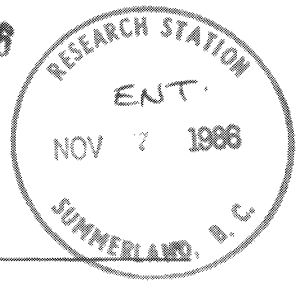
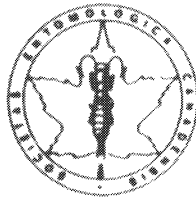


NOV 7 1986



ENTOMOLOGICAL SOCIETY OF CANADA

Bulletin



SOCIÉTÉ ENTOMOLOGIQUE DU CANADA

Vol. 18

September-septembre 1986

No. 3



Entomological Society of Canada
Société Entomologique du Canada

Bulletin

Vol. 18 September-septembre 1986 No. 3

<i>Letter to the Editor</i>	79
<i>Mid-Term Report from the President</i>	79
<i>37th Annual General Meeting</i>	81
<i>Committee Reports: Elections, Achievement Awards</i>	81
<i>Awards: Gold Medal Recipient</i>	82
<i>Awards: Hewitt Award</i>	82
<i>Call for Nominations</i>	82
<i>Biological Survey of Canada</i>	83
<i>Articles: The God Question by D. A. Craig; The Manufacture of Anomalopsyche</i> <i>Hephaesta by Heather Proctor; Insect Biology at Sudbury's Science North</i> <i>by F. Mariotti and J. Shorthouse</i>	84
<i>News of Organizations: Biological Council of Canada; International Society</i> <i>of Arboriculture; International Commission of Zoological Nomenclature</i>	92
<i>Positions Available</i>	95
<i>Workshop</i>	95
<i>Personalia</i>	96
<i>Book Review</i>	98
<i>Meetings</i>	98
<i>Recent Deaths</i>	99

R. B. Aiken: Bulletin Editor

Cover Design: M. A. Sydor

Published by:
The Entomological Society of Canada,
1320 Carling Avenue, Ottawa, Ontario K1Z 7K9

LETTER TO THE EDITOR

I enjoyed Doug Eidt's letter in the March 1986 *Bulletin* about how flies land upside-down. But I wonder why he calls the Wilkerson-Butler paper (in the *ESA Annals*) "apocryphal." As the paper's editor, and in fairness to its authors, I insist that its authenticity is beyond question although (I confess) it has not yet become part of the Old Testament. When (or if) it does, Solomon's advice may be changed: like Immelman, the WW-I ace, we may be adjured to "go to the horsefly, thou flier."

Carl Schaefer
University of Connecticut

MID-TERM REPORT FROM THE PRESIDENT

The Executive Council held its mid-term meeting in Ottawa on April 22-23, 1986. The Science Policy Committee met the day previous, on April 21 and the Biological Survey of Canada (Terrestrial Arthropods) met afterwards on April 24, 25. A number of developments arising from committee reports and other actions should be of interest to E.S.C. members.

The Search Committee for a new Treasurer, chaired by Bernard Philogène was successful in obtaining a candidate, and Dr. Don Bright of the Biosystematics Research Institute assumed the position of Treasurer early in 1986. Our financial position is sound with revenue exceeding expenditures. The 1986 budget will be presented to the Governing Board at the annual meeting in Winnipeg.

Dr. Ron Aiken, Mt. Allison University, became Bulletin Editor and assumed his duties with the March issue. Assistant Bulletin Editor Bev Mitchell acted as Editor during the interim period.

The study on the economics of insect control on wheat, corn and canola in Canada is nearly complete and the first draft of the report is being circulated to the Scientific Committee. It is expected that the final draft will be in the hands of the Scientific Authority for the Government by fall or earlier. A new study, the economics of insect control on beef cattle and dairy was initiated. The Steering Committee, G. Surgeoner (Chairperson), T. Galloway, D. Lewis and J. Shemanchuk are organizing the project and are preparing a submission for funding to the appropriate government agencies.

Under the Chairmanship of First Vice-President G. G. E. Scudder, the Science Policy Committee met on 21 April 1986. The final draft of the report of the Microbial Insecticides Study Committee was filled by Chairperson O. N. Morris. The Executive approved the recommendation of the Science Policy Committee that the report be published by E.S.C. and mailed to all society members as well as a selected list of provincial and federal government officials, university biology department chairpersons and other officials in forestry, health of animals and other related agencies. The E.S.C. has been attempting to establish a biological control study committee under an Integrated Pest Management program of the Research Branch, Agriculture Canada. A work planning meeting was held in May 1985, and as a result of that meeting, a workshop on Biological Control and its Relations to IPM is planned in conjunction with the E.S.C. annual meeting in Winnipeg. O. N. Morris and J. Laing will officially represent our Society at the workshop and when the meeting is concluded, the E.S.C. will be in a position to decide what action to take on a biological study.

The B.C.C. Representative reported that the 1985 B.C.C. Congress was considered successful even though several societies were unable to participate fully. A second Congress is planned for late May in 1990 at Laval University. The B.C.C. is reviewing its fee structure in order to obtain increased revenues, but details have not been finalized. Workshops on scientific criteria for environmental quality are being organized and the E.S.C. was asked to submit names of scientists who could participate in such workshops. The B.C.C. is initiating a program of Parliamentary Science Associateships with the objective of providing assistance in matters of science and technology to Members of Parliament.

Past President S. McIver wrote the Prime Minister on behalf of the E.S.C. to urge the prompt establishment of a Parliamentary Standing Committee on Science, Research and Technology.

Scientific Editor Al Ewen reported that the system of a Scientific Editor and two assistant editors is working well in the processing of manuscripts. The number of associate editors has been increased to 18 so that review of manuscripts can be more efficient.

The plans for the 1988 International Congress of Entomology are progressing well under the Organizing Committee, G. G. E. Scudder, Chairperson, J. N. McNeil, I. M. Smith, S. R. Loschiavo, G. E. Ball and K. G. Davey. A logo has been selected, topics for plenary sessions are being developed, symposia topics are under consideration and plans are underway for special events connected with the Congress. It is planned that the first announcement will be mailed this fall. Accommodation and meeting rooms will be on the campus of the University of British Columbia.

The By-Laws, Rules and Regulations Committee were asked to consider what changes in our By-Laws and Standing Rules might be needed in order to meet with the International Congress in 1988 and with the B.C.C. Congress in 1990. The Committee concluded that no general changes are needed in either the Standing Rules or the By-Laws to enable the Society to meet at other times of the year. There also appears to be no restrictions on meeting with other societies. Specific changes to the Standing Rules may be required to ensure that the Society's business is managed satisfactorily when the Annual Meeting is held outside the usual September 15 to October 31 interval. An ad hoc committee of G. Gerber and E. Becker was appointed to identify these changes and report to the October 1986 Governing Board meeting.

The Insect Common Names and Cultures Committee has prepared a list of English common names of Canadian insects and the list is now under review by Committee members. Chairperson E. M. Belton is organizing the list, deciding upon nomenclatorial problems and making the necessary corrections. A French list has been published by the Quebec Society for Plant Protection and the E.S.C. is negotiating with the Q.S.P.P. to obtain the computer tapes of the French common names list. The E.S.C. plans to publish a combined French-English list of common names of Canadian insects.

The Publications Committee, chaired by M. Mackauer has prepared guidelines for publication of invited review papers supported by the C. P. Alexander fund. The guidelines were approved by the Executive and will be published in the Bulletin. The Executive was asked to review E.S.C. policy towards paid advertisements. It was agreed that advertisements would be appropriate in the Bulletin and this matter will be discussed at the next Governing Board meeting. The subject of copyright status of articles in the Society's journals was raised and this will be investigated. A revised statement on the terms of office of associate editors was accepted and this will be incorporated in the Standing Rules.

The Finance Committee, chaired by H. Danks reviewed requests for a photocopier for the E.S.C. office and a computer for the Scientific Editor's office. The Committee recommended that a decision be deferred until the office obtains records of the amount of photocopying done and documents any delays or difficulties with the present system of using a photocopier in another building. The Finance Committee recommended against the purchase of a computer for the Scientific Editor. At present, the Editor is renting a computer to keep track of manuscripts at a reasonable cost and this arrangement seems to be satisfactory.

Plans for the 1986 annual meeting hosted by the Entomological Society of Manitoba are on schedule and a formal announcement has been sent to Society members. We are looking forward to an excellent annual meeting in the City of Winnipeg.

The 1987 annual meeting will be in Penticton, hosted by the Entomological Society of British Columbia. The Washington State Entomological Society will also participate in the meeting. N. Angerilli is Chairperson, R. McMullen is Program Chairperson and J. Cossentine Arrangements Chairperson. The meeting will be held in the Delta Hotel on the south shore of Lake Okanagan.

