The second part deals with special topics in vespid biology with nine chapters ranging widely in content. Some are straightforwardly sociobiological: reproductive competition (Roseler), queen number and control (Spradbery) and evolutionary sociogenetics (Ross and Carpenter). Others deal with subjects of some social biological significance: nourishment and social evolution (Hunt), polyethism (Jeanne), nest architecture (Wenzel), the nest as a focus for social life (Starr) and vespid exocrine glands (which are important in communication) (Downing). The final chapter (Matthews) deals with social behaviour of the Sphecidae; it is the only one not on the Vespidae and its inclusion is justifiable, perhaps, only because of "wasp" paraphyly. Nonetheless, it is a welcome summary of the available information on another group of Hymenoptera in which some species have crossed the "eusociality threshold".

The great diversity of social organisation found in vespids is especially interesting and is very well documented in this book. Contrast the typical (and probably misleading) view of a eusocial hymenopteran colony composed of one queen and her worker daughters with a nest of *Agelaija vicina*

which contained 108,000 queens and 1.2 million workers on a brood comb which covered a total of 33 square metres! At the other extreme, in *Ropalidia formosa*, nests with more than one adult female are uncommon and the average number of brood cells is less than one dozen.

The origin of a reproductive division of labour has proved to be difficult for evolutionary biologists to explain and many studies of vespid wasps investigate this phenomenon. It occurs in two main forms: in eusocial societies mothers reproductively dominate their daughters; whereas in multiple foundress associations the foundresses are of approximately the same age. Not surprisingly, many chapters discuss these subjects. Both Gadagkar and Hunt downplay the importance of kin selection in the origins of eusociality and both are impressed by the low coefficients of relatedness that have been found among females in many species of social Hymenoptera. However, most of these estimates come from species whose social biology is far removed from the hypothesised ancestral condition: almost all estimates of relatedness have been obtained from ants and social vespids; taxa which have been eusocial for over 100 million years! Using these organisms to test the kin selection hypothesis for the origin of eusociality is like testing ideas on the origin of tetrapods by studying bats! Nonetheless, the evolution of a reproductive division of labour in multiple foundress associations is an evolutionary labile phenomenon in vespids and is amenable to genetic, cost/benefit and phylogenetic analysis. Additionally, the type of social organisation exhibited by the Stenogastrinae may represent a close approximation to the ancestral condition for all eusocial vespids; the lack of estimates of relatedness among nestmates for any species of this subfamily remains the largest gap in our knowledge of vespid sociobiology.

This book is far more than a series of review papers. All of the chapters are timely and extremely useful summaries of available information but many make significant original contributions. For example, Reeve develops some mathematical models to investigate the selective advantages of multiple foundress nest associations. Although these models are derived with special reference to *Polistes*, they could be applied to any hymenopteran with some multiple foundress nests. Gadagkar provides a new, verbal model which combines the three major hypotheses of the evolution of eusociality. In his view, societies formed initially for mutualistic benefit, provided opportunities for parental manipulation, and this eventually led to a situation where kin selection could operate.

The separation of the book into taxonomic and topic-based sections results in some unavoidable redundancy. Roseler's chapter suffers most from such duplication. A more detailed account of his research on the physiological aspects of reproductive dominance would have been preferable.

*The Social Biology of Wasps* is well written and amply embellished with photographs, maps and line drawings. A great deal of useful information is summarised in the extensive tables and the book is remarkably free of errors (although one author referred to phorids as moths!). There is a taxonomic index in addition to a well cross-referenced subject index.

This book will be of interest to a wide range of people. Anyone interested in natural history will find much to marvel at, anyone interested in the behaviour or ecology of insects should buy the book and students of sociobiology will find enough information in it to keep them entertained for days. At \$34.95 (U.S.) for a paperback of over 670 pages (including a 64-page bibliography) this book is reasonably priced.

Laurence Packer  
Biology Department  
York University

## PHOTOS



### **Entomological Society of Saskatchewan 1991-1992 Executive.**

From left to right: Dorothy C. Murrell (Treasurer), Peter Harris (President), Owen O. Olfert (Secretary), Juliana J. Soroka (Past President), Keith N. Roney (Proc. Editor)

### **Photographs from the 39th Annual Meeting of the Entomological Society of Saskatchewan, 1-2 November 1991, Saskatoon, Saskatchewan**

**Richard K.B. Martel**  
University of Regina  
Winner of the A.R. Brooks Memorial Prize  
and Best Student Paper Award



# POSITIONS AVAILABLE

## **Program Coordinator - Okanagan-Kootenay Sterile Insect Release (SIR) Board**

The SIR Board requires a Program Coordinator who will be responsible for the operation of a program to eradicate the codling moth with sterile insect release technology. In addition responsibilities include delivery of quality service, developing operating policy and procedures, manpower deployment and program management.

