

PROCEEDINGS OF THE 42nd ANNUAL MEETING OF THE



Entomological Society of Alberta

Canmore, Alberta 27-29 October 1994

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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 vigour. 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 - 1994

| | |
|-----------------------------------|--------------------|
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Membership is open to anyone interested in Entomology. Annual dues are \$10.00 (\$5.00 for students). Contact the Treasurer whose address is in the membership list at the back of this Proceedings.

PROGRAM OF THE 42ND ANNUAL MEETING

Thursday, October 27

20:00 - 23:00 Registration and Mixer

Friday, October 28

08:30 Registration

09:00 Welcoming Remarks and Announcements

09:15 Keynote Lecture: Dr. Henk Wolda
"Diversity of tropical insects"

10:00 Coffee Break

10:15 Symposium: Human activities and biodiversity of arthropods.

12:00 Lunch

13:30 Submitted papers

15:00 Coffee

15:15 Submitted papers

18:00 Cash Bar Open

19:00 Banquet

After Dinner Speaker: John Acorn on "Butterflies"

Saturday, October 29

08:30 Submitted papers

10:00 Coffee

10:15 Submitted papers

11:15 Business Meeting

PRESIDENT'S REPORT

Alec McClay

The main activity of the Entomological Society of Alberta has always been the Annual Meeting. This year, for the first time in many years, our annual meeting is also a joint meeting with another regional Society, and I would like to welcome all members of the Entomological Society of Saskatchewan and thank them for their contributions to this meeting. I also thank Hector Cárcamo and Gordon Pritchard for their efforts in organizing the meeting. The theme of biodiversity has led to a meeting which, while diverse in itself, has also been coherent.

I would like to thank all members of the executive (Lloyd Dosdall, Jim Jones, Dave Langor, Rick Butts, Andrew Keddle, Tim Lysyk, Greg Pohl, Hector Cárcamo, and Tim Lysyk) for their work during the year.

In 1997 it will be Alberta's turn again to host the joint meeting with the Entomological Society of Canada. The executive met to start the planning process for this meeting, and agreed that the location should be Edmonton. Bev Mitchell and I were delegated to select dates and a venue, and after reviewing proposals from the main downtown hotels, selected the Holiday Inn Crowne Plaza. An official invitation has been sent to Entomological Society of Canada for the dates of October 4-8, 1997. Over the next 6 months to 1 year we would like to appoint a general organizing committee chair, a scientific program chair, and a local arrangements chair so that detailed planning for the meeting can start. We already have some volunteers for some of these positions, and a possible theme for the meeting. However I would like to encourage all members of the Society to bring their suggestions and offers of help to the Executive over the next few months.

A problem which this Society has discussed almost ad nauseam over the years has been that of increasing public awareness of, and interest in, entomology. For a Society composed largely of researchers, it has always been difficult to find the time and the channels to bring entomology before a wider audience. It is very encouraging to see that some members of this Society are now actively involved in such efforts. The Bug Room and associated programs organized by Terry Thormin at the Provincial Museum of Alberta, Bert Finnermore's involvement with the "Butterflies at the Garden" exhibit, and John Acorn's popular butterfly book and television appearances have done more to increase the profile of entomology than many academic entomologists will ever achieve. These efforts deserve the full support of the Society.

In 1994 the Department of Entomology at the University of Alberta was absorbed into the new Department of Biological Sciences. It is too early to say what effects this will have on entomology in the province, but I hope that insect studies will continue to be a strong theme in the new department, while benefiting from increased interactions with other biological disciplines. One direct effect on the Society is that our archives, long housed at the Department of Entomology, were left homeless. The archives have now been transferred to the Agriculture Canada Lethbridge Research Centre, and Tim Lysyk has been appointed archivist.

Finally, it was encouraging to see both veteran and younger entomologists from Alberta receiving recognition at the Annual Meeting of the Entomological Society of Canada in Winnipeg. George Ball and Joe Shemanchuk were inducted into Honorary Membership of ESC, Bob Byers became a Fellow of ESC, and Scott Digweed was a winner in the student paper competition.