The Scientific Committee of the Biological Survey of Canada met on April 24, 25 under the chairmanship of G. G. E. Scudder. A proposal to expand the Survey was discussed and representatives from the Canadian Society of Zoologists and the Canadian Botanical Association were invited as observers. The status of funding to support Survey publications is a major problem and a number of avenues are being investigated. At the present time, the status of NSERC funds to publish Dr. Danks' manuscript on insect dormancy is uncertain. Progress was reported on a number of scientific projects including fauna of the Yukon, grasslands, springs and their fauna, aquatic insects of peatlands and marshes, aquatic insects of Newfoundland, taxonomy of mayflies and insects of the Queen Charlotte Islands. Generic keys to Thysanoptera and Strepsiptera are in press and a key to families of Coleoptera is under preparation. A new project on boreal lifezone is underway and progress was reported on arthropods of the soil.

There was considerable discussion on a proposed study of the effects of climatic change on the flora and fauna of Canada and what role the Survey might take in monitoring long-term environmental changes to arthropod populations.

Under regional developments, an expedition to British Columbia west coast islands is scheduled for late July, Saskatchewan now has a mapping scheme prepared for bumblebees

and blackflies, the Metro Toronto Zoo has hired a full time entomologist, Quebec has initiated a project on the insect fauna of the province and an account of arctic beetles is scheduled for completion in 1987. The Acadian Entomological Society will host the 1989 E.S.C. annual meeting, and a symposium on springs and their insect fauna would be appropriate.

Among other items discussed, a Biological Survey logo has been prepared and approved and a document on the nature of the Biological Survey concept as a national initiative in the life sciences was prepared and sent to NSERC.

Past President Susan McIver represented the E.S.C. at the October annual meeting of the Entomological Society of Manitoba, Regional Director R. Cannings attended the annual meeting of the British Columbia Entomological Society, Director-at-Large, Gordon Pritchard represented E.S.C. at the annual meeting of the Alberta Entomological Society, and Regional Director D. J. Larson represented E.S.C. at the April annual meeting of the Acadian Entomological Society.

FIRST NOTICE / PREMIÈRE ANNONCE ANNUAL MEETING

Entomological Society of British Columbia Entomological Society of Canada Washington State Entomological Society

September 28-30, 1987
Delta Lakeside Hotel
Penticton, British Columbia

FEATURE SYMPOSIUM—"Arthropod Pheromones—From the lab bench to the field. An up-to-date account of pure and applied research." (Sept. 28).

Submitted Papers and Special Interest Groups—Sept. 29-30.

Meeting Chairman: Dr. N. Angerilli, Agriculture Canada, Research Station, Summerland, B.C. V0H 1Z0

COMMITTEES

Report of the Elections Committee

The committee was comprised of Robert Baker (substituting for F.M. Barrett), Tom Alloway (sitting in for D. L. Gibo) and Glenn Morris (Chairperson). We met July 24, 1986 at Erindale College in Mississauga and examined ballots for the 1986 election of officers.

A total of 344 ballots were cast. The successful candidates were:

Second Vice-President:

D. C. Eidt

Directors-at-large:

N. J. Holliday

I. M. Smith

Fellowship Selection Committee:

R. F. Morris

A. G. Robinson

The Election Committee hereby attests that all of the ballots were accurately counted and that the results are correct.

Glenn K. Morris,
Committee Chairperson

Report of the Achievement Awards Committee

The Achievement Awards Committee has selected Dr. E. J. LeRoux as the recipient of the 1986 Gold Medal. There was no C. Gordon Hewitt Award given for 1986.

A biographical sketch of Dr. LeRoux will appear in the December issue of the Bulletin.

E. C. Becker
Committee Chairman

CALL FOR NOMINATIONS

Honorary Members

The Entomological Society of Canada has vacancies for up to two (2) new Honorary Members. Please forward nominations to the Chairman of the Membership Committee by November 30, 1986. All nominations must be accompanied by a 1-2 page biographical sketch highlighting those accomplishments that contribute to his/her being considered for Honorary Membership. A complete publication list should also be included. Send nominations to Dr. R. G. H. Downer, Department of Biology, University of Waterloo, Waterloo, Ontario, N2L 3G1.

BIOLOGICAL SURVEY OF CANADA (TERRESTRIAL ARTHROPODS)

Survey Report

The Scientific Committee met in Ottawa on 24-25 April, 1986. Recent developments are reported below.

Scientific Projects

1. Illustrated keys to the families of arthropods of Canada

The first fascicle of this series, dealing with the myriapods, is in press.

2. Aquatic insects of freshwater wetlands

The proceedings of the conference on the aquatic insects of peatlands and marshes (St. Andrews, 1984) has been submitted for publication.

3. Arthropods of freshwater springs in Canada

Documentary work and some specific studies on spring habitats are underway. The outline of a symposium on the insect faunas of springs, provisionally to be held at the Entomological Society of Canada meeting at St. John's in 1989, has been prepared. One of the recommendations of the recent report of the Pearce Commission of Inquiry on Federal Water Resources, that water data collection should be extended to include ground waters, reflects the opinion of the Survey's 1984 brief to the Commission.

4. Arthropods of peatlands

This new project has been well received. Specific studies of several habitats have begun, and some guidelines for sampling peatland faunas have been prepared.

5. Arthropods of the boreal life zone

Announcement of this new project on the insects of jack pine and related tree species prompted a small but useful response.

Other Scientific Priorities

1. Climatic change

On behalf of the Committee, Dr. J. V. Matthews continues to monitor the possibilities for the wider involvement of biologists, including entomologists, in the study of climatic change.

2. Paper on environmental impact assessment

A paper entitled "The importance of insects in environmental impact assessment" is in press.

3. Research on long-term environmental changes

The Committee discussed at length possibilities for long-term research, which will be explicitly considered in future planning for individual scientific projects. The role of ecological collections is also being considered.

Information and Liaison with Other Organizations

1. Expansion of the Biological Survey of Canada (Terrestrial Arthropods)

Representatives of the Canadian Society of Zoologists and the Canadian Botanical Association were present at the meeting, reflecting the interest of these societies in possibilities for an expanded biological survey.

2. The U.S. Biological Survey

The invited representative of the Committee on Systematics Resources of the Entomological Society of America reported on recent developments in the U.S. National Biological Survey.

3. CCEA and COSEWIC

Letters to favour continued communication have been sent by the chairman on behalf of the Committee to the Canadian Council on Ecological Areas and to the Committee on the Status of Endangered Wildlife in Canada.

Other Items

1. Survey publications

Efforts by the publications subcommittee to raise funds from private sources have not been successful. However, funds have been secured from other sources, including the Natural Sciences and Engineering Research Council, and the Survey's book on insect dormancy is now in press.

2. General matters

The Committee discussed other matters, including workshops on the fauna, lettering for the Biological Survey logo, and the 1986 Annual Report.

3. Change of Chairmanship

Dr. G. E. Ball agreed to replace Dr. G. G. E. Scudder as chairman of the Committee.

ARTICLES

The God Question

For a number of years there has been a question in the final exam in my insect morphology course involving design of an insect for a given habitat.

For want of a better title for the project, it has over the years become known as the "god question"—in part no doubt because the students get to play god. However, there is nothing supernatural about the project, although some of the results may be unnatural!

The course covers basic principles of morphology, some necessary physiology and principles of locomotion which involve some aero- and hydrodynamics. Although the answers to the god question are science-fiction, I only accept solutions using current knowledge. Students are given the question a few weeks before the final exam and I attempt to provide them with useful literature and to keep them reasonably within bounds. I have found that questions about extreme aquatic habitats provide the best scope for a student's ingenuity.

The following paper on the hypothetical *Anomalopsyche hephaesta* by Heather Proctor is one of the best answers I have had in recent years. The characteristics of the habitat I provided are outlined in the first section.

Heather Proctor is an honours B.Sc. student in the Department of Zoology, University of Alberta. She is a recipient of an NSERC 1967 Science and Engineering Scholarship which she will take up while doing graduate work in the Department of Biology, University of Calgary. Heather's prime biological interest is freshwater mites, but she is also a talented artist and rides Icelandic horses.