The successful applicant will possess: at least an M.Sc. degree in entomology or pest management from a recognized university or college; at least 5 years' experience in the management of an organization which focuses on entomology such as a government pest control unit or a research laboratory; the ability to communicate effectively, both orally and in writing, to growers, media representatives, scientists and the general public; and a demonstrated ability to plan, coordinate and supervise the work of a large number of seasonal employees. Preference will be given to applicants who have direct experience with SIR technology. Familiarity with tree fruit pest management and production will be a definite asset.

The duration of this position is approximately 8 years. The successful applicant will sign a contract with a 1-year probationary period. The salary is competitive, and cash may be offered in lieu of a benefit package. Applicants should state their salary expectations in their application. This position will be filled as soon as a suitable candidate is found. Applicants should indicate when they would be available.

Interested candidates should IMMEDIATELY send in their resumes and 3 references to:

Mr. Greg Norton, Chairman of SIR Board  
R.D.O.S. 101 Martin St., Penticton, B.C. V2A 5J9  
Tel: (604) 492-0237 or Fax: (604) 492-0063

Further information is also available from Dr. Arnold Dyck, Agriculture Canada Research Station, Summerland, B.C. Tel: (604) 494-7711.

## **Postdoctoral Fellowship - Insect Pathology and Microbial Control**

A position is available for a postdoctoral fellow to participate in research aimed at developing entomopathogenic fungi for the control of grasshoppers and locusts. The successful candidate should have a Ph.D. in entomology or a related discipline, with training in insect pathology. Knowledge of histology, scanning electron microscopy, insect bioassay and microbial formulation is highly desirable.

The position is available April 1, 1992; starting date is flexible. Preference will be given to Canadian citizens or landed immigrants.

Applicants should send a statement of interest in this position and a C.V. to:

Dan Johnson or Mark Goettel  
Agriculture Canada Research Station  
P.O. Box 3000 Main  
Lethbridge, Alberta, T1J 4B1  
Tel: (403) 327-4561 or Fax: (403) 382-3156

# SCHOLARSHIPS AND GRANTS

## Entomological Society of Canada - Postgraduate Awards 1992

### Invitation for Applications

The Entomological Society of Canada will offer two postgraduate awards of \$2,000 each to assist students beginning graduate study and research leading to an advanced degree in entomology. The awards will be made on the basis of high scholastic achievement.

*Eligibility* - The successful applicants must be either Canadian citizens or landed immigrants with Bachelor's degrees from Canadian universities. Applicants must begin their first year of postgraduate studies between 15 June 1991 and 31 December 1992. The studies and research must be carried out at a Canadian university. Each award is conditional upon certification by the Department Head that successful applicants have been accepted into the first year of a program of study and research for an advanced degree with full graduate student status. A student who was unable to gain admission or enters graduate school as a qualifying candidate is not eligible to receive an award.

*Method of Application* - Applicants should submit a properly completed form, with support documents, in accordance with the instructions printed on the application form. Applications must be received by the Secretary of the Society no later than **12 June 1992**.

*Process of Selection and Award Presentation* - Applications will be reviewed by a committee of the Society and announcement of the two winners will be made at the annual meeting of the Society and each winner will receive a certificate. Payment of the award will be made in October, 1992.

### Regulations

*Earnings from other sources* - Award holders are permitted, under normal circumstances, to demonstrate, instruct or assist in non-degree related research for a maximum of 200 hours per annum, provided that the Head of their Department considers it desirable and that it does not hinder the progress of their studies. Apart from these assistantships, award holders will devote their full time to study and research and will not undertake any paid work during the school term. They may hold other awards and scholarships.

*Transfers* - Awards are made on the condition that the winners engage in a program of graduate studies and research for an advanced degree in entomology in Canada. Students, who after receiving the award, wish to change their graduate program or transfer to a foreign university may be asked to decline the award. Any change in the course of study, department or university in which an award winner is registered requires prior approval of the Scholarship Committee. A request for permission to transfer must be supported by statements from Heads of Departments.