KEYNOTE SPEAKER: HENK WOLDA BIODIVERSITY

Diversity is a term commonly used in scientific circles, referring to the number and abundances of different organisms in a given group, family, order, etc., occurring in a given area. The information contained in just the number of species is limited and an idea about their relative abundances greatly advances our understanding of the make-up of the flora and/or fauna. The use of diversity indices is very fashionable, and sometimes even useful, but one has to keep in mind that all the information contained in the number of species plus their relative abundances cannot usually be captured in just one number, one index.

Biodiversity is a much grander term. It refers to the sum total of all living organisms in a given area or even on the earth as a whole. Because it is a term treasured by policy makers, and often found in newspapers and magazines, usually in the context of nature conservation, scientists cannot simply ignore the term in spite of its problems, not the least of which is that we normally do not know anything about the total number of organisms anywhere. We may know about birds, carabid beetles, or vascular plants, but rarely about all of these at the same time, let alone about mites, nematodes, fungi, etc. Nevertheless, we better be prepared to inform politicians about what we do know and what we can estimate if we are to play a role in conserving our still available biotic resources.

Several estimates have been made on total biodiversity on earth, starting with Erwin's estimate of 30 million insects. If we take, however, the more conservative estimate of Hodkinson and Casson of 2 million insects and add estimates by Wilson and by Hawksworth, we come to a possible total of 5.5 million organisms, including 1.5 million fungi and 1 million nematodes. It is anybody's guess how far this estimate may be from the truth.

Even if we did know the total number of species in a given area, we still would have only a minimum estimate of biodiversity. There is generally a large between-population variation in genetic and phenotypic characters and we have to deal with the almost universal, and large, within-population variation. The actual biodiversity is incredibly large and almost beyond our comprehension.

Coming down to earth from these high spheres of biodiversity and returning to "simple" diversity, I will use some of my light-trap data from Panama to illustrate that measuring diversity is not necessarily that simple. After 17 years on Barro Colorado Island (BCI) almost 1100 species of Homoptera were found, but the species/ individuals curve still had not reached an asymptote. Every year species appeared that had not been collected before. So what is the diversity of Homoptera on BCI? In each year the number of species remained roughly the same over that period, but the kind of species found changed. Some species appeared, some disappeared, some increased and some decreased in abundance over the years. Diversity, then, depends on when one looks, in what year, and over how many years. Within each year there are also massive changes in diversity. Both the number of species and the number of individuals varies strongly between seasons, often, but not always, related to the alternation of wet and dry seasons. Seasonal changes in temperature are minimal or absent, so that there is no season without actively flying insects. Depending in part on the climatic seasonality at different localities, the percentage of species of Homoptera active around the year varied from 37 to 73 percent.

"Diversity of tropical insects" also depends on where one looks. In Panama there is an enormous between-site variation in the number as well as the kind of species present. Some of this is correlated with altitude and with habitat, but much of the causes of this beta diversity remains unknown.

When discussing diversity on insects, at least of tropical ones, one thus has to specify in some detail where the data were obtained, when during the year, in what year or over how many years, as that may strongly affect the results. Biodiversity may be extremely difficult to study, but also common diversity in some insect group or other may not be easy to measure and evaluate.

ABSTRACTS OF SUBMITTED PAPERS

Factors affecting biodiversity in agro-ecosystems. N. Melnychuk, O. Olfert, C. Gillott and P. Kusters, Agriculture Canada & U. Saskatchewan, Saskatoon, SK. A strong desire by all segments of society to preserve soil and water quality has stimulated a major shift in agricultural farming systems towards reduced tillage, extended crop rotations, and reduced pesticide usage. Insect pests reduce the economic sustainability of crop production. Despite efforts to control insect pests, they are a persistent part of the agroecosystem. The presentation reviewed the current knowledge base on how agronomic practices affect pest populations. The review focused on: (i) conservation tillage; (ii) multiple cropping systems, and (iii) farmscaping.

The review concluded that:

- (i) Sustainability of farming systems and the issue of biodiversity involves interactions between insects, plants (weeds), soil and economics and, as such, research demands a co-ordinated effort between the disciplines.
- (ii) There is variability in patterns of biodiversity within similar farming systems; and there is a dearth of information available from the Northern Great Plains.
- (iii) Spatial heterogeneity of the agro-ecosystem can directly influence biodiversity. It is essential to characterize the landscape and habitat of study sites.
- (iv) If insects are to be used as indicators of agricultural sustainability, there needs to be an understanding of how farming systems influence the biotic diversity of insect fauna.

Biodiversity of plant hybrid zones: insects on eucalyptus and cottonwoods. K.D. Floate and T.G. Whitham, Agriculture Canada, Lethbridge, AB. Hybrid zones are not currently protected under federal conservation laws and it has been suggested that hybridization be discouraged to preserve species integrity. However, recent studies suggest that plant hybrid zones are centres of insect abundance and biodiversity. We review studies of insect assemblages in a hybrid zone and adjacent pure zones of *Eucalyptus amygdalina* and *E. risonii* in Tasmania, and in a hybrid zone and adjacent pure zones of cottonwoods (*Populus fremontii* and *P. angustifolia*) in the United States, both of which support a rationale for conserving plant hybrid zones. This issue is not inconsequential as hybridization is a global phenomenon involving numerous and diverse taxa, and may account for 30-80% of extant plant species.

Staphylinid Beetle Diversity in Alberta's Aspen Forests. Greg Pohl, Canadian Forest Services, Edmonton, AB. Staphylinid beetles were collected in pitfall traps in aspen forests at six locations in Alberta. Community variation within regions outweighed any variation between regions. At Lac La Biche, post harvest-age stands contained more unique species, and supported a more diverse staphylinid community, than stands of harvest age.

The arthropod biodiversity of *Populus* spp. coarse woody material. H.E.J. Hammond, Biological Sciences, U. Alberta, Edmonton, AB. Forest stands dominated by aspen and poplar form one of the largest biomes in western Canada. A large proportion of the biomass in these forests is composed of submerchantable timber and standing dead trees. This 'dead wood' habitat is often lost during forestry operations. The objectives of my study are to describe: the arthropod fauna associated with *Populus* dead wood, and to compare the beetle fauna between regions, stands of different age, decay of the wood, and sample type. Insects were collected using three methods: insect rearings from wood, modified window-traps attached to dead trees, and hand-collecting.

Based on preliminary data collected from the rearings, 8054 arthropods were reared, with the highest proportions represented by mites, flies and beetles. Of the 1400 beetle specimens collected, only 124 species are represented in the analysis. Using rarefaction estimates of species diversity, and cluster analysis of Bray-Curtis percent similarity, I found that: Lac la Biche has a more diverse beetle fauna than Eureka River, old stands have a more diverse fauna than mature stands, moderately decayed wood has a more diverse fauna than

minimal and advanced decayed wood, and snags have slightly more faunal diversity than logs. Future work will continue to focus on old and mature stands, but insect collections will expand into recently clear cut areas (< 2 years), and remnant woody material in young forest stands.

BTK impacts on non-target Lepidoptera of wetland gaps in the boreal forest. Michele Williamson, Biological Sciences, U. Alberta, Edmonton, AB. I investigated how aerial applications of *Bacillus thuringiensis* var. *kurstaki* (BTK) affected non-target Lepidoptera in wetland gaps. I (1) quantified the impact of BTK on Lepidoptera feeding on *Salix bebbiana* Sarg. and (2) studied the impact of BTK applications on parasitoids using lepidopteran hosts. These effects were quantified by sampling replicate gaps before and after spraying in the following treatment blocks: (a) 2 yrs. of successive aerial application of BTK, (b) 1 yr. of application, (c) 1 yr. application of only inert ingredients used with BTK, and (d) no treatment (control blocks).

(1) BTK affected several species of Lepidoptera found on *S. bebbiana* by branch and beat samples. A field experiment demonstrated increased mortality and hindered development for *Epinotia criddleana* (Kearfott) feeding on *S. bebbiana*. (2) No indirect BTK impacts were observed from numbers of pupal parasitoids emerged from larval *E. criddleana*.

Impacts of logging, soil compaction and organic matter removal on soil fauna in northern British Columbia: A component of the long-term soil productivity study. Jeffrey P. Battigelli, Biological Sciences, U. Alberta, Edmonton, AB. Soil fauna play important, catalytic roles in the forest soil ecosystem. Grazing on microbial biomass and detritus, they stimulate bacterial and fungal activity, aiding in forest litter decomposition and the release of important plant nutrients. Knowledge of the diversity and function of the soil fauna community in the Sub-Boreal Spruce Biogeoclimatic Zone is extremely limited. Both the short- and long-term effects of silvicultural practices on the soil fauna population are unknown, as are the resultant implication of these effects for nutrient cycling and soil fertility.

As a component of the Long-term Soil Productivity Study, sponsored by the British Columbia Ministry of Forests, my study will focus on the diversity and structure of the soil fauna community in the Sub-Boreal Spruce Zone in northern British Columbia. This will provide an opportunity to quantify the impact of logging, soil compaction and organic matter removal on the soil fauna population using a manipulative field experiment. The study will address site degradation, old-growth forest and biodiversity issues.

Three replicates of nine treatment plots each have been established in three forest regions (Prince George, Prince Rupert and Cariboo). Soil fauna sampling will occur three times (spring, summer and fall) during the first and second years post-treatment. Three methods will be used to extract soil fauna: High-Gradient extraction, Berlese Funnel extraction and pitfall traps. Specimens will be counted and identified to the order and family level. Oribatida (Acari) and Collembola will be identified to the species level. Canonical ordination analysis will be used to examine the relationship between organism distributions and soil chemical and physical properties.

This study will take full advantage of the multidisciplinary approach of the project and provide a better understanding of the structure and functioning of the entire forest soil ecosystem. This understanding will aid in developing guidelines to reduce silvicultural impacts on the soil fauna community and maintain long-term productivity.

Effects of sulphur pollution on biodiversity of carabids. Hector Cárcamo, Biological Sciences, U. Calgary, Calgary, AB. A pitfall trapping study was started in 1994 in a lodgepole pine forest in central south west Alberta to determine the potential effect of sulphur pollution on the soil fauna. Preliminary analysis suggests that observed species richness of carabid beetles and overall abundance are not affected by contamination. However, carabid assemblages in the severely impacted site had greater dominance, and therefore, lower species diversity than those assemblages under moderate or low regimes of sulphur contamination. The carabid prey specialist *Scaphinotus marginatus* was not collected in

pitfall traps placed less than a 100 m from a sulphur block. The effect of contamination from sour gas processing on this species needs to be tested experimentally.

The structure and evolution of tiger beetle mandibles: further jawings and some food for thought. **John H. Acorn and George E. Ball, Biological Sciences, U. Alberta, Edmonton, AB.** Structural interpretation of the mandibles of cicindelid beetles is problematic, despite previous studies on other carabid beetles (Acorn and Ball. 1991. Canadian Journal of Zoology. 69(3):638-650). The primary difficulty lies in determining homologies between apparently unique structures in the mandibles of cicindelids and structures already identified in the mandibles of other carabid adephagans. Our findings suggest that the most plesiotypic cicindelid mandibles belong, paradoxically, to the tropical, arboreal collyrine cicindelids, a group traditionally regarded as highly derived. In contrast, the mandibles of the generally carabid-like megacephaline cicindelids are markedly derived in structure. Based on these findings, we propose a system of terms for cicindelid mandible features, and a transformation series linking major mandible types.

Mitochondrial DNA variation in the *Pissodes strobi* species group (Coleoptera: Curculionidae) in western Canada. **David W. Langor, Canadian Forest Services, Edmonton, AB.** Four species of the *Pissodes strobi* species group are recorded from western Canada, including *P. strobi* (Peck), *P. terminalis* Hopping, *P. schwarzi* Hopkins, and *P. nemorensis* Germar. The species are difficult to discriminate among using morphological characters, but allozyme and chromosomal characters and ecological traits have limited discriminatory value. In this study, a 1585 bp segment of mitochondrial DNA (mtDNA), including half of the cytochrome oxidase I (COI) and all of the tRNA leucine and COII genes, was amplified using the polymerase chain reaction. Variation in mtDNA within and between all four species of *Pissodes* was sampled with restriction enzymes. Twenty-four haplotypes were found among the 121 maternal lineages surveyed. Haplotype distributions suggest intermediate levels of gene flow for each species. *Pissodes strobi* exhibited the highest genetic diversity. Inter-specific estimated sequence divergences ranged from 0% to 28.7%. Phylogenetic relationships among species were reconstructed using *P. affinis* Randall as an outgroup. *Pissodes terminalis* and *P. nemorensis* were the most closely related species, and this clade was most closely related to *P. strobi*, and *P. schwarzi* branches off below these three. Restriction site variation is sufficient to discriminate unambiguously among most species. However, *P. terminalis* and *P. nemorensis* haplotypes are very similar, which may result in difficulties in discriminating among these two species, using mtDNA characters, where their ranges putatively overlap in Manitoba. A diagnostic protocol using three restriction enzymes, BclI, Dra I, and Hinf I, is recommended.

The good, the bad, and the infected. **Susan Bjornson, Biological Sciences, U. Alberta, Edmonton, AB.** The predatory mite, *Phytoseiulus persimilis* Athias-Henriot, is used for the biological control of two-spotted spider mites on greenhouse ornamental and vegetable crops. Poor predation performance has led to the discovery of several potential pathogens, including a microsporidium, within *P. persimilis* tissues. Taxonomic identification of the microsporidium requires a description of the developmental stages and mature spore characteristics.

Insect pests of Saskatoon berries. **Lloyd Harris, Crop Protection, Regina, SK.**

Saskatoon berry, *Amelanchier alnifolia*, is native to the Canadian Prairies. Recently, there has been considerable interest in the cultivation of saskatoons as a horticultural crop. Several saskatoon orchards have been established. Approximately, 600 acres have been planted and growers are recognizing that insects and plant disease may be serious factors limiting the economic viability of the crop.

Eleven years of surveying native saskatoon berry stands for insects has provided a list of the insects most commonly associated with "saskatoons" and their relative importances as pests.

Of the more than 48 different species of insects and mites associated with saskatoons only the saskatoon bud moth, shadbush sawfly, hawthorn weevil, apple curculio, cherry stem borer, and wooly elm aphid appears to have a direct and serious impact on fruit production. The impact of the wood boring beetles on the health of the plants remains unknown. The biology of most of these insects appears to have been neglected and could provide an opportunity for additional research.

Management of Birch Leaf Miners in Northern Cities. Robin McQueen, Biological Sciences, U. Alberta, Edmonton, AB. Two species of leaf mining sawflies, *Fenusa pusilla* (Lepeletier) and *Profenusa thomsoni* (Konow) cause damage on birch trees in the City of Edmonton. The goal of my research is to develop a leaf miner management plan that meshes biological and horticultural control procedures. During the summer of 1994, I investigated the impact of adult dispersal on this type of plan. One experiment showed that *Fenusa pusilla* and *Profenusa thomsoni* can easily disperse 25-30 m, an important distance since urban birches are often only 25 m apart. Results from a mark-release-recapture experiment showed that *Profenusa thomsoni* adults are capable of dispersing over 100 m in 2 days and they can easily maneuver through a birch mosaic commonly found in urban neighborhoods. I concluded that the use of sticky traps to catch dispersing adults is a worthwhile addition to a birch leaf miner management plan.

Intraspecific competition in two exotic birch leafminers (Hymenoptera: Tenthredinidae) in Alberta. Scott Digweed, Biological Sciences, U. Alberta, Edmonton, AB. Two introduced birch-leafmining sawflies, *Fenusa pusilla* (Lepeletier) and *Profenusa thomsoni* (Konow), are quite separate temporally and spatially, but can compete intraspecifically for leaf resources. In *F. pusilla*, larval weight decreases with increasing larval density per leaf. Fitness effects of competition are therefore sought in size relationships of subsequent stages (i.e., overwintering prepupae and adults). In *P. thomsoni*, larval survivorship decreases with increasing larval density, indicating that the fitness effects of competition occur within the larval stage. However, contrary to expectation, adult *P. thomsoni* do not avoid oviposition on crowded leaves.

Variation in the pteridine content of tsetse fly heads. G. S. McIntyre and R. H. Gooding, Biological Sciences, U