D. A. Craig
Department of Entomology
University of Alberta

The God Question or The Manufacture of *Anomalopsyche hephaesta* (Trichoptera: Anomalopsychidae)

by

Heather Proctor,¹

Department of Zoology, University of Alberta, Edmonton, T6G 2E3

Description of habitat: *Anomalopsyche hephaesta* inhabits a short stretch of stream 2000m above sea level on the side of an extinct volcano in Iceland. The stream originates from a subterranean hot spring and has a temperature of 80°C at the site of emergence and a high concentration of dissolved salts. The stream is shallow, with a maximum depth of 10cm, and cobble substrate. Emergent rocks are common. The stream's velocity often exceeds 20cm/sec. The warmest average air temperature at Reykjavik, the capital of Iceland, is 12°C (Nat. Geo. Soc. 1975) and since an ~6°C drop occurs per 1000m increase in altitude, (Ricklefs 1973, p. 43), the warmest average air temperature at the stream site is $[12^{\circ}\text{C} - (2 \times 6^{\circ}\text{C})] = 0^{\circ}\text{C}$. The environment at the stream site has been stable for several hundred thousand years (long enough for the insect to have evolved, in other words).

Problems and Solutions for *Anomalopsyche hephaesta*

1) **Getting to the habitat originally:** Mani (1962, p. 198) mentions that caddisfly larvae in the Himalayas are common up to altitudes of 5000m. The trichopteran ancestor of *Anomalopsyche* could easily have lived in the same stream as the descendant but further down the side of the volcano where the water temperature would be lower, and the salts would have been diluted by runoff from snow and other streams. Adaptations for hot-water life could have taken place gradually as new forms evolved which were capable of tolerating upstream conditions.

2) **Preventing heat death:** According to Brock (1978, p. 40), insects do not live in water hotter than 50°C. This is probably because their proteins are denatured at high temperatures; their enzymes become dysfunctional when the shapes of the active sites are altered. Thus *Anomalopsyche* must regulate its body temperature at a level much lower than the stream's 80°C.

An organism living in hot water "cannot be a biological submarine with an air-conditioning system since there is no way for a heart pump to operate in an isothermal environment" (Brock 1978, p. 4). *Anomalopsyche* must therefore be in contact with some substance considerably cooler than the stream. Happily for the insect, the air temperature is very much lower than that of the water. One might expect that the air directly above the stream would be almost as warm as the water. However, with such dramatic differences in temperature between the stream and ambient air, convection currents would be set up with a constant, cool breeze blowing in from the sides of the stream.

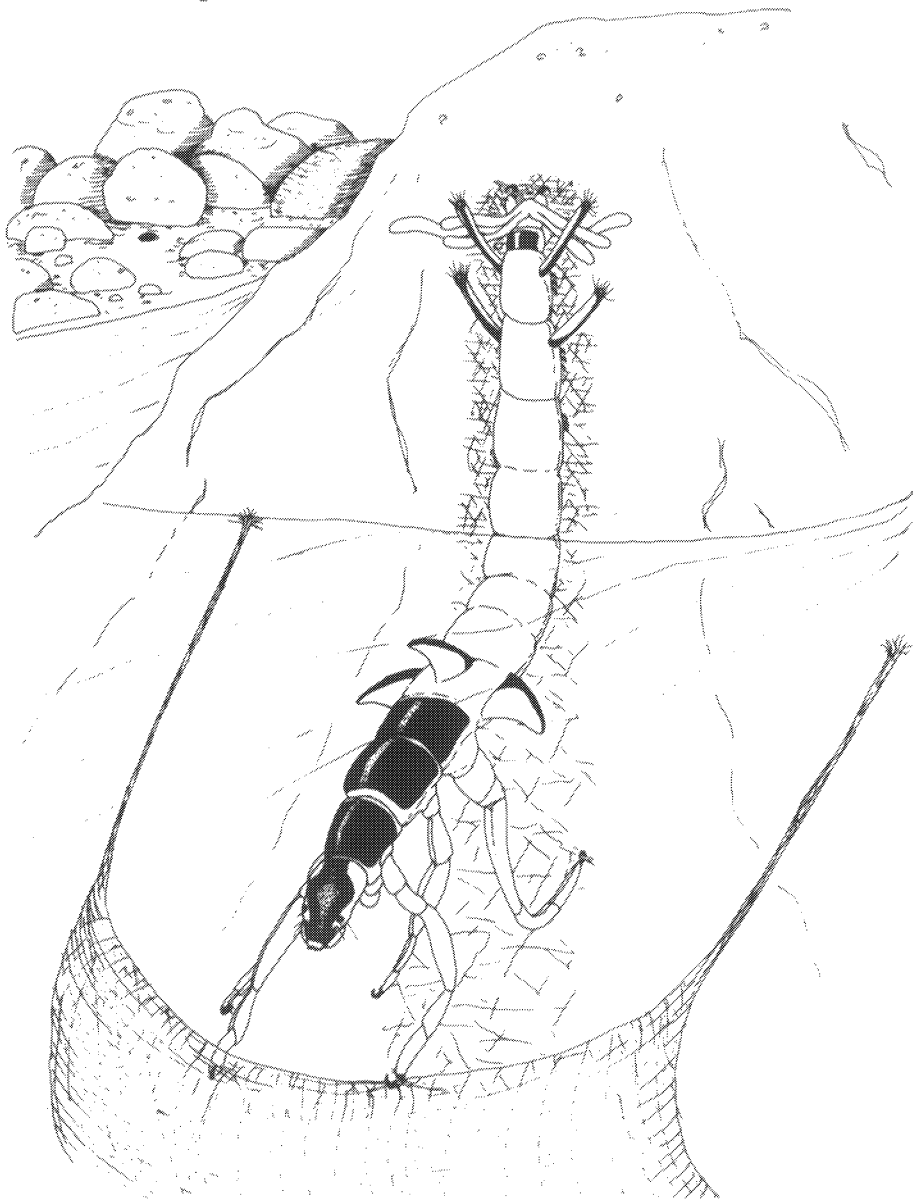


Fig. 1. Habitus drawing of *Anomalopsyche hephaesta* larva.

Besides this convective cooling mechanism, the circulating air would cause a great deal of evaporative heat loss. According to Mani (1962, p. 49), the atmosphere at high altitudes is extremely unsaturated, and that "with even a slight rise in . . . temperature, the rate of evaporation is therefore greatly accelerated. . . . High wind velocity naturally accelerates the rate . . . also." Warming of the cold, unsaturated air increases its water-holding capacity, and it readily picks up stray water molecules. [Since it is the fastest water molecules that escape from a wet surface, the average speed (i.e. temperature) of the remaining molecules is lowered. Hence evaporation is a cooling process.]

Anomalopsyche takes advantage of the cooling effect of this cold, dry breeze with adaptations of its circulatory system. The hind end of the insect is held out of the water by its prolegs whose claws are hooked into a silken pad attached to the downstream side of an emergent rock (Fig. 1). Its circulatory system is more 'closed' than those of most other insects, with definite paths for haemolymph circulation and valves maintaining a unidirectional flow. At the base of each of the numerous anal papillae is a powerful pulsatile organ that pumps haemolymph through the thin-walled eversions. The papillae are kept wet by epithelial fluid secretions. As warm haemolymph from the submerged part of the insect travels through the moist papillae, it is cooled by convection and evaporation to the cold dry breeze. Cool haemolymph is returned to main circulation from the papillae.

Anomalopsyche prepares itself for complete submersion by increasing the rate of circulation through these structures, thus cooling the haemolymph more. When under water, flow through the papillae is essentially halted and body fluid travels an alternate route so that it is not heated by the formerly cooling pathway. The insect can remain under water for only a short time before it must return to the surface.

In addition to circulatory modifications, *Anomalopsyche* has tracheal adaptations to further cool the interior of its body by evaporation. The insect breathes through raised spiracles (Fig. 1). Large tracheae encircle the gut, and rapid, deep ventilation (with the help of air sacs) forces air around the intestine. Since *Anomalopsyche*'s food is hot, this cooling of the gut is essential to prevent deactivation of digestive enzymes.

3) Maintaining position in stream: With an increase in temperature, density of water decreases (Brock 1978, p. 28), and the kinetic viscosity is somewhat lessened. However, it is still sufficient to result in turbulent conditions. In the following calculations, the kinematic viscosity (ν) of water at 40°C ($0.658 \times 10^{-6} \text{m}^2/\text{s}$) is used, as Vogel (1981, p. 17) doesn't list that of water at 80°C.

(As *Anomalopsyche* stations itself on the downstream side of rocks, the length of the rock, as well as the length of the insect must be considered.) Assuming an average emergent rock length (l) of 20cm and the lowest rate of flow (u), Re would be:

$$Re = \frac{lU}{\nu} = \frac{0.2\text{m} (0.2\text{m/s})}{0.658 \times 10^{-6}\text{m}^2/\text{s}} = 60,790.3$$

Thus a von Karmen trail of alternating vortices would form behind the rock at a stream velocity of 20cm/s. For the flow to be fully turbulent (i.e., $Re \geq 200,000$), the water would have to flow at 65.8 cm/s. The maximum body length of *Anomalopsyche* is 2.5cm, so it would theoretically be producing a von Karmen trail also rather than a fully turbulent wake at a stream velocity of 0.658m/s:

$$Re = \frac{0.025\text{m} \times 0.658\text{m/s}}{0.658 \times 10^{-6}\text{m}^2/\text{s}} = 25,000$$

It is apparent then that the areas behind the rock and along the insect's body are turbulent, making it difficult to hold on.