*Additional Allowances* - The award stipends are all-inclusive. There is no provision for additional grants by the Society for any purpose. Additional grants, for example, to attend meetings, pay course fees, meet publication costs, etc., will not, under any circumstances, be authorised.

All communications regarding these awards, including requests for applications, should be addressed to:

Dr. R. West, ESC Secretary  
Forestry Canada, Newfoundland and Labrador Region  
P.O. Box 6028  
St. John's, Newfoundland A1C 5X8  
Fax 709-772-2576

## Bourses pour Étudiants Post-Gradués 1992

### Avis

La Société d'entomologie du Canada offrira deux bourses d'un montant de \$2,000 chacun pour aider des étudiants qui entreprennent des études post-graduées et des recherches en vue de l'obtention d'un diplôme d'études supérieures en entomologie. Les bourses seront accordées aux étudiants et étudiantes en raison des seuls critères de réussite académique.

*Éligibilité* - Les candidats doivent être canadiens ou résidents reconnus du Canada et détenir un baccalauréat d'une université canadienne. Les candidats doivent obligatoirement avoir débuté leur première année d'études post-graduées entre le 15 juin 1991 et le 31 décembre 1992, et effectuer leur étude et recherche dans une université canadienne. Les bourses ne seront accordées que lorsque les directeurs de Département auront certifié que les candidats choisis sont inscrits en première année d'un programme d'études supérieures, et ce avec tous les privilèges attachés au statut d'étudiant gradué. Un étudiant qui n'a pu être admis à une École des Gradués, on qui s'inscrit en vue de compléter l'obtention de crédits, n'est pas éligible pour recevoir une bourse.

*Procédure* - Les candidats devront soumettre leur candidature à l'aide du formulaire approprié et y joindre tous les documents requis. Les demandes devront être reçues par le Secrétaire de la Société au plus tard le **12 juin 1992**.

*Sélection et remise des bourses* - L'analyse des candidatures se fait par un comité de la Société, et l'annonce des récipiendaires se fera à la réunion annuelle de la Société ou ils recevront un certificat. Le paiement de la bourse aura lieu en octobre 1992.

### Règlements

*Autres sources de revenus* - Un boursier pourra normalement donner des séances de cours ou des démonstrations et être auxiliaire de recherche jusqu'à un maximum de 200 heures par année, en autant que le Directeur de son département considère cela profitable et que ces tâches additionnelles ne nuisent pas au progrès de l'étudiant. Sauf pour ces assistances, un boursier devra consacrer tout son temps à ses études et recherches et n'accepter aucune autre rémunération. Il peut cependant jouir d'une autre bourse ou d'un prix.

*Transferts* - Les bourses sont accordées sous condition que les boursiers entreprennent des études graduées en vue de l'obtention d'un diplôme en entomologie au Canada. Les boursiers qui décideront de changer de champs d'études, ou transférer dans une université hors du Canada peuvent se voir retirer leur bourse. Après acceptation de la bourse, tout changement de programme d'études, de département ou université devra recevoir à préalable l'approbation du Comité de la Bourse de la SEC. Une telle demande doit être accompagnée de documents provenant des Directeurs des départements concernés.

*Frais supplémentaires* - Une bourse consiste en une somme d'argent total. En aucun cas la Société n'accordera de montant supplémentaire. Des frais additionnelles pour, par exemple, assister aux réunions scientifiques, payer des frais de cours, défrayer des coûts de publications, etc., ne seront autorisés sous aucune considération. Toute correspondance relative aux bourses, incluant les demandes de formulaires doit être adressée à:

Dr. R. West, secrétaire SEC  
Forestry Canada, Newfoundland and Labrador Region  
P.O. Box 6028  
St. John's, Newfoundland A1C 5X8  
Fax 709-772-2576



# UPCOMING MEETINGS / RÉUNIONS À VENIR

## **52nd Annual Meeting of the Acadian Entomological Society**

July 28-29, 1992

Charlottetown, Prince Edward Island

CONTACT: Jeff Stewart, Agriculture Canada, Research Station, P.O. Box 1210, Charlottetown, P.E.I., C1A 7M8. Tel: (902) 566-6844; Fax: (902) 566-6821.

## **75th Annual Meeting of the Florida Entomological Society**

August 10-13, 1992

Stuart, Florida

The 75th annual meeting of the Florida Entomological Society will be held at the Indian River Plantation Resort and Conference Center, 555 N.E. Ocean Boulevard, Hutchinson Island, Stuart, Florida 34996. (Tel. 407-225-3700) The deadline for submission of papers and posters will be May 15, 1992.

