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PROCEEDINGS OF THE 40TH ANNUAL MEETING OF THE

Entomological Society of Alberta

Jasper, Alberta 15-17 October 1992

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THE ENTOMOLOGICAL SOCIETY OF ALBERTA

The Entomological Society of Alberta was organized November 27, 1952, at a meeting held in Lethbridge, Alberta, as an affiliate of the Entomological Society of Canada. A certificate of incorporation was obtained under the Societies Act of Alberta on February 19, 1953.

The membership of about 70 paid-up members at that time consisted mainly of Dominion (Federal) entomologists at the Science Service Laboratories in Lethbridge (now an Agriculture Canada Research Station), Suffield Research Station, the Forest Zoology Laboratory in Calgary, and students and staff from the University of Alberta.

One of the prime motives for establishing the Society was to encourage interest in amateur entomology, which had declined from its earlier vigor. The objectives of the Society are succinctly stated in the original Constitution, which differs only slightly from the present day Bylaws:

"The object of the Society shall be to foster the advancement, exchange, and dissemination of the knowledge of insects in relation to their importance in agriculture, forestry, public health, and industry and, for its own sake, among the people of the province of Alberta."

OFFICERS - 1992

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Membership is open to anyone interested in Entomology. Annual dues are $10.00 ($5.00 for students). Contact the Treasurer, C/O Department of Entomology, University of Alberta, Edmonton, T6G 2E3.

PROGRAM OF THE 40th ANNUAL MEETING

Thursday, October 15

1800 Executive meeting, Geikie Board Room

1900 Registration

1930 Wine and Cheese Reception

Friday, October 16

0800 Registration

0845 Welcoming Remarks and Announcements

0900 Keynote Lecture: Dr. Joseph S. Elkinton
"New Findings in Gypsy Moth Population Dynamics"

1000 Coffee Break

1030 Submitted Papers

1215 Lunch

1330 Submitted Papers

1900 Reception

1930 Banquet

2100 After Dinner Speaker: Dr. Jari Niemelä
"Entomology on the Top and Bottom of the World"

Saturday, October 17

0915 Submitted Papers

1015 Business Meeting

PRESIDENT'S REPORT 1992

I thought that when I had free reign at this podium, I would have something learned to say. I don't. I considered giving a talk about gerrids. I'm not allowed. I'd like to tell you about all the 'important' administrative work that I did on behalf of the Society. I can't. Yes, I've answered a few letters and lost a night's sleep worrying about what you would do to me if the Ministry of Consumer & Corporate Affairs removed us from the roll of non-profit organizations in Alberta. They didn't. All in all, I think that our society is in rather good shape on this 40th birthday, and the best evidence of that is this very successful and stimulating meeting that we have enjoyed. It's been fun serving as your President, but really I didn't do very much. Let me tell you about some people who did.

Rick Butts, serving in the capacity of Vice-President, responded enthusiastically every time I called on him. For example, he immediately accepted my invitation to attend the President's reception of the Entomological Society of Canada in Saskatoon and to consume all sorts of free food and drink on my behalf. I have no doubts that Rick represented the Society long and well that evening. Thanks, Rick.

I must offer some serious and special thanks to Daryl Williams, our Treasurer, and to Lloyd Dosdall and Mike Dolinski, who have served as Auditors for 1990. Daryl holds down the single job in our Society that is real work and requires weekly attention during much of the year. Those of you who know Daryl well will understand that, because of his quiet and shy nature, he doesn't enjoy being fussed over. Therefore, let me say simply that Daryl did a big and rather time consuming job on our behalf to sort out our financial statements for 1990 and the 1990 meeting in Banff. He also presented them to the Ministry of Consumer & Corporate Affairs in time to save our license so that we could continue to do entomology without profit. Daryl, Lloyd and Mike deserve our genuine thanks for seeing a long, sometimes tedious job through to the end.

I must thank Past President, David Langor, who really ran the Society. He reminded me in his usual positive way about everything that needed to be done, often several times. David headed up the organization of this meeting and attended to all the local arrangements which have been excellent. David, Andy Keddie (who organized the Scientific Program) and Daryl Williams (who looked after the financial matters) have provided us with a splendid opportunity to meet and share our most recent insect (and arachnid!) lore.

It has been a good year for entomology in Alberta, as we have witnessed in the many fine presentations that we've heard here. This is the real 'stuff' of

entomology. I believe that the best way forward is to be very serious and enthusiastic about our science, and for us all, individually, to make our best efforts to communicate our work and our enthusiasm for our subject to others who have not yet seen the 6- or 8-legged light. If we each endeavored to make one convert to entomology during the upcoming year, I submit that we would have more effect than all the 'collective initiatives' that we undertake from time to time. I'd like to give special mention to two examples of this sort of progress. The entomology group at Lethbridge has made arrangements to teach an introductory course in our discipline at the University of Lethbridge, and have been working hard to get some entomology into the public school curriculum in their city. Bert Finnamore and Terry Thormin have also been doing excellent work to promote entomology in Edmonton at the Provincial Museum. As Terry has explained at this meeting, they initiated the 'Bug Room' project last summer, and I can tell you that it was a smashing success. I'm delighted to know that they will continue on an expanded scale, and I hope that members of this Society will help if called upon. In my opinion, we should all take these creative efforts as examples of what can be done for entomology. Ol' Ben Franklin said, 'Thunder is good. Thunder is impressive. But it is lightning that does the work!' We should aim to burn entomology into the provincial landscape whenever an opportunity to strike presents itself.

In closing, I offer my thanks to the Executive and the membership at large for making the Annual Meeting of this society something that I look forward to with enthusiasm each year, and for making Alberta a very fine place indeed to be an entomologist.

John Spence

KEYNOTE SPEAKER

Joseph S. Elkinton

Dr. Elkinton was born in Philadelphia, Pennsylvania. He received an undergraduate degree in Psychology from Haverford College, Pennsylvania, and a doctorate in Entomology from the University of California at Berkeley. Following a two year postdoctoral fellowship at Michigan State University, Dr. Elkinton joined the Department of Entomology at the University of Massachusetts, Amherst where he is now a full professor. His teaching responsibilities include courses in forest and shade tree entomology and insect ecology. Dr. Elkinton's current research focuses on the population dynamics of forest defoliators, especially the gypsy moth.

ABSTRACTS OF SUBMITTED PAPERS

YOU ARE WHAT YOU EAT: *POPLAR* SCIENCE FOR TENT CATERPILLARS (LEPIDOPTERA: LASIOCAMPIDAE. J. R. Spence, D. Parry, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3; and W. J. A. Volney, Forestry Canada, Northern Forestry Centre, Edmonton, Alberta, T6H 3S5.

We undertook a Waldbauer-type analysis of feeding performance and metabolic efficiency of fifth instars of *Malacosoma disstria* (FTC) using foliage from the following six species of plants which are fed on in Alberta: *Populus tremuloides*, *P. balsamifera, Prunus viginiana, Amelanchier alnifolia, Betula papyrifera* and *Rosa acicularis.* Caterpillars consumed less foliage, made less frass, but developed faster and became generally larger on trembling aspen than on the other hosts. This is mainly a consequence of high digestibility of aspen coupled with a high efficiency of conversion for ingested material; efficiency of conversion of digested material was lower for aspen than for all other hosts except rose. In most years, individuals that fed exclusively on aspen would either reach the adult stage earlier, and/or become larger females. Larger females lay significantly more eggs. Metabolic efficiencies of Albertan FTC on trembling aspen and choke cherry are similar to those for eastern FTC grown on black cherry. Metabolic efficiency of the forest tent caterpillar, taken over a range of foliage types consumed in nature, is similar to that observed for gypsy moth.

LARGE SCALE FOREST FRAGMENTATION PROLONGS TENT CATERPILLAR OUTBREAKS (LEPIDOPTERA: LASIOCAMPIDAE), J. Roland, Department of Zoology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Mean duration of forest tent caterpillar outbreaks in Ontario from 1950 to 1984 were compared to the degree of clearing and fragmentation of forests in 261 townships. Outbreaks were longer in areas with higher levels of forest fragmentation. Preliminary data show that increased structural heterogeneity of forested and non-forested land reduces the impact of some natural enemies of tent caterpillars.

BIOLOGY AND IMPACT OF IMPORTANT FOREST TENT CATERPILLAR PARASITOIDS IN ALBERTA. D. Parry, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Parasitoid complexes from forest tent caterpillar outbreak populations and artificially created endemic populations were compared. *Rogas malacosomatos*, a braconid parasitoid of early instar larvae, was more common in the artificial populations than in the early and mid phases of outbreaks. Although the tachinid larval parasitoids *Leschenaultia exul* and *Patteloa pachypyga* were both present in the artificial populations, *L. exul* was much more abundant. Rates of parasitism by *L. exul* and *P. pachypyga* in outbreaks

differed, with the former being abundant in the early and late stages of outbreaks and the latter dominating the middle phase. In the late phase of FTC outbreaks, negative competitive interaction with the sarcophagid pupal parasitoid *Arachnidomyia aldrichi* probably reduces *P. pachypyga* abundance allowing *L. exul* populations to increase.

THE DYNAMICS OF JACK PINE BUDWORM POPULATIONS (LEPIDOPTERA: TORTRICIDAE). W. J. A. Volney, Forestry Canada, Northern Forestry Centre, Edmonton, Alberta, T6H 3S5.

Jack pine budworm, *Choristoneura pinus* Freeman (Lepidoptera: Tortricidae), populations are known to irrupt with different frequencies in different parts of their range. Defoliation records reflect this pattern but are inappropriate in diagnosing the reasons for population release or collapse. Population survey data can provide some insight into the processes operating within populations. Time series analyses ot these data help narrow the search for causes of population change.

MODELLING SPRUCE BUDWORM DEVELOPMENT IN WESTERN CANADA (LEPIDOPTERA: TORTRICIDAE). J. D. Weber, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Spruce budworm (SBW), *Choristoneura fumiferana*, phenology in western Canada has been studied recently in order to synchronize *Bacillus thuringiensis* (B.t.) application with development of later instar larvae. The age structure of SBW populations is represented in a stochastic model of instar proportions for given accumulations of degree days. Model parameters differ from those developed for SBW in Ontario, with emergence requiring more accumulated degree days, and post-emergence development less. Degree day accumulation is delayed at higher latitudes, and amplitude of annual temperature cycles is greater, leading to abbreviated springs where SBW development is accelerated to keep pace with shoot expansion and lignification. Clinal variation in SBW development rate curve parameters across a gradient of latitude may account for apparent accelerated development. Alternatively, accumulated degree days in the north may be underestimated by Allen's modified sine wave method of calculation as daily temperature traces are broad about the maxima and sharp at the minima.

THE LODGEPOLE TERMINAL WEEVIL IN ALBERTA. D. W. Langor, Forestry Canada, Northern Forestry Centre, Edmonton, Alberta, T6H 3S5.

The phenology, behaviour, and survival of *Pissodes terminalis* Hopping was studied in young lodgepole pine, *Pinus contorta* Douglas, stands in west-central Alberta from 1989-92. The life cycle of the species spans two years. Adult weevils overwinter in the duff and emerge in late spring to disperse by flight and reproduce. Eggs are laid in the current year's terminals. Larvae feed in the

phloem for 1.5-2 months and then enter the pith to continue development. Feeding of the larvae kills the terminal leader. Late instar larvae overwinter in the pith. Development continues in the following spring. New adults emerge in mid-summer, feed for several weeks, and move to the ground to overwinter. A cohort is produced each year. Major mortality agents are entanglement in resin, parasitoids, and winter exposure. Total mortality from egg to adult varied from 93% to >99%. The variation in the life cycle of *P. terminalis* over its range is discussed.

LOGGING AND BOREAL GROUND BEETLE ASSEMBLAGES ON TWO CONTINENTS: IMPLICATIONS FOR CONSERVATION (COLEOPTERA: CARABIDAE). J. Niemelä, J. R. Spence, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3; D. W. Langor, Forestry Canada, Edmonton, Alberta, T6H 3S5; and Y. Haila, Department of Zoology, University of Helsinki, Helsinki, Finland.

We studied the effects of clearcutting on ground beetle (Coleoptera, Carabidae) assemblages in Canadian and Finnish boreal forest by comparing pitfall samples from young, regenerating stands with those from natural, mature forests. More than half (15) of the 26 genera, but only four of the 108 species, were shared between the two continents. On both continents, carabid abundance was highest in the youngest regenerating sites (1-10 years since cutting) and in certain types of mature forest. Species richness and diversity were higher in the regenerating sites than in the mature forest on both continents. Three types of numerical responses of species to logging were distinguished: (1) species of open habitat appeared and/or increased in abundance, (2) forest generalists were not dramatically affected and occurred in all or most forest types, and (3) mature forest specialists disappeared after forest cutting. Most species in each of the three groups were taxonomically closely related on the two continents. Our results suggest that biotic diversity can be maintained throughout the boreal forest by a general management approach that maximizes habitat diversity on the regional scale. However, knowledge of local conditions and fauna will be essential to conserve specific assemblages of litter-dwelling invertebrates.

CHEMICAL ATTRACTANTS OF HORSE FLIES (DIPTERA: TABANIDAE). R. G. Holmberg, Faculty of Science, Athabasca University, Athabasca, Alberta, T0G 2R0; and J. F. Sutcliffe, Department of Biology, Trent University, Peterborough, Ontario.

Manitoba Fly Traps were used to assess the attractiveness of carbon dioxide and 1-octen-3-ol to tabanids (predominantly *Hybomitra epistates* and *H. illota*) near Athabasca, Alberta. The attractiveness of both chemicals was confirmed. Carbon dioxide was tested at four release rates: 500, 1000, 3000 and 4000 mL per minute. Statistical differences between traps with and without carbon dioxide occurred only for release rates of 3000 and 4000 mL per minute. A release rate of 500 mL per minute of carbon dioxide was equally

attractive to tabanids as a release rate of 0.02 mL per hour of 1-octen-3-ol. Combining these two chemicals gave an additive effect. Negative results were obtained for acetone (released at 0.30 mL per hour), acetophenone (0.05 mL), and a mixture of 3- and 4-ethyl phenol (0.01 mL).

ORIGIN, COMPOSITION, AND FUNCTION OF MUCOPOLYSACCHARIDES ASSOCIATED WITH FEEDING IN CULICID LARVAE (DIPTERA: CULICIDAE). K. M. Fry, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Filter-feeding by larval mosquitoes has been studied for more than 100 years. However, the precise mechanism of particle capture remains poorly understood. One element of filter-feeding under debate is the use of mucopolysaccharides to aid in particle capture or handling. As part of a larger study, I investigated the role of mucopolysaccharides in feeding in larval culicids.

Larvae of *Aedes aegypti* (L.), *Culex territans* Walker, and *Anopheles earlei* Vargas were fixed in Bouin's, serial sectioned at 10 μm, and stained with alcian blue, aldehyde fuchsin, and periodic acid-Schiff's reagent to identify mucopolysaccharides in the cephalic region. Developing cuticle, peritrophic membrane, and luminal areas of dorsal and ventral glands, as well as the lateral palatal brush and epipharyngeal epidermis, stained positively with alcian blue, indicating the presence of sulphated and carboxylated mucopolysaccharides. No staining was observed in gut containing Dayglo® particles, whereas vivid staining was seen in gut containing algae, diatoms, and detritus. No exit duct was seen in serial sections, indicating that mucopolysaccharides are not secreted externally for use in particle capture or handling.

It appears that the food of culicid larvae is self-agglutinating, facilitating formation of food boluses and fecal pellets. This may affect food resource form and distribution. The function of the mucopolysaccharides observed in the cephalic region of larval mosquitoes remains obscure but it is hypothesized that they may serve a role in moulting.

THE EFFECT OF HOST PLANT SPECIES ON DEVELOPMENT AND REPRODUCTIVE PARAMETERS OF BERTHA ARMYWORM, *MAMESTRA CONFIGURATA*, (LEPIDOPTERA: NOCTUIDAE). L. M. Dosdall, N. T. Cowle, and M. J. Herbut, Alberta Environmental Centre, Vegreville, Alberta, Edmonton, Alberta, T0B 4L0.

Developmental rates of *Mamestra configurata* from first to sixth instar larvae and to pupae were determined in controlled environment chambers using excised leaf tissue of several host plant species. Developmental rate varied depending on plant species, and was most rapid on *Chenopodium album, Brassica napus,* and *Brassica rapa*. Larvae of *M. configurata* were unable to complete their development on leaves of *Thalaspi arvense* and *Medicago sativa*. Significant differences occurred in *M. configurata* pupal weights depending on larval host plant species. Greatest pupal weights were derived from *C. album*

and *Sinapis alba*; lowest pupal weights were from *Pisum sativum, Brassica juncea,* and *Linum usitatissimum*. In feeding choice experiments, *M. configurata* larvae consumed significantly greater quantities of leaf material of *B. napus, B. rapa*, and *C. album* relative to other plant species evaluated. Females oviposited significantly greater numbers of eggs on leaves of *C. album,* relative to four other plant species evaluated.

DISINTEGRATION OF THE FEEDING STRUCTURE IN *TRICHOPLUSIA NI* (LEPIDOPTERA: NOCTUIDAE). K. A. Justus and B. K. Mitchell, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Trichoplusia ni is an important pest of crucifers, particularly fresh cabbage. Crucifers produce secondary compounds collectively known as glucosinolates which are thought to serve as anti-fungal agents and/or as deterrents of herbivory. The glucosinolate sinigrin, in high concentrations (10-20 mM), does in fact deter feeding in cruciferous flea beetles (Bodnaryk, 1991). Sinigrin, however, occurs in low concentrations in cabbage leaves and, at these concentrations, does not deter feeding of *T. ni* larvae. We tested 5th instar *T. ni* for responses to several sinigrin concentrations by measuring various parameters of 4-6 consecutive meals. These larvae were bi-modal in their responses to 4 and 8 mM sinigrin. Depending on the individual larvae considered and the meal being studied, sinigrin can be regarded as a feeding stimulant, as a mild feeding inhibitor, or as having no effect on *T. ni*.

IF YOU PUT ALL YOUR EGGS IN ONE CARCASS, DOES IT REALLY MATTER WHAT THE CARCASS TASTES LIKE? B. K. Mitchell and M. Soucie, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Oviposition and larviposition in insects are controlled by a complex of internal and external stimuli that are not fully described for any species. In flesh flies and blow flies, habitat/substrate odours have clearly been shown to attract gravid females, and in some species, odour alone is sufficient to release the final stages of oviposition behaviour. In flesh flies such as *Sarcophaga bullata*, however, physical contact with the larviposition substrate, extensive tasting and feeding immediately precede larviposition. Is this gustatory input only associated with feeding, or does it also supply information essential to the decision to deposit larvae? *S. bullata* often larviposits in discrete bouts, with approximately 70 sec. inter-bout intervals. This behavioural sequence is ideally suited to experimental manipulations of the substrate and immediate olfactory environment designed to separate the relative roles of olfaction and taste. We present evidence for a crucial role for taste in larval deposition by *S. bullata* and for a modulatory role for olfaction.

SYSTEMATIC POSITION OF PILIPALPINAE (COLEOPTERA: TENEBRIONOIDEA).
D. A. Pollock, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Historically, the genera of Pilipalpinae have been placed in a number of families of Tenebrionoidea, most recently in Pythidae. Several other authors have placed this taxon in Pyrochroidae. Analysis of 54 characters of larvae and adults of Boridae, Pythidae, Pilipalpinae, and Pyrochroidae indicates that inclusion of Pilipalpinae in Pythidae is unfounded phylogenetically. Characters used in the analyses included adult mandibles, male and female genitalia, and the urogomphal plate of larvae. Phylogenetic analysis, using PAUP version 3.0, gave the following relationship: (Boridae + (Pythidae + (*Tydessa* + (Pilipalpinae, excl. *Tydessa* + Pyrochroidae)))). Pilipalpinae are rendered paraphyletic, with the genus *Tydessa* adelphotaxon to the remainder of Pilipalpinae + Pyrochroidae (sens. stricto).

DISTRIBUTION PATTERN OF *PTEROSTICHUS MELANARIUS* (COLEOPTERA: CARABIDAE) IN CULTIVATED HABITATS IN CENTRAL ALBERTA. H. A. Cárcamo and J. R. Spence, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

We studied activity and diversity of ground beetles, using pitfall traps, in three agricultural habitats in central Alberta. The introduced species *Pterostichus melanarius* accounted for over 70% of all carabids caught at an uncultivated meadow near Ellerslie (10 km southwest of Edmonton). However, it was less abundant in nearby experimental plots. Only one individual of *P. melanarius* was collected in two barley farms near Neerlandia, about 150 km northwest of Edmonton. The pattern of species diversity and activity of native carabids suggests the potential for negative interactions with the exotic species.

INTERSPECIFIC INTERACTIONS BETWEEN TWO SPECIES OF *PTEROSTICHUS* (COLEOPTERA: CARABIDAE). C. Currie and J. R. Spence, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

We investigated the potential interaction of two carabid beetles, *Pterostichus adstrictus* (Eschz.) and *Pterostichus melanarius* (Ill.) under laboratory conditions. Adult survivorship of *P. adstrictus* was lower in the presence of *P. melanarius* adults as a result of intraguild predation. There was no evidence that interspecific competition for limited food had a direct effect on the survivorship of either species. However, weight change of gravid *P. melanarius* was higher when food was more abundant. Larvae of both species had higher survivorship when held alone, but interspecific predation of larvae by adults significantly reduced larval survivorship of both species.

IS THE RANGELAND WOOLLYBEAR, *GRAMMIO BLAKEI* (LEPIDOPTERA: ARCTIIDAE), A PEST OF NATIVE RANGE PASTURES? J. R. Byers, D. L. Johnson & W. D. Willms, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Woollybear caterpillars of *Grammia blakei* are sometimes abundant on native range pastures. On several occasions during the last ten years, densities of 10 or more per square metre have been observed in southern Alberta and historical records indicate that densities exceeding 50 per m2 have occurred. *Grammia blakei* is widely distributed throughout the Great Plains and Intermountain regions of North America. The caterpillars overwinter as mid- to late- instars and resume feeding in the spring as soon as new plant growth appears. They are general feeders, but on native range in southern Alberta they feed mostly on early season grasses. Experiments using small enclosures were conducted to determine the effect of *G. blakei* woollybears at different population densities and to assess their potential impact on the productivity of rangeland pastures. The results indicate that each woollybear causes a loss in early season forage yield of about 1 g of dry matter. At a density of 10 woolly bears per square metre the loss would be 100 kg/ha, or about 8 AUD (animal unit days). The long term average forage production of native range pastures in the short grass region of southern Alberta is 387 kg/ha, and is sometimes <100 kg/ha. The impact of feeding by the woollybears is undoubtedly further increased because they feed early in the spring. It is well known that grazing native pastures before mid-May considerably reduces plant vigor, and even moderate numbers of woollybears, over a period of years, could substantially affect the plant species composition of infested pastures by their disproportionate impact on early season species and on seedling survival.

MODELLING OF COLD TOLERANCE OF THE RUSSIAN WHEAT APHID, *DIURAPHIS NOXIA* (HOMOPTERA: APHIDIDAE). R. A. Butts and G. B. Schaalje, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

The Russian wheat aphid (RWA) is considered to be a freezing susceptible insect. In western Canada and the northwestern U.S, the level of infestation and the severity of damage in spring cereals will depend in part on the ability of RWA to tolerate cold temperatures and survive the winter.

Laboratory populations of RWA were tested for tolerance to freezing and pre-freezing temperatures. Supercooling points (points of freezing) of below -25o C were determined for each instar with no differences between laboratory and field populations. However, sampling indicated that mortality in the field occurred at temperatures much higher than the supercooling points. Therefore, mortality at pre-freezing temperatures was studied in the laboratory.

Aphids were maintained in chambers at -1, -5, -10, -15, and -20 degrees C. At 1 degree C, 100% mortality occurred after 25 days, whereas at -20 degrees C, 100% mortality was reached in less than 48 hours. Aphids exposed to -1 and -5 degrees C show no signs of stress for up to 20 and 15 days

respectively. However, short periods of exposure to -10, -15, and -20 degrees C appear to cause irreversible damage. These data coincide with patterns seen in the field.

SWIMMING BEHAVIOUR OF *BAETIS* SPECIES (EPHEMEROPTERA: BAETIDAE): LOCOMOTORY CHANGES AS A CONSEQUENCE OF BODY SIZE. T. N. Kutash, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

The swimming behaviour of variously sized *Baetis* species nymphs were observed using high speed cinematography. Swimming behaviour changed both quantitatively and qualitatively with an increase in body length. Nymphs less than 3 mm long used abdominal oscillations combined with rowing movements of the legs to swim, while nymphs larger than 4 mm long utilized only abdominal oscillations for propulsion. Behavioural transition occurred at 3.5 ± 0.2 mm. Nymphs within this range exhibited either rowing or non-rowing behaviours while some nymphs displayed an intermediate swimming pattern. It is suggested that rowing behaviour of *Baetis* sp. nymphs at low Reynolds numbers is necessary to minimize the drag of the recovery stroke and facilitate forward motion.

ORIGIN AND FATE OF THE PLEUROPODIA IN EMBRYOS OF *NEOHEEGERIA VERBASCI* [OSBORN] (THYSANOPTERA: PHLAEOTHRIPIDAE). B. Heming, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Paired, glandular pleuropodia in embryos of *Neoheegeria verbasci* are of the derived, invaginate type. They originate at about 22 percent total development time (%TDT) through enlargement of 10 epidermal cells on either side of neuroblasts generating the ventral nerve cord ganglion of abdominal segment I. Their cells invaginate at about 27% TDT, reach their maximum size at about 45% TDT just before katatrepsis, and maintain this appearance until just before dorsal closure at about 60% TDT. They then degenerate, although cellular remnants persist until just before hatch. The pleuropodia are similar to those of other thysanopteran embryos, resemble those of known odonate, plecopteran, hemipteran and phthirapteran embryos and may function in the synthesis, transport and/or secretion of factor(s) inducing katatrepsis, the deposition of embryonic cuticle and, perhaps, the disappearance of serosal and embryonic cuticles just before hatch.

TEGENARIA GIGANTEA (ARANEIDA: AGELENIDAE) NOW ESTABLISHED IN ALBERTA. R. Leech, Biosciences, NAIT and Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Tegenaria gigantea (Chamberlin and Ivie, 1935), an agelenid spider, was introduced, and is now established, in Alberta. Males are more active and more commonly seen than are females. A male recently caught in Edmonton has a leg span of over 10 cm. When challenged or threatened, they will attack. Their

bites can be painful but are usually not serious. A preserved specimen is brought for all to see.

GUESS WHO CAME TO DINNER! M. Steiner, W. Alexander, and S. Bjornson, Alberta Environmental Centre, Bag 4000, Vegreville, Alberta, T0B 4L0.

The predatory mite *Phytoseiulus persimilis* is used to control spider mites in greenhouse crops in Alberta. Following reports of poor performance in recent years, mites from three commercial suppliers were evaluated for performance-contributing factors such as longevity and fecundity and found to be wanting. Internal examination through electron microscopy and light microscopy revealed the presence of a variety of microorganisms, including undescribed species of rickettsia, microsporidia, virus, and bacteria. The nature of some of these organisms suggests that they may well be responsible for the observed failures of *P. persimilis*, particularly when these predatory mites are under stress. A commonly observed artifact causing "white-gut" symptoms, described by other workers as due to microorganisms or secretory/excretory substances, is tentatively identified as primarily crystals of calcium oxalate. Its significance is presently unknown. Producers and evaluators of *P. persimilis* and other biological control organisms need to be aware of uninvited dinner guests that may affect post-release performance.

THE BUG ROOM. T. Thormin, Natural History Section, Provincial Museum, 12845 - 102 Ave., Edmonton, Alberta, T5N 0M6.

Any museum program should be comprised of three parts: research, collections, and exhibits. Right from its start in 1983, the Entomology Program at the Provincial Museum of Alberta recognized the value of live exhibits and, in 1985 we acquired our first live culture *Blaberus giganteus* from the University of Alberta. In January of 1992, with about 25 live cultures to work with, we were asked to put together a feature exhibit. The gallery was called "The Bug Room" and ran from mid May to mid August. Cultures were placed in aquaria and terraria that were landscaped to reflect their natural habitat. Displays of dead specimens and photographs of insects decorated the walls and added to the interpretation potential of the gallery. Five staff were hired to interpret the gallery and present special programs such as the summer "Bug Camps".

Success of the gallery was indicated by the statistics. Almost 65,000 people saw the exhibit. At times line-ups to get into this gallery were 1 1/4 hours long. Attendance during the time the gallery was open was up 47% over the same period the previous year. A visitor's survey showed that the public wants the exhibit to be permanent, bigger and with more species. Presently the plan is to do another temporary exhibit in 1993, but to do it in permanent gallery space that is almost twice the size of the space utilized in 1992, and to have a number of additional cultures. The long term plan is to eventually have this as a permanent gallery.

BIOCONTROL OF WEEDS WITH INSECTS IN ALBERTA: PROVINCIAL PROGRAMS.
A. S. McClay, Alberta Environmental Centre, Bag 4000, Vegreville, Alberta, T0B 4L0; D. E. Cole, Alberta Agriculture, Edmonton, Alberta; and C. J. Richardson, Alberta Forestry, Lands and Wildlife, Sherwood Park, Alberta.

Three departments (Environment, Agriculture, and Forestry, Lands and Wildlife) are cooperating to develop and implement biological control of weeds with insects in Alberta. In collaboration with Agriculture Canada and the International Institute of Biological Control, insects are being reared, released and evaluated against seven target weeds. The root-feeding beetle *Apthona nigriscutis* Foudras (Coleoptera: Chrysomelidae) is proving effective against leafy spurge on dry sites. "Redistribution clinics" are held each summer at sites close to the established beetle colonies to provide users with beetles and training in how to use them. Since 1988 more than 96,000 of these beetles have been released at over 250 sites in Alberta. Other insects are showing promise for leafy spurge in moister sites. The status of insects released against toadflax, Canada thistle, perennial sowthistle, scentless chamomile and bladder campion is briefly reviewed.

EVIDENCE FOR SUCCESSFUL OVERWINTERING OF DIAMONDBACK MOTH (*PLUTELLA XYLOSTELLA*) IN ALBERTA (LEPIDOPTERA: YPONOMEUTIDAE). L. M. Dosdall and T. Micklich, Alberta Environmental Centre, Bag 4000, Vegreville, Alberta, T0B 4L0.

Fourteen adult specimens of diamondback moth (*Plutella xylostella* (L.)) were collected at Vegreville, Alberta from emergence traps on field plots that had been seeded the previous year to *Brassica napus* and *Brassica rapa*. Although no previously published evidence exists to indicate that *P. xylostella* can overwinter in Canada, successful overwintering in 1991-92 is the most probably explanation for the collections. Warmer than average winter temperatures in 1991-92 probably facilitated survival of diamondback moth on these field plots.

ENTOMOLOGICAL SOCIETY OF ALBERTA
MINUTES OF EXECUTIVE MEETING, 15 October 1992
Chateau Jasper, Jasper

Present:	Rick Butts	Mark Goettel	David Langor	Tim Lysyk
	Alec McClay	John Spence	Daryl Williams	
Absent:	George Evans	Jim Jones	Robert Holmberg	

Meeting called to order at 6:47 pm.

Approval of Agenda.

MOTION: That the agenda be adopted - McClay/Lysyk.

Adoption of minutes.

MOTION: That the minutes of the 3 October 1991 Executive Meeting be adopted - Lysyk/Langor.

Business arising from previous meetings.

Financial Management (temporary) Committee: This committe consisting of John Spence, Daryl Williams, and David Langor looked into the long-term management of Society funds. It was recommended that the ESA Executive be responsible for the management of Society funds. It was recommended that as much of the funds as practical should be invested in the highest interest accounts available. Furthermore, organizers of annual meetings should strive for a balanced budget, excluding costs associated with a guest speaker. It was recommended that the Trust Fund (temporary) Committee be disbanded.

Insect Collection Contest (temporary) Committee: No report.

Insect Collector's Guide (temporary) Committee: Pat Scholefield informed the executive that there was no action this year.

Public Awareness (temporary) Committee: Rick Butts presented a summary of his report outlining ways in which we are already involved in P.R. work and suggesting ways to increase public awareness of entomology and of our Society.

Auditors report for 1990: Daryl Williams reported that Consumer and Corporate Affairs had contacted him regarding tardiness in the submission of the 1990 auditor's report. Everything now has been cleared up.

Officer's Reports.

Treasurer's report: Daryl Williams asked if there had been an Auditor nominated last year. It was agreed that Rick Butts would nominate Auditors for last year and this year. Daryl presented his financial statement for 1991 and noted that the interest gained was more than enough to cover annual meeting shortfalls.

Secretary's report: Mark Goettel reported that he received several letters requesting that information be passed on to the membership. There was difficulty in doing this as the Society does not have a newsletter. Discussion followed regarding the merits and drawbacks of a newsletter. Finally it was agreed that Mark could send a notice to be posted at several key locations, whenever he saw fit. David Langor will send a membership list to Mark so that it can be held and updated by the secretary.

Editor's report: On behalf of George Evans, John Spence reported that the 1990 Proceedings are published, however, due to several misunderstandings, lack photo plates. It was also reported that George wished to step down as Editor. David Langor indicated that he would let his name stand for election as Editor and suggested that the 1991 and 1992 Proceedings be published in one issue. It was agreed that the compilation of the photo plates would be the Editor's responsibility.

Regional Director's report: Alec McClay presented a summary of his report which is to be presented at the Annual Business Meeting.

Reports of standing committees.

1992 Annual Meeting Organizing Committee: David Langor reported that there were 51 confirmed registrants and that he expected about 63 people to attend. He emphasized the utility of a late registration penalty fee to discourage people from waiting until the last minute to register.

Nominations Committee: Rick Butts reported that Alec McClay was nominated for Vice President, Bev Mitchell for Regional Director, and David Langor for Editor. Nominations for Director (central), Resolutions Committee, and Auditor are yet to be confirmed. Otherwise, present officers are willing to serve for another term.

Membership Committee: John Spence reported that the Society had gained at least two new members.

Science Fair Liason Committee: John Spence had nothing new to report regarding Science Fairs in northern Alberta, Tim Lysyk helped judge the Southern Alberta Regional Science Fair.

Awards Committee: Rick Butts reported that our last years' submission for the Gordon Hewitt Award was successful; Dan Johnson was the award recipient. Rick will call for new nominations at the Annual Meeting.

New business.

Venue for the 1993 Annual Meeting: It was noted that it was the Central Region's turn to host the meeting. Michi Okuda will be solicited to organize the next meeting.

Adjournment.

MOTION: That the meeting be adjourned- Lysyk/Butts. 8:25 PM.

ENTOMOLOGICAL SOCIETY OF ALBERTA
MINUTES OF THE ANNUAL MEETING

Chateau Jasper, 17 October 1992

Meeting called to order at 10:05 by President John Spence.

Approval of Agenda.

MOTION: That the agenda be approved - Lysyk/Keddie. CARRIED.

Greetings from the Entomological Society of Canada.

President elect, Paul Riegert, brought greetings from the ESC. He stressed the need to keep up the membership in the ESC and outlined the difficulties that lay ahead. He attempted to clear up the many misconceptions regarding increased membership dues and our affiliation with the Canadian Federation of Biological Sciences.

Adoption of minutes of the previous Annual Meeting.

MOTION: The the minutes of the previous meeting be adopted - Shemanchuk/Langor. CARRIED.

Business arising from previous Annual Meeting.

ESA Financial Management (temporary) Committee: A temporary committee consisting of John Spence, Daryl Williams, and David Langor looked into the long-term management of society funds. David Langor reported that the committee makes the following recommendations:

1. Given a current balance of approx. $17,000, $10,000 be deposited in a higher interest yielding account and renewed yearly; $5,000 be deposited in 5 equal monthly term deposits; and the remainder be placed in the chequing account.
2. Deployment of Society funds be flexible and at the discretion of the ESA Executive.
3. Future Annual Meeting Organizing Committees strive for a balanced budget, excluding all costs associated with the guest speaker.
4. The Trust Fund (temporary) Committee struck two years previously be disbanded and that the Society express its gratitude to the members of this committee by a letter from the president.

MOTION: That the report be accepted - Langor/Ball. CARRIED.
MOTION: To adopt recommendation 1 - Langor/Shemanchuk. CARRIED.
MOTION: To adopt recommendation 2 - Langor/Mitchell. CARRIED.
MOTION: To adopt recommendation 3 - Langor/Butts. CARRIED.
MOTION: To adopt recommendation 4 - Langor/Heming. CARRIED.
MOTION: That the ESA Financial Management (temporary) Committee be disbanded - Langor/Leech. CARRIED.
Colin Hergert suggested that, as a housekeeping duty, we address the tabled motion of the Trust Fund (temporary) Committee from last year.
MOTION: To adopt the recommendations of the Trust Fund (temporary) Committee - Lysyk/Langor. DEFEATED.

Insect Collection Contest (temporary) Committee: Robin Leech reported that there was very little entomology at most of Alberta's Universities and Colleges and, therefore, very few sources of potential collections. MOTION: That the report be accepted - Leech/Keddie. CARRIED.

Robert Holmberg suggested that the ESA should cooperate with the museum in establishing some sort of contest involving insects. Graham Griffiths suggested that exhibits and posters be solicited rather than only insect collections. Mike Dolinski suggested that we approach the Dept. of Education and Bev Mitchell suggested that we should teach teachers.
MOTION: That two committees be set up to look into furthering awareness of entomology; one at the elementary school level and another at the high school level - Mitchell/Justice.
After much discussion, Mike Dolinski and Bev Mitchell volunteered to form the committee at the elementary school level. Jan Volney CALLED THE QUESTION. DEFEATED. Bev Mitchell then amended the original motion.
MOTION: That a committee be set up to look into furthering awareness of Entomology at the elementary classroom level - Mitchell/Dolinski. CARRIED.
Bev Mitchell and Mike Dolinski volunteered to serve on this committee.

Insect Collector's Guide (temporary) Committee: Colin Hergert reported that no progress was made. Robin Leech and Tim Lysyk volunteered to look over the guide in view of making minor changes.

MOTION: To form a committee to investigate revamping the insect collectors guide and to look into possible avenues of publication - Volney/Williams. CARRIED.
Robert Holmberg, Tim Lysyk, and Robin Leech volunteered to serve on this committee.

Public Awareness (temporary) Committee: Rick Butts presented the report. MOTION: That the report be accepted - Butts/Langor. CARRIED.

Report of the 1992 Annual Meeting Organizing Committee.

David Langor reported that there were 63 attendees, 23 talks, and 2 posters. The penalty for late registration was helpful as it encouraged pre-registration. Also, waiving of submission of abstracts with submission of titles helped in persuading people to register early. The budget for the meeting will be in the black, excluding costs associated with the guest speaker. MOTION: That the report be accepted - Langor/Hemming. CARRIED.

Reports of Officers.

Treasurer's Report: Daryl Williams presented the interim 1992 treasurer's report. There was a balance of over $17,000 as of 1 September 1992. MOTION: That the treasurer's report be accepted - Williams/Leech. CARRIED.

Secretary's Report: Mark Goettel announced that he received several letters requesting that information be passed on to the membership. There was difficulty in doing this as the society does not have a newsletter. He stated that from time to time he sent notices to be posted at several key locations whenever he saw fit. MOTION: That the report be accepted - Goettel/Leech. CARRIED.

Editor's Report: In George Evans' absence, John Spence presented the editor's report. He reported that George Evans was stepping down as editor after publication of the 1991 Proceedings. David Langor has offered to let his name stand for election as editor. It was announced that all reports and abstracts must be submitted to the new editor by 30 November. MOTION: That the report be accepted - Spence/Dolinski. CARRIED.

Auditor's Report for 1990: Mike Dolinski and Daryl Williams reported that the previous problems with the 1990 budget were now cleared up

and that the budget had passed the audit. MOTION: That the report be accepted - Dolinski/Keddie. CARRIED.

Regional Director's Report: Alec McClay reported that the ESC was facing some serious deficits. A new Finance and Publication Committee was recently formed to look into this problem. There will be a new membership category with reduced fee for students which will allow them to receive the Bulletin but not The Canadian Entomologist. The next meeting will be held at Sault Ste. Marie, Ontario in 1993. MOTION: That the report be accepted - McClay/Williams. CARRIED.

President's Report: John Spence reported that the ESA meetings were very successful and amicable. He thanked the members of the Executive for their help during his tenure as President. MOTION: That the report be accepted - Spence/Keddie. CARRIED.

Reports of Standing Committees.

Awards Committee: David Langor reported that there were no nominations and that the deadline was 1 December. MOTION: That the report be accepted - Langor/Hergert. CARRIED.

Insect Collection Committee: no report.

Membership Committee: no report.

Science Fair Liason Committee: Rick Butts reported that one book prize was awarded by the Society at the Southern Alberta Regional Science Fair. MOTION: That the report be accepted - Butts/Leech. CARRIED.

Nomination Committee: The following slate of nominees was presented by Rick Butts:

Vice President.....Alec McClay
Secretary.....Mark Goettel
Treasurer..... Daryl Williams
Editor.....David Langor
Director (ESC).....Bev Mitchell
Director (central).....Michi Okuda
Auditors.....Mike Dolinski

MOTION: That the report be accepted - Shemanchuk/Keddie. CARRIED. There was a call for further nominations. Tim Lysyk nominated Jan Volney as Auditor and Jan accepted the nomination. MOTION: That nominations cease - Ball/Keddie. CARRIED. As there were no other nominations, the slate was declared elected.

Resolutions Committee: Burt Schaber and Rick Butts presented the following resolutions:

Resolution #1:

Whereas this being the 40th anniversary of the founding of the Entomological Society of Alberta, and whereas all founding members have made significant contributions to entomology, agriculture, and forestry, not only in Alberta, but throughout Canada, and in some cases, throughout the world,

be it resolved that the Entomological Society of Alberta write a letter of appreciation to the surviving charter members and commend them for their vision in establishing the Society, and acknowledge their contributions to entomology, agriculture and forestry.

Further, whereas one charter member is in attendance of this meeting,

be it resolved that the membership of the Entomological Society of Alberta offer a special thanks to Paul Riegert, Professor Emeritus at the University of Regina.

Resolution #2:

Whereas the prestigious C. Gordon Hewitt award is presented by the Entomological Society of Canada to a young scientist who has made a significant contribution to entomology, and whereas Dan L. Johnson of the Lethbridge Research Station, who was nominated by the Entomological Society of Alberta, was the 1992 recipient of this award,

be it resolved that the membership offer congratulations in a letter sent to Dan L. Johnson.

Resolution #3:

Whereas the Organizing Committee of this meeting have taken us to new distances and to realms of beauty and wonder,

be it resolved that the membership of the Entomological Society of Alberta offer thanks to the Organizing Committee as a whole, and in particular to its chairman, David Langor; scientific program coordinators, Andy Keddie and John Spence; and treasurer, Daryl Williams.

Whereas the depiction of the sombre and humourous endeavours of Society members should be photographically recorded, as it is a

vital component of the history of the Entomological Society of Alberta,
be it resolved that the membership of the Society offer special thanks to photographer, Robin Leech.
Whereas the success of the Meeting depends on "setting the scene",
be it resolved that the membership thank Joe S. Elkinton for a most interesting talk on gypsy moth population dynamics.
Whereas the flow of any meeting is dependent on courageous moderators,
be it resolved that the Society offer thanks for a superb job to Ken Fry, Cameron Currie, Darren Pollock, and Andy Keddie.
Whereas the post-banquet presentation entitled, "Entomology on the top and the bottom of the world", was humourous, informative, and delivered with style,
be it resolved that the membership of the Society express appreciation in a letter to the speaker, Jari Niemelä.
Whereas the facilities and accomodations provided by the Chateau Jasper were of superb quality,
be it resolved that the appreciation of the membership of the Society be expressed in a letter sent to the appropriate members of the staff of the Chateau Jasper.
MOTION: That the resolutions be accepted as read - Schaber/Mitchell. CARRIED.

New Business.

Michi Okuda reported that the next meeting of the Society will either be in Olds or Kananaskis.

Adjournment.

The meeting adjourned at 12:02 pm on a motion by Joe Shemanchuk.

Entomological Society of Alberta
FINANCIAL STATEMENT
to 31 December 1992

Bank assets, 1 January 1992:				$15,530.29
CREDITS				
MEMBERSHIPS:				
Regular	1993:	27 @ $10.00	270.00	
	1992:	43 @ $10.00	430.00	
	1991:	6 @ $10.00	60.00	
	1990:	1 @ $10.00	10.00	
Student	1993:	8 @ $5.00	40.00	
	1992:	12 @ $5.00	60.00	
	1991:	1 @ $5.00	5.00	
Corporate			18.68	
Currency exchange			3.54	
Total Memberships			897.22	
Cash currently held by treasurer			50.00	
Deposits on record			847.22	847.22
INTEREST:				
Term deposit monthly interest			248.37	
Term deposit maturity interest			1227.94	
Total Interest			1476.31	1476.31
ANNUAL MEETINGS , 1991: (see financial statement, 1991)				217.59
ANNUAL MEETINGS, 1992:				
Registrations				
regular		36 @ $40.00	1440.00	
student		11 @ $25.00	275.00	
accomp. persons		15 @ $25.00	375.00	
Late fees		10 @ $10.00, 8 @ $5.00	140.00	
Banquet ticket		1 @ $20.00	20.00	
Total Income			2250.00	2250.00
		Total Credits		**20321.41**

EXPENDITURES

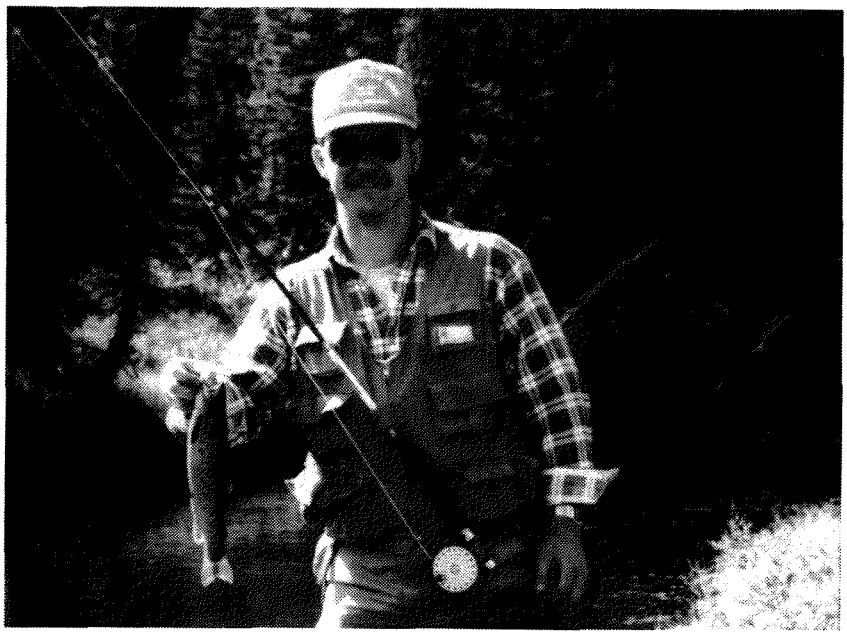
ANNUAL MEETINGS, 1992:		
Expenses for facilities, Chateau Jasper	1957.83	
Airfare for Keynote Speaker	640.30	
Total	2598.13	2598.13
PUBLICATION COSTS:		
Proceedings of the ESA, 1990	390.01	390.01
MISCELLANEOUS:		
Banking Charges	48.10	
Photographic charges	140.70	
Mailing costs	114.81	
Presidents expenses	20.78	
Total	324.39	324.39
Total Expenditures		**3312.53**

BALANCE SUMMARY

Total Credits	20,321.41
Total Debits	3,312.53
Balance	17,008.88

Bank Assets on December 31, 1992 = **$17,008.88**

[This financial statement was audited by Jan Volney and Mike Dolinski.]



OBITUARY
Timothy Gordon Spanton
1954-1993

Entomological colleagues, and friends in the scientific community, were deeply saddened by the news of Dr. Tim Spanton's death, on 27 May 1993, by natural causes at his home in Edmonton. Tim was born in Ottawa, on 2 October 1954. His lifelong interest in biology and the outdoors led to an undergraduate degree from Carleton University and employment as an ornithological field collector with, what was then, the National Museum of Natural Sciences. Tim subsequently undertook an M.Sc. program at Lakehead University and produced a fine thesis on the systematics of the *Cicindela sylvatica* species group of tiger beetles, under the supervision of one-time Albertan Rick Freitag. During his time at Lakehead, Tim married Yvonne Purvis, and their first daughter, Jessica, was born.

The Spanton family then moved to Edmonton and Tim soon began working on his Ph.D., under the supervision of George Ball. His interest in systematics was still strong, but he was also keen on forest entomology, so he chose the weevil genus *Panscopus* to review. His thesis later expanded to address the higher classification of the subfamily Entiminae. After his successful defense in the spring of 1992, Tim went to work at the Northern Forestry Centre of Forestry Canada in Edmonton where, until his death, he was undertaking a study of yet another group of beetles, the staphylinids.

Tim was a rigorous, painstaking scientist, with the admirable ability to sustain focused concentration on difficult and complex problems. He was highly regarded by his colleagues, and he was also personable and kind. His sense of humour was quick, and he was a well rounded individual with a zest for life. He was also a story teller of no mean repute, with a vocabulary to rival that of most paperback dictionaries. Hunting, fishing, cycling, and cross-country skiing were his primary extra-curricular pursuits, and in the months before his death he was also enthusiastically rediscovering his love of birding, something he was highly skilled at. His family, however, was always most important to him, and he was a kind and devoted husband to Yvonne, and father to Jessica and Kendra. With Tim's passing, we have lost a talented entomologist and a good friend. He will be deeply missed by us all.

John Acorn

ENTOMOLOGICAL SOCIETY OF ALBERTA
MEMBERSHIP LIST
(Revised: Nov 1993)

Honorary Members:

GURBA, Joseph B. 9415 - 144 St., Edmonton, Alberta, T5R 0R8, (Res.) 452-6752.
GUSHUL, Evan T. 1714 - 15 Ave. South, Lethbridge, Alberta, T1K 0W9, (Res.) 328-2426.
JACOBSEN, Larry A.1011 - 14 St. South, Lethbridge, Alberta, T1H 2W3, (Res.) 327-3754.
LARSON, Ruby I. 2503 - 12 Ave. South, Lethbridge, Alberta, T1K 0P4, (Res.) 327-2089.
NELSON, W.A. (Bill)1030 Fern Crescent, Lethbridge, Alberta, T1K 2W3, (Res.) 327-4736.

Regular Members:

ACORN, John 15714 - 86 Ave., Edmonton, Alberta, T5R 4C4, (Res.) 488-1080.
BALL, George E. see address #1, (Res.) 483-4951, (Bus.) 492-2084, (Fax.) 492-1767.
BALL, Kay 8108 - 138 St., Edmonton, Alberta, T5R 0C9, (Res.) 483-4951.
BARR, Bill B. 11588 - 80 Ave., Edmonton, Alberta, T6G 0R9.
BJORNSON, Susan see address #1, (Res.) 436-5649, (Bus.) 492-9808, (Fax) 492-1767.
BRAUN, Lorraine see address #1, (Res) 433-7476, (Bus.) 492-3080 (Fax) 492-1767.
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HEMING, Karen 10948 - 75 Ave., Edmonton, Alberta, T6G 0G9, Tel. (Res.) 435-5791.
HENRIQUEZ, Nidia Ministerio de Agricultura y Ganaderia, Centro de Tecnologica Agricola, Apartado Postal 885, San Salvador, E. Salvador.
HERBERT, M. see address #5, (Bus.) 632-6767, (Fax) 632-8379.
HERGERT, Colin 2316 Crestwood Road S.E., Calgary, Alberta, T2C 0C6, (Res.) 279-2658, (Bus.) 272-8753, (Fax) 569-2467.
HILCHIE, Gerald see address #1, (Res.) 434-9068, (Bus.) 492-0465, (Fax) 492-1767.
HOLMBERG, Robert Faculty of Science, Athabasca University, Athabasca, Alberta, T0G 2R0, (Res.) 675-3396, (Bus.) 675-6226, (Fax) 675-6186, (E-Mail) robert@cs.athabascau.ca
HOLTER, T. 1052 Lake Christina Way S.E., Calgary, Alberta, T2J 2R3.
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HORNE, M. 84 Southampton Drive, Calgary, Alberta, T2W 0T8, (Res.) 255-5177, (Bus.) 220-7634.
HUGHES, Robert B. see address #5, (Res.) 632-4942, (Bus.) 632-8237, (Fax) 632-8379.
JOHNSON, Dan L. see address #2, (Res.) 320-5910, (Bus.) 327-4561, (Fax) 382-3156, (E-Mail) johnson@abrsle.agr.ca
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KANAGARATNAM, P. 210 - 3509 Sylvan Road South, Lethbridge, Alberta, T1K 3J8, (Res.) 327-7674.
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KRUSHEL, H. Plant Quarantine, Agriculture Canada, Bag 2908, Postal Station M., Calgary, Alberta, T2P 3C3, (Res.) 288-8893, (Bus.) 292-5635.
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LANGOR, David W. see address #4, (Res.) 987-2392, (Bus.) 435-7330 (Fax) 435-7359, (E-Mail) dlangor%nofc.dnet@cedar.PFC.forestry.ca
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GOD'S Country	Paul Reigert	Entomological Bums	List of Honor	Paul Reigert Colin Hergert	Tim Spanton
Bev Mitchell Kris Justus	Rick Butts Marilyn Steiner	Michi Okuda Hector Carcamo	Rob Hughes	Kay Ball Karen Toohey Betty Reigert	
"Gimme a break!" Dylan Parry	*"That question p..... me off".* Jim Weber	*"He's gonna drop it"* Darryl Williams John Spence	Susan Bjornson	Colin Hergert	Burt Schaber
"Now what? " Terry Thormin	Marilyn Steiner	Tracy Kutash	*"Boy!...do I need a drink"* Dave Langor	Darren Pollock Alec McClay	*"Friends, Romans, Entomolo...."* Joe Elkinton
"It was him" Robert Holmberg	*"You sure?"* Jan Volney	*"Yeh!"* Bob Byers	*"Yeh, sure it was him"* Jari Niemela	*"OK Ken own up"* John Spence	*"What did I do?"* Ken Fry
Time for tea	Kris Justus	Colin Hergert The Shemanchuks Marilyn Steiner	Burt Schaber	Bonnie Leech George Ball Terry Thormin Robert Holmberg	
"It's about that size" Jens Roland	*"Am I the only one who can't stand straight?"* Hector Carcamo	Bruce Heming	LLoyd Dosdall	Cam Currie with swoll tongue	Rick Butts	*"for ever and ever amen"* Bev Mitchell

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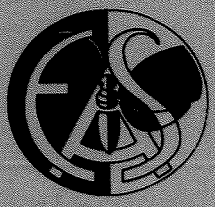

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