Anomalopsyche must maintain its position in the stream since it is adapted only to a short stretch of hot water, and drifting into cooler downstream areas would mean instant death. Therefore it is equipped with strong claws on its prolegs and metathoracic legs, as well as hooks on the underside of its abdomen. These enable it to cling to the silken pad it spins along the downstream side of the rock (Fig. 1). As well, since *Anomalopsyche* spends much of its time lying out in the current it has keel-like stabilizers (adaptations of the normal dorsal and lateral humps of some trichopteran larvae). These protuberances are streamlined in cross-section and have the upstream edge strengthened with a layer of sclerotized cuticle. They help to prevent yawing, pitching and rolling of the insect in the turbulent wake behind the rock. The humps can be hydrostatically inflated and deflated when required (e.g., when the insect is crawling to the bottom, it has no use for the lateral humps).

Finally, *Anomalopsyche*'s net (see problem 5), trailing downstream of the insect, serves as a safety net if all else fails.

4) **Respiration:** For many reasons it is unlikely that the stream water carries enough oxygen for *Anomalopsyche*'s respiration. First, the insect lives very near to the subterranean source of the stream, and such water is likely to be hypoxic or anoxic (Hynes 1970, p. 42). Second, hot water is saturated at a much lower O_2 content than is cold water (Brock 1978, p. 28). Third, the high-altitude location of the stream means a low partial pressure of O_2 in the atmosphere: only 78.2% of that at sea level (Mani 1962, p. 37). This combination of factors means that even when the stream water is fully saturated it will carry very little O_2 . Thus *Anomalopsyche* must be facultatively anaerobic, autotrophic, or an air-breather. Evolutionarily, it opted for the latter.

Anomalopsyche, unlike other caddisflies, has open abdominal spiracles; these are located on the antepenultimate and penultimate abdominal segments. Air sacs in the abdomen act as pumps to actively ventilate the insect's tracheal system. The spiracular openings are raised up on long stalks and are surrounded by hydrofuge hairs (Fig. 1). There are mechanosensilla at the bases of the hairs that are sensitive to bending. When the spiracular opening is submerged, the hairs converge; this bending is sensed by the sensilla, and a nervous message causes the automatic pumping of the air sacs to cease. Thus *Anomalopsyche* would not 'inhale' hot water.

5) **Getting food:** One may well wonder what sort of food would be available to *Anomalopsyche*. Brock (1978, p. 40) states that at temperatures above 80°C, the only things that can exist in water are a few species of chemolithotrophic and heterotrophic bacteria. Could this prokaryotic fare possibly sustain a 2.5cm insect? Brock (1978, p. 44) describes one type of attached macroscopic bacterial growth that rapidly (*i.e.* in a few days) covers submerged glass slides and strings in pinkish masses. This is a good, easily digestible food for *Anomalopsyche*.

Although one may also consider vegetable detritus as a possible food for this insect, there are two reasons why it is an unlikely source. One is that at 2000m, there is little vegetable matter to fall into the stream. The second is that detritus is probably made available as food for insects only because of bacterial action upon the vegetable matter (Hynes 1970, p. 194). So *Anomalopsyche* may as well just consume the bacteria.

One other possible food source is dead insects which have been carried up from lower altitudes by wind currents and dropped on the side of the volcano. Mani (1962, p. 77) mentions that on a snowfield in the Himalayas, "within a short period of 20 minutes, no less than 400 specimens of various dead insects were deposited within an area of about 10 square metres . . .". The surface area of the stream, at least the initial part of it, probably doesn't cover as much area. As well, the rate of insect-drop Mani describes occurred in a tropical area where there were likely many more insects at the base of the mountain. In Iceland, it is doubtful that such a large number of animals would be present. Nevertheless, dead insects may provide another source of food for *Anomalopsyche*.

The method of food capture used by this insect is one common to larval Trichoptera; it makes use of silken nets. However, these nets are not merely used to strain particulate matter from the water, but also serve as substrates for bacterial growth. *Anomalopsyche* builds a net like that pictured in Fig. 1. It is attached by guy-lines to the rock and does not extend beyond the reach of the insect's forelegs. Silvester (1983) described the net of *Hydropsyche sparnier* with a mesh of $91 \times 139\mu\text{m}$ dimensions as being most efficient filtering $100\mu\text{m}$ particles at water velocities of 50cm/s. *Anomalopsyche* builds nets of similar mesh size.

Anomalopsyche, anchored to a silken pad on an emergent rock, hangs in the current upstream to the net. It periodically checks the weight of its load, composed of insects and bacterial colonists, by pulling the rim of the net towards itself with its forelegs. If the insect 'judges' that the opposing drag indicates a heavy load, it consumes the net and the adhering food.

6) **Maintaining the body fluid osmolarity:** Mani (1962, p. 163) mentions that most thermal springs in the Himalayas are high in salts, and of a great osmolarity than insect haemolymph. Pennak (1978, p. 5) states that several caddis larvae have successfully invaded brackish waters, estuaries and intertidal zones, so *Anomalopsyche*'s ancestors may have been well-suited for this type of osmoregulation.

Anomalopsyche would have to secrete iso-osmotic or, ideally, hyperosmotic urine. Like brackish-water mosquitoes (Gillot 1980, p. 496), *Anomalopsyche* has specially-adapted rectal pads that actively secrete any salts that are in excess concentration in the haemolymph.

7) **Protection from ultraviolet:** Mani (1962, p. 40) mentions that the atmosphere at high altitudes is so transparent that ultraviolet radiation is dangerous to life. Thus most high-altitude insects, even those which spend most of the day in shadow, are protectively darkened

with melanin. *Anomalopsyche* is no exception, having a brown abdomen and darker sclerotized portions to protect it from the harmful U.V. rays.

8) **Mating:** Mating proceeds in a normal fashion for caddisflies, with the male and female being winged and neither consuming any food. The lifespan of the adult is *extremely* short; as the members of this species are concentrated in such a small area, there is no need to spend time searching for mates.

9) **Development:** In the egg stage, the insect requires a great deal of O_2 but cannot of course use 'breathing' movements to get it. As well, the developing embryo is unable to actively rid itself of heat. Therefore, *Anomalopsyche*'s eggs are not able to develop in the hypoxic $80^\circ C$ water.

Pennak (1978, p. 593) says of trichopterans, "sometimes the eggs are laid on objects a short distance above the water" and that the eggs are "sometimes... simply glued to the substrate by a cement substance." *Anomalopsyche* lays stalked eggs on the surface of rocks. Thus the developing larva is held away from the heat of the rock, and has access to O_2 .

The first instar larva consumes its eggshell and uses the nutrients to manufacture a pad of silk on its natal rock near the water's edge. Initially it lives above the surface of the water and casts individual draglines of silk into the stream to be pulled up later and consumed along with the bacteria that have colonized it. As well, bacteria growing on the rock near the surface of the water are eaten. Subsequent instars extend the silken pad deeper into the water and build longer and more elaborate nets as they increase in size and become better able to regulate their body temperature and maintain their position in the turbulent water. The larva undergoes ecdysis out of the water to avoid being swept away by the current.

The pupa doesn't have the problems with heat and oxygen that the egg does, as trichopteran pupae are often quite active (Pennak 1978, p. 614). Prior to pupation, *Anomalopsyche* makes several trips to the stream bed along the silken path it builds on the side of the rock. It brings small pebbles to the surface and fixes them to the side of the rock with silk, gradually building its pupal case. A trailing rope of silk is left from the interior of the case to the water (Fig. 2). This is necessary to maintain water balance in the metabolically active pupating insect. The spiracles are constantly ventilating to provide adequate O_2 for metamorphosis, and this results in a great deal of evaporative water loss. This is needed for cooling, of course, but the pupa must replace the water; the silken rope sops up stream water and brings it to the *Anomalopsyche* pupa in its case.

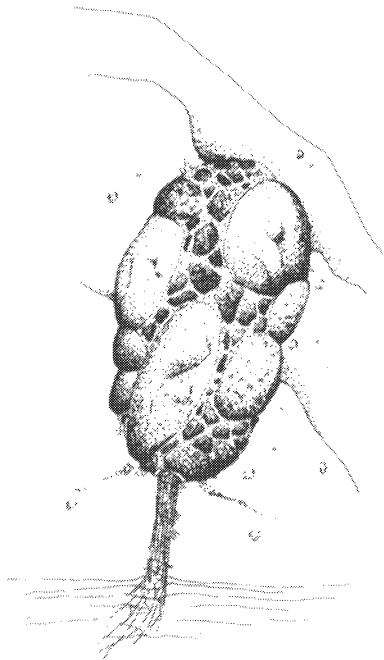


Fig. 2. *Anomalopsyche*'s pupal case showing the pupa's method of attaining water.

Conclusion: It is rather doubtful that an insect as fanciful as *Anomalopsyche hephaesta* could ever exist. However, the process of designing the insect required such intense brainstorming on my part that this creature lives, if not in a hot Icelandic stream, then in "the misty waters of my mind."

References

- Brock, T. D. 1978. Thermophilic microorganisms and life at high temperatures. Springer Verlag, New York. 465 pp.
- Gillot, C. 1980. Entomology. Plenum Press, New York. 729 pp.
- Hynes, H. B. N. 1970. The ecology of running waters. University of Toronto Press. 555 pp.
- Mani, M. S. 1962. Introduction to high altitude entomology: Insect life above the timberline in northwest Himalaya. Methuen and Co., Ltd., Lond. 302 pp.
- National Geographic Society. 1975. National Geographic Atlas (4th ed.). Ed. Melvin M. Bayne, Washington, D.C. 330 pp.
- Pennak, R. W. 1978. Freshwater invertebrates of the United States. (2nd ed.). Wiley-Interscience, John Wiley and Sons, New York. 803 pp.
- Ricklefs, R. E. 1973. Ecology (2nd ed.). Chiron Press, New York. 966 pp.
- Silvester, N. R. 1983. Some hydrodynamic aspects of filter-feeding with rectangular-mesh nets. J. Theor. Biol. 103: 265-286.
- Vogel, S. 1981. Life in moving fluids: The physical biology of flow. Willard Grant Press, Boston. 352 pp.

†Present address: Department of Biology, University of Calgary, Calgary, Alberta. T2N 1N4

Insect Biology at Sudbury's Science North

By

Frank Mariotti

**Program Planner, 100 Ramsey Lake Road,
Sudbury, Ontario, P3E 5S9**

Joe D. Shorthouse

**Department of Biology, Laurentian University,
Sudbury, Ontario, P3E 2C6**

In the fall of 1984, the Board of Governors of the Entomological Society of Canada decided to partially fund a display designed to encourage public interest in insects at Sudbury's Science North. The display was officially unveiled at a news conference on June 11, 1986 and the encouragement and support from the Society was duly acknowledged. The new insect display forms an integral part of the 'Small Creatures' laboratory of Science North and already is one of the more popular exhibits in the centre. A plaque commemorating the contribution of the Society hangs prominently to the left of the exhibit.

Science North is the most recent science centre to open in North America. Designed as two metaphorical snowflakes, the entrance/administrative building is joined to the larger exhibit building via a 100 metre tunnel cut through some of the oldest rock on earth (estimated to be 2 billion years old). A spiralling, glass enclosed ramp overlooking Lake Ramsey, a large lake in the centre of Sudbury, leads visitors from a rock cavern that serves as a 300 seat theatre hall to the exhibit floors above. The exhibit floors at Science North are broadly divided between earth sciences, human physiology, meteorology, physical sciences and natural history.

Science North differs from museums and other science centres in that a three-way personalized interaction occurs between the visitor, the exhibit, and the staff. Rather than a visitor learning about fossils or flying squirrels by examining them through a pane of glass, visitors to Science North actually handle exhibits and live animals and thus are encouraged to interact and question the staff. Most exhibits appear to be a scientist's laboratory or workshop where the visitor can participate in various explorations. Interactions between visitors and



Fig. 1. Sudbury's Science North consists of two snowflake-shaped buildings that rest on some of the oldest rocks on earth. Photo by Alfred Boyd.

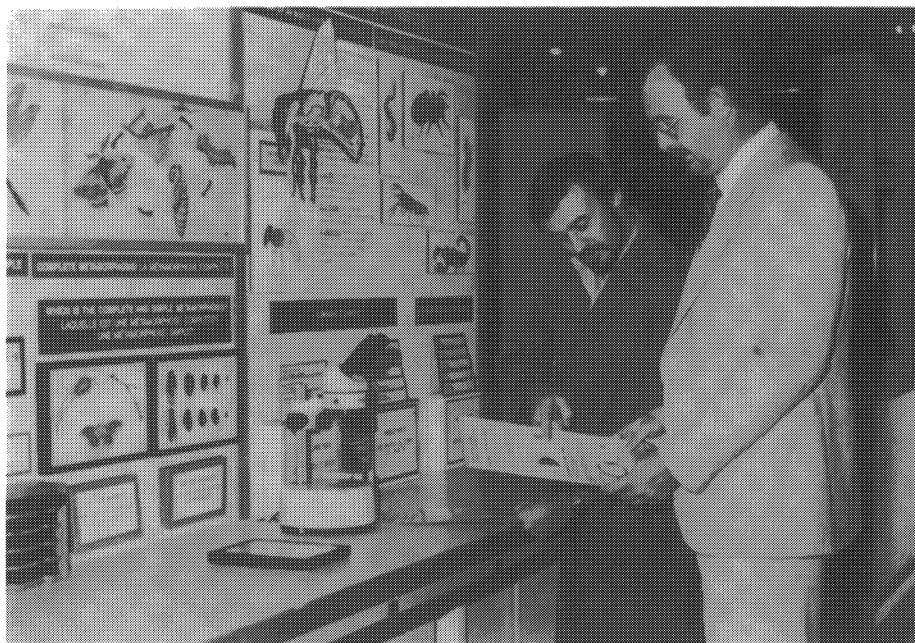


Fig. 2. Science North Program Planner Frank Mariotti (left) discussing one of the activity cards with Joe Shorthouse (right) who acted as a consultant. Photo by Mary C. Roche.

staff, particularly in the small creatures section, frequently lead from stereotypes and phobias to enlightening conversations about habitats and adaptations. There is a high staff-to-visitor ratio and even the people who plan and design the exhibits spend time on the floors interacting with visitors.

The insect display in the Small Creatures laboratory consists of three large wall-mounted, interchangeable, bilingual panels strategically located in front of an insect zoo. The display occupies a five metre wall and its three panels are visually attractive and encourage the viewer to approach. Two of the panels are more permanent and depict important aspects of insect structure and reproduction. The third panel highlights the reasons why insects are so successful. The panels are mounted above a bench that runs the length of the display where microscopes and aquaria are readily available. Colourful activity cards with questions act as mini-labs and can be removed from slots for close examination. Additional panels eventually will be interchanged with the existing third panel. These panels will highlight such things as insect-plant relationships and biting flies of northern Ontario.

The insect zoo consists of 12 large glass-enclosed cages encircling a central maintenance area. When Science North opened, the insect zoo was the first of its kind in Canada and has been successful in culturing exotic phasmids such pink-winged, New Guinea, Malaysian, Australian and Vietnamese walking sticks and Javanese leaf insects.

All cultured insects are frequently removed from their cages and handled by visitors. Handling large, live insects has proven to be a critical step in fostering interactions between visitors and staff. Once a visitor is comfortable handling one of these insects, the door is then opened to understanding and appreciation. Often parents who have never seen, let alone touched exotic insects, take over the role of educator when interacting with their children.



Fig. 3. The hands-on experience encouraged at Science North fosters excitement and intrigue amongst children as is occurring with this Australian walking stick. Photo by Mary C. Roche.

Insect displays such as the one at Science North also attempt to bridge the gap between current research by entomologists and the public. In northeastern Ontario, for example, the latest findings on jack pine and spruce budworm, gypsy moths, tent caterpillars and insect repellents frequently enter into the dialogue between visitors and staff members. At Science North, well-trained staff combined with exciting, hands-on exhibits and personalized interactions create a unique mechanism for educating the public about science. Entomologists also will have an opportunity to experience Science North as the Entomological Society of Ontario will be held here in the fall of 1987.



Fig. 4. Having an insect zoo adjacent to the display panel provides ample opportunity for visitor-staff interactions, as is occurring with this large Malaysian walking stick. Photo by Mary C. Roche.

NEWS OF ORGANIZATIONS

Biological Council of Canada / Conseil canadien de biologie

To all members of Council

Activities involving the BCC continue throughout the summer. Our committee considering the federal government's action on shared funding has been active. Drafts have been discussed and a statement will have gone forward to the PMO, Treasury, MOSST and other targets by the time you receive this. I shall write you more about it later.

Ent. Soc. and the CSZ have proposed nominees to the Committee for Ecology and the Environment. I am waiting for names from other members. I do want the Committee established this summer. I am also looking for names from CBA and CPS of persons who will assist in follow-up work with the Forestry Report.

I also want to receive comments from you concerning the format of BCC meetings in the future. I have had a very thoughtful expression of opinion from Doug Ormrod (CSPP) which, together with views expressed by Glenn Wiggins when he left Council, correspond largely with my own ideas.

Essentially, it is suggested that the current format, one half day of Executive meeting, followed by a full day of Council, is not the most effective way for BCC to proceed. Clear distinctions between Executive and Council responsibilities are difficult to make and meetings become repetitive. It would be better to involve the full Council in all the meetings, in order to optimize the time available for discussion and to get as broad an expression of opinion as possible on all matters.

As nearly as I can determine from talking to past officers, the current procedure was set in motion during a period when the BCC was not attracting representatives to its meetings, so the executive meeting was established to ensure representation from each constituent society. We are getting good attendance now so the Executive Board meeting is less functional. Furthermore, we are in a critical period as the matter of financing science is coming under

heavy discussion and new initiatives in biology are proposed. That means that we need as wide discussion as possible of the matters before us.

If we extend full Council meetings, replacing current Executive meetings, what then is the purpose and responsibility of an Executive Board? I see the Executive Board with a number of functions. One of them is fulfilled by this letter, and whatever responses I receive from Executive Board members, namely direct communication between officers and societies, chiefly through society presidents. The presidents, in particular, are the vital link between the BCC and its constituents. If you are interested in the BCC, your society will be. Presidents are the main channel to transfer society needs and expectations to the operations of BCC as well as to transmit BCC proposals to its constituents.

Another function is provided by members-at-large, all of whom I hope will soon have special functions and consequently will be important operators in BCC functions. They will work with societies through the BCC officers and society presidents.

A third function for the Executive Board is an emergency reserve. It provides a smaller, but representative group, to be mobilized quickly when necessary, for decisions, opinions, action. It may be that, once or more a year, the Executive Board meets without full Council. Perhaps Council should come into session only once a year.

Please let me have your thoughts on these matters, or any others that concern the operation of the BCC. Unless there is strong opposition, I propose to modify our meeting this fall, to have the full Council assembled for the day and a half we have chosen (23-24 October).

Another reason for assembling the full Council for as long as possible is the usefulness of attracting representatives of other organizations to make presentations to us. For instance, this fall, I hope to have NSERC, the Director of the Youth Science Foundation and the Association for the Advancement of Science in Canada all speak to us on matters of common interest. There may be others too. Moreover, I would like to see the reestablishment of a previous practice, namely reporting to BCC by constituent societies, of actions or problems or explanations of common interest. In that way I would hope to encourage society initiatives for BCC action. The constituent societies should try to make the BCC work for them. Representatives of a society, working together, could have a profound influence on courses of action.

I am waiting for comments on the Constitution from my Constitutional Committee. Let's get that straightened out this fall.

Keep in mind that each member society should have a representative on the Organizing Committee of the Second Canadian Congress of Biology. The Organizing Committee should be in place by the time of the fall meeting. YSF and AASC have been asked to consider associating their 1990 meetings with the Congress. That will be reported on at the October meeting.

The Committee to Nominate to Government Agencies comprises M. B. Fenton (York-CSZ), Luc Brouillet (Institut Botanique-CBA) and J. P. Williams (Toronto-CCUBC). It should be able to report some actions in October.

J. R. Nursall, President
Biological Council of Canada

International Society of Arboriculture

Grants for Shade Tree Research

Each year since 1975, the International Society of Arboriculture has awarded grants to encourage scientific research on shade trees. Horticulturists, plant pathologists, entomologists, soil specialists, and others, are invited to submit a brief outline of a proposed project for which a grant of \$1500 might assist in purchase of equipment, technical or student help, or otherwise contribute to the research. For the coming year the Trustees have voted to award 15 grants of \$1500 each.

Individuals self-supported or privately or publically employed are eligible. There are no restrictions based on religion, race, sex, age, or nationality of the applicant. The grants are not expected to cover all research costs but to aid, stimulate and encourage scientific studies of shade trees. The ISA requires that administrative overhead *not* be deducted from grants it awards.

Interested researchers should prepare *not more than 2 pages* outlining:

- (1) Name, address and telephone number of Principal Investigator.
- (2) Institution(s) and date(s) of Investigator's college and/or graduate degree(s).
- (3) Title and purpose of the project.
- (4) Intended use of the grant money. (NO "overhead" allowed!)
- (5) Individuals involved in the research.
- (6) Citations to 2 relevant publications by the researcher. (Don't send reprints.)
- (7) **IMPORTANT: How will the expected results help with ALL arborists' daily work!**
(Bear in mind: some reviewers are arborists, others are scientists.)
- (8) What is the anticipated total cost of the entire project, regardless of whether or not you get an ISA grant and regardless of the amount of the grant?
- (9) What is the anticipated total duration of the entire project, regardless of whether or not you get an ISA grant?

To receive consideration, proposals—which will be reviewed separately by each member of the ISA Research Committee—**must be received by December first!** Recipients of grants are notified by about mid-March. Send proposal to:

Dr. Francis W. Holmes
Director of Shade Tree Laboratories
University of Massachusetts
Amherst, MA. 01003

Out of fairness to applicants who comply with our rules, we reserve the right to forward **ONLY THE FIRST TWO PAGES** per application to members of our evaluating committee! For the same reason, any proposal received after December first will be considered one year later.

International Commission on Zoological Nomenclature

Reference: ITZN 11/5

14 July 1986

The following applications have been received by the Commission and have been published in volume 43, part 2, of the *Bulletin of Zoological Nomenclature* (9 July, 1986). Comment or advice on them is welcomed and should be sent c/o The British Museum (Natural History), London, England. Comments will be published in the *Bulletin*.

Case No.

- 2463 *Antispila* Hübner, [1825] (Insecta, Lepidoptera): proposed validation of *Antispila stadtmüllerella* [Hübner], 1825 as type species.
- 2495 *Napomyza* Westwood, 1840 (Insecta, Diptera): proposed conservation by the suppression of *Napomyza* Curtis, 1837.
- 2397 *Microgaster* Latreille, 1804 (Insecta, Hymenoptera): proposed designation of *Microgaster australis* Thomson, 189 as type species.
- 2494 *Sigara scholtzi* Fieber, [1860] (Insecta, Heteroptera): proposed conservation by the suppression of *Sigara scholtzii* Scholtz, 1846.
- 2519 *Micronecta griseola* Horváth, 1899 (Insecta, Heteroptera, Corixidae): proposed conservation by the suppression of *Sigara minuta* Fabricius, 1794 and *Sigara lemana* Fieber, 1860.
- 2395 *Agromyza* Fallén, 1810 (Insecta, Diptera): proposed validation of *Agromyza reptans* Fallén, 1823 as type species.
- 2537 *Tropiphorus* Schönherr, 1842 (Insecta, Coleoptera): proposed conservation by suppression of *Brius* Dejean, 1821.
- 2534 *Tetropium* Kirby, 1837 (Insecta, Coleoptera, Cerambycidae): proposed conservation by the suppression of *Isarthron* Dejean, 1835.
- 2511 *Cyclaxyra* Broun, 1893 (Insecta, Coleoptera): proposed conservation by the suppression of *Melanochroa* Broun, 1882.

Reference: ITZN 59

14 July 1986

The following Opinions, rulings of the International Commission on Zoological Nomenclature, have been published in volume 43, part 2, of the *Bulletin of Zoological Nomenclature* (9 July 1986).

Opinion No.

- 1383 (p. 121) *Apis pilipes* Fabricius, 1775 (Insecta, Hymenoptera): designated as type species of *Megilla* Fabricius, 1805.
- 1386 (p. 128) *Papilio erato* Linnaeus, 1758 (Insecta, Lepidoptera): neotype designated.
- 1387 (p. 130) *Curculio picirostris* Fabricius, 1787 and *Tychius stephensi* Schönherr, 1836 (Insecta, Coleoptera, Curculionidae): conserved.
- 1391 (p. 138) *Zygaena anthyllidis* Boisduval, [1828] (Insecta, Lepidoptera): conserved.
- 1396 (p. 148) *Byrrhus murinus* Fabricius, 1794 (Insecta, Coleoptera, Byrrhidae): conserved.
- 1397 (p. 150) *Rhopalocerus* W. Redtenbacher, 1842 (Insecta, Coleoptera, Colydidae): conserved.
- 1398 (p. 152) *Capys* Hewitson, [1865] (Lepidoptera, Lycaenidae): conserved.
- 1399 (p. 154) *Cochliomyia* Townsend, 1915 (Diptera, Calliphoridae): conserved.

The Commission regrets that it cannot supply separates of Opinions.

P. K. TUBBS
Executive Secretary
c/o British Museum (Natural History)
Cromwell Road,
London, England, SW7 5BD

POSITION AVAILABLE

Technician in Entomology

Plant/insect interactions of insects attacking cruciferous crops addressed from an insect behavioural and a chemical approach.

Insect culture maintenance, behavioural bio-assays, plant extraction and fractionation.

B.Sc. or M.Sc. with some experience in entomology required. Chemical background an asset.

Salary: \$18,000-\$22,000 depending on qualifications.

Starting Date: September 8, or as soon as an appropriate candidate is found. One (1) year contract, renewable up to 3 years. Send CV, transcript of marks, and names of 3 references to:

Dr. Ken Pivnick
Plant Biotechnology Institute
National Research Council of Canada
110 Gymnasium Road
Saskatoon, Saskatchewan S7N 0W9
Telephone: (306) 975-5271

WORKSHOPS

The Biosystematics Research Institute will be holding a second workshop on the insect order Hymenoptera from May 1 to 9, 1987, in the K.W. Neatby Building on the Central Experimental Farm in Ottawa.

The major hymenopterous groups will be taught by the following B.R.I. taxonomists: H. Goulet (Symphyta), W. R. M. Mason (superfamilies of Hymenoptera, Aculeata), M. Sharkey (Ichneumonoidea, Braconidae), C. Yoshimoto and G. Gibson (Chalcidoidea and Cynipoidea), L. Masner (Proctotrupeoidea) and M. Sanborne (Ichneumonidae). Lectures will cover classification, diagnosis, identification, life histories and economic importance of these groups of Hymenoptera. In a special session, our enthusiastic Dr. Masner will cover modern sampling techniques, the preparation of specimens and the principles of curation.

Classes will begin at 8:00 a.m. and continue until 10:00 p.m. with lunch and supper breaks. Typically, the mornings and afternoons will include lectures and laboratory periods, but the evenings will be reserved entirely for laboratory work (catching up or attention to specific needs). Refreshments will be available. On the first evening, a complimentary dinner will be provided. This will afford an opportunity to meet the teachers and members of the class as well as other Ottawa entomologists.

Each participant will receive a syllabus containing the lecture material with illustrations, keys and pertinent literature. The syllabus will be forwarded to successful candidates at least one month before the beginning of the workshop. The course will be limited to 25 applicants and a fee of \$300.00 (CDN) will be charged. Candidates will be chosen on a first come first serve basis. (Overall reaction to the first Hymenoptera Workshop was very favorable).

Course application forms and further information may be obtained by contacting: Mike Sarazin, Biosystematics Research Institute, K.W. Neatby Building, Room 3135, C.E.F., Ottawa, Ontario, K1A 0C6, (Tel.: 613-996-1665).

PERSONALIA

Biological Council of Canada / Conseil canadien de biologie Gold Medal Award

The Biological Council of Canada announces that its Gold Medal Award for 1986 will be given to Dr. David T. Suzuki, scientist and broadcaster, at the Annual Meeting of the Genetics Society of Canada, on 9 June 1986, at Université Laval, Quebec.

The Gold Medal is awarded for outstanding service to biology in Canada, which includes public service as well as high scientific achievement. Dr. Suzuki is perhaps best-known for his CBC program "The Nature of Things," as well as a number of special programs and other serial shows in television and radio which stress the importance of human beings understanding the world of which they are part. He is active in discussions of science policy in Canada, civil rights, the protection of the environment and in committees and councils dealing with science in general. Dr. Suzuki also has a world-wide reputation as an experienced scientist.



Dr. David T. Suzuki

His best known scientific work involved the use of temperature-sensitive mutational changes in fruit flies, which provided a method that enables biologists to study the genetic and environmental control of developmental processes in higher organisms. He is the recipient of seven honorary degrees from universities in Canada and the United States. Dr. Suzuki has been recognized by the University of British Columbia as a Master Teacher. He is a Fellow of the Royal Society of Canada.

Dr. Suzuki was born in Vancouver. His university education was undertaken in the United States, at Amherst College and the University of Chicago. He was a member of the staff of the University of Alberta 1962-63, following which he moved to UBC, where he has had an appointment in Zoology ever since.

Previous winners of the BCC Gold Medal Award have been

Michael Shaw, University of British Columbia, 1983

Robert H. Haynes, York University, 1984

David F. Mettrick, University of Toronto, 1985

The Biological Council of Canada comprises seven professional biological societies and represents some 4000 biologists from universities, government service and industry in Canada.

Bernard C. Smith Retires

Bernard Smith retired in April 1986 from the Research Station, Agriculture Canada, at Harrow, Ontario, completing a 36-year career in entomology. Bernie served in the R.A.F. and R.C.A.F. as a radar technician in 1942-45 and in a similar capacity with the Canadian Army for a short period after the war. Upon graduation in 1950 from the University of Western Ontario with a B.A., he worked in Fort Churchill for two years on a project on biting flies. He joined the staff of the Research Institute for Biological Control at Belleville in 1952 being stationed initially at Fredericton to study parasites of the balsam woolly aphid. Subsequently at Belleville, Bernie studied feeding and searching by predators, chiefly coccinellids, becoming a recognized authority in this area. He moved to the Research Station at Harrow when the Belleville Institute closed in 1972. His studies at Harrow on the northern and western corn rootworms emphasizing sampling techniques and population responses to cultural practices and pesticides are valuable contributions to our understanding of these important pests of grain corn. During his entomological career Mr. Smith was the author of 35 research papers and transferred significant technology to the agrifood industry.

Bernie anticipates a busy retirement. He plans to devote considerable time to assisting in a thriving family gift and flower shop business in Windsor and to refurbishing his home near Belleville.

We wish Bernie and Ellen a prosperous happy retirement.

Robert P. Jaques
Research Station
Harrow, Ontario

Bernard Philogène heads Faculty of Science

Dr. Bernard Philogène, who since last summer has been acting dean of the newly-demised Faculty of Science and Engineering, has been named first Dean of the new Faculty of Science that began operations July 1. As of July 1 the Faculty of Science comprises the departments of Biochemistry (shared with Health Sciences), Biology, Chemistry, Computer Science, Geology, Mathematics and Physics.

Dr. Philogène, who had been involved in the administrative side of the Faculty of Science and Engineering since 1982 as vice-dean (research) before last summer's appointment, has been with the Department of Biology since 1974. First appointed as an assistant professor, he was promoted to associate professor in 1977 and to full professor in 1982. He has served on both the Board of Governors and the University Senate.

Born in Mauritius, Dr. Philogène holds a B.Sc. from the Université de Montréal, an M.Sc. from McGill and a Ph.D. from the University of Wisconsin. He served with the Canadian Forestry Service and taught entomology at the University of British Columbia before joining U. of O.

An insect physiologist, he has drawn raves for his academic and general presentations of insights into insect life. (Dr. Philogène's Ph.D. thesis dealt with post-embryonic development of the sawfly, and his M.Sc. thesis with the cuticle of the house cricket.) He and co-researcher John T. Arnason of the Biology department have recently made a major breakthrough in the control of insect populations with development of an insecticide called Alpha-T. That research reflects his special interest in the use of pesticide in developing countries.

— from University of Ottawa *Gazette*.

Freeman McEwen, Honorary Doctor of Laws

Freeman McEwen, Dean, Ontario Agricultural College, University of Guelph, received an honorary doctor of laws degree from the University of Prince Edward Island at its May 11 convocation ceremony.

BOOK REVIEW

Bouguerra, M. L. 1985. *Les poisons du tiers-monde*. Sciences et Société. Editions de la Decouverte, 1, Place Paul-Painlevé, 75005. Paris. 89F. 265 pages.

There are quite a number of books on pesticides. There are very few dealing specifically with developing countries where it has generally been taken for granted that the only way to deal with disease vectors, stored product insects or hordes of locusts is by extensive application of chemicals.

Although the third-world uses less than 25% of all pesticides manufactured in the world (herbicides, insecticides and fungicides) it has become the site of major disasters (Bhopal) and regular poisonings linked to day-to-day agricultural use. Four years ago OXFAM, a British-based non governmental organization focussed on this particular topic with David Bull's "A growing problem: Pesticides and the Third World poor." Bull's contribution devoted only 16 pages to the question of occupational and accidental poisoning. Bouguerra spends 200 or so pages with detailed accounts of mishaps. He leaves no stones unturned with every event properly referenced.

This book is a precious document for those who are called upon to intervene in developing countries in all situations where pesticides are used. The tone is sometimes alarmist but it is difficult to blame a scientist from the "South" (Bouguerra is Tunisian) to react emotionally to situations where, for instance there is deliberate dumping of chemicals that are banned or restricted for use in the North, or again where there is adulteration of insecticides sold to uninformed governments.

Altogether the book has thirteen chapters, the last one being devoted to integrated pest management and its long term benefits. It should be read by all current and future consultants of international development organizations.

Bernard J. R. Philogène,
University of Ottawa

MEETINGS

ANNOUNCEMENTS

Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Manitoba, 6-8 October 1986, Holiday Inn South Winnipeg, Manitoba.

CONTACT: Dr. N. J. Holliday, General Chairman, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, or Dr. G. H. Gerber, Chairman, Scientific Program Committee, Research Station, Agriculture Canada, 195 Dafoe Road, Winnipeg, Manitoba, R3T 2M9.

Thirteenth Annual Aquatic Toxicology Workshop on 11-14 November 1986 at Université de Moncton.

CONTACT: Dr. J. S. S. Lakshminarayana, Department of Biology, Université de Moncton, Moncton, N.B. Canada E1A 3E9 (506)-858-4323.

Entomological Society of Alberta, 34th Annual Meeting on November 7-8, 1986, Provincial Museum of Alberta, Edmonton.

CONTACT: Jean Lacoursiere or Markus Eymann, Department of Entomology, University of Alberta, Edmonton, Alberta T6G 2E3.

Entomological Society of America, Annual Meeting on 8-12 December 1986 in Reno, Nevada.

CONTACT: William A. Allen, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 (703)-961-6772

American Society of Zoologists, Annual Meeting on 27-30 December 1986, Nashville, Tennessee.

CONTACT: Mary Wiley-Adams, Box 2379, California Lutheran College, Thousand Oaks, CA. 91360

International Congress of Limnology on 8-14 February 1987 at Hamilton, New Zealand.

CONTACT: Convention Management Services, PO Box 3839, Auckland, New Zealand

9th International Plecoptera Conference on 18-24 February 1987 at Marysville, Australia.

CONTACT: Dr. I. Campbell, Water Studies Centre, Chisholm Institute of Technology, PO Box 197, Caulfield East, Victoria 2145, Australia

Society for the Study of Evolution, Annual Meeting on 21-24 June 1987 at Bozeman, Montana.

CONTACT: Dr. R. G. Harrison, Department of Biology, Yale University, New Haven, Connecticut, U.S.A. 06511-7444

The Biosystematics of Haematophagous Insects, an international symposium on 29 June to 2 July 1987 at the Liverpool School of Tropical Medicine. Registration fee £25, Students £10.

CONTACT: Dr. M.W. Service, Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L5 5QA, England

XVI Pacific Science Congress at Seoul, Korea on 20-30 August, 1987.

CONTACT: Prof. Choon Ho Park, Secretary-General, Organizing Committee, XVI Pacific Science Congress, Seoul, 1987, K.P.O. Box 1008, Seoul 110, Korea.

XVIII International Congress of Entomology, at the University of British Columbia, Vancouver, B.C., on 3-9 July 1988.

CONTACT: Dr. G. G. E. Scudder, Secretary General, XVIII International Congress of Entomology, Department of Zoology, University of British Columbia, Vancouver, B.C. V6T 2A9. Telephone (604) 228-3168.

RECENT DEATHS

MATSUDA, Ryuichi, Ottawa, Ont. Age 65. On June 10, 1986. Retired insect morphologist, Biosystematics Research Centre, Agriculture Canada.

**ENTOMOLOGICAL SOCIETY OF CANADA
SOCIÉTÉ ENTOMOLOGIQUE DU CANADA
Executive Council-Conseil Exécutif**

<i>President</i>	H. F. Madsen 2591 McKenzie Street Penticton, B.C. V2A 6J1
<i>First-Vice President</i>	G. G. E. Scudder Department of Zoology University of British Columbia #2354-6270 University Boulevard Vancouver, B.C. V6T 2A9
<i>Second Vice-President</i>	E. C. Becker 1320 Carling Avenue Ottawa, Ontario K1Z 7K9
<i>Past-President</i>	S. B. McIver Department of Environmental Biology University of Guelph Guelph, Ontario N1G 2W1

Trustees-Fiduciaires

<i>Secretary</i>	J. A. Shemanchuk Research Station Agriculture Canada Lethbridge, Alberta T1J 4B1
<i>Treasurer</i>	E. C. Becker 1320 Carling Avenue Ottawa, Ontario K1Z 7K9
<i>Scientific Editor</i>	A. B. Ewen 107 Science Crescent University of Saskatchewan Saskatoon, Saskatchewan S7N 0X2
<i>Assistant Scientific Editors</i>	C. H. Craig M. Mukerji
<i>Bulletin Editor</i>	R. B. Aiken Department of Biology Mount Allison University Sackville, N.B. E0A 3C0
<i>Assistant Bulletin Editor</i>	B. K. Mitchell Department of Entomology University of Alberta Edmonton, Alberta T6G 2E3

Directors-Administrateurs

Directors-at-Large: R. G. H. Downer (1986), R. F. Shepherd (1986), C. Cloutier (1987), G. Pritchard (1987), L. S. Thompson (1988), R. H. Gooding (1988)

Regional Directors: R. Cannings (E.S.B.C.), D. A. Craig (E.S. Alta.), P. W. Reigert (E.S. Sask.), J. C. Conroy (E.S. Man.), J. S. Kelleher (E.S. Ont.), P. P. Harper (S.E. Que.), D. J. Larson (Acadian E.S.)

Contributions and correspondence regarding the Bulletin should be sent to: R. B. Aiken, Department of Biology, Mount Allison University, Sackville, N.B. E0A 3C0. Telephone (506) 364-2509. Inquiries about subscriptions and back issues should be sent to the Entomological Society of Canada, 1320 Carling Avenue, Ottawa, Ontario K1Z 7K9.

Bulletin Deadline

The deadline for the next issue, Vol. 18, no. 4 is November 1, 1986

OFFICERS OF AFFILIATED SOCIETIES

Entomological Society of British Columbia

President: Dr. N. Angerilli
President-Elect: Mr. R. Cannings
Secretary-Treasurer: Dr. G. Miller, Pacific Forest Research Centre,
506 West Burnside Road, Victoria, B.C. V8Z 1M5
Editor (Journal): Dr. H. R. MacCarthy
Regional Director to ESC: Mr. R. Cannings

Entomological Society of Alberta

President: Dr. R. Gooding
Vice-President: Dr. B. Mitchell
Secretary-Treasurer: Mr. A. McClay,
Alberta Environmental Centre,
Bag 4000, Vegreville, Alberta T0B 4L0
Editor (Proceedings): E. Mengerson
Regional Director to ESC: Dr. D. A. Craig

Entomological Society of Saskatchewan

President: Dr. P. Mason
Vice-President: P. Curry
Secretary-Treasurer: Dr. G. B. Neill, PFRA Tree Nursery,
Indian Head, Saskatchewan S0G 2K0
Editor (Proceedings): R. DeClerck
Regional Director to ESC: Dr. P. W. Riegert

Entomological Society of Manitoba

President: Dr. M. M. Galloway
Vice-President: Dr. P. A. MacKay
Secretary: Dr. N. D. G. White, Agriculture Canada Research Station,
195 Dafoe Road, Winnipeg, Manitoba R3T 2M9
Treasurer: Mr. W. L. Askew
Editor (Proceedings): Dr. R. E. Roughley
Regional Director to ESC: Dr. J. C. Conroy

Entomological Society of Ontario

President: Dr. J. D. Shorthouse
Vice-President: Dr. A. D. Tomlin
Secretary: Dr. M. K. Sears, Department of Environmental Biology,
University of Guelph, Guelph, Ontario N1G 2W1
Treasurer: Dr. S. A. Marshall
Managing Editor (Proceedings): Dr. P. G. Kevan
Regional Director to ESC: Dr. J. S. Kelleher

Société d'entomologie du Québec

Président: Dr. J.-G. Pilon
Vice-Président: Dr. J.-P. Bourrassa
Secrétaire: Dr. G. Bonneau, Laboratoire d'Entomologie forestière,
Complex Scientifique du Québec,
2700 rue Einstein, Sainte-Foy, Québec G1P 3W8
Trésorier: Dr. C. Bouchard
Editeur (Revue d'Entomologie
du Québec): Dr. A. Maire
Représentant à la SEC: Dr. P.-P. Harper

Acadian Entomological Society

President: Dr. E. Osgood
Vice-President: Dr. D. Moirs
Secretary-Treasurer and Editor: Dr. H. W. Houseweart, College of Forest Resources,
227 Nutting Hall, University of Maine,
Orono, Maine 04469
Regional Director to ESC: Dr. D. Larson