CONTACT: Jorge E. Peña, Chairman Program Committee, FES, University of Florida, Tropical Research & Education Center, 18905 S.W. 280 Street, Homestead, Florida 33031. Tel. (305) 246-7048 or (305) 246-6340.

## **25th Annual Meeting of the Society for Invertebrate Pathology**

August 16-21, 1992

Heidelberg, Germany

The 25th Annual Meeting of the Society for Invertebrate Pathology will be held in Heidelberg, Germany. The scientific program will consist of organised symposia of invited papers, sessions of contributed papers, posters and workshops. Symposia are being organised on the following topics: *Bacillus sphaericus*; Microbial control of scarab beetles; *Serratia* infections in insects; Advances in formulation and application technology for microbial pesticides; Genetic engineering of microbials; Pathogens of locusts; Standardisation and quality control of *Bacillus thuringiensis* and other microbial pesticides; Immunology of invertebrates; Entomopathogenic nematodes; Marine invertebrate pathology; *Bacillus thuringiensis*: receptors and specificity; Mechanism of infection by entomopathogenic fungi: recognition, attachment, penetration, and post penetration responses; Mode of action of insect pathogens in the midgut; Bee pathogens; Microbial control of vectors.

The deadline for submission of Abstracts is 1 April, 1992. Registration and payment of fees should be made before June 30.

CONTACT: SIP Congress Secretariat, KABS, Kreisverwaltung Ludwigshafen, Europaplatz 5, P.O. Box 210 780, D-6700 Ludwigshafen, Germany. In Canada, information on registration and abstract preparation can be obtained from Mark Goettel, Agriculture Canada Research Station, P.O. Box 3000, Main, Lethbridge, Alberta, T1J 4B1. Tel: (403) 327-4561; Fax: (403) 382-3156.

# MISCELLANEOUS

## Additional Information on Insect Transmitted Plant Diseases

P.G. Kevan and co-workers (J.C. Sutton, P. Gang, and E. Magoulas) at the University of Guelph have used honeybees to vector *Gliocladium roseum* to flowers of strawberries and raspberries. This fungus suppresses grey-mold fruit rot caused by *Botrytis cinerea*. By using various formulations of *G. roseum* spores placed in hive-entrance dispensers (modified pollen dispensers) the levels of grey-mold suppression achieved were effectively the same as by spray application of the spores or by use of the fungicide, "Captan".

Studies of fungal biocontrol agents against white-mold (*Sclerotinia*) on canola are in the preliminary stages in Kevan's laboratory.

## Erratum

Please note that Don Dixon is in charge of the 1994 Annual Meeting in Winnipeg, Manitoba and not Paul Fields (as indicated in the December 1991 *Bulletin*, Vol. 23(4): p.139).

## Quip of the Year (1991)

At the Annual Meeting in Montreal, Ed Becker requested that members of the Entomological Society of Canada "dig up a few oldtimers" to enhance his Newsletter entries. Groan!

## EDITOR'S NOTES

I would like to thank Dan Johnson (Agriculture Canada, Lethbridge) for a thought-provoking Guest Editorial. Dan has asked that members share their views with him about the inclusion/exclusion of insects under the CCAC guidelines. In addition, please continue to send any information that you may have on the "Insect Rights Movement" to me in Brandon!

Many thanks to those of you who sent text on diskette - especially Charles Vincent who provided the French version of "La recherche entomologique et la politique" (par E.J. Leroux et J.J. Cartier)!

Any STUDENT MEMBERS interested in becoming involved with Society Affairs are asked to write to Kenna MacKenzie (Chair, Student Affairs Committee, Department of Entomology, Comstock Hall, Cornell University, Ithaca, N.Y. 14853-0999).

Please do not hesitate to contact me if there is something you would like to see in the *Bulletin*. I enjoyed my first term as Editor and look forward to more of the same!

Fiona F. Hunter

THE DEADLINE FOR THE NEXT ISSUE (VOL. 24(2)) IS **MAY 1, 1992**  
LA DATE LIMITE POUR RECEVOIR VOS CONTRIBUTIONS  
POUR LE PROCHAIN NUMERO (VOL. 24(2)) EST LE **1 MAI 1992**

Please send contributions to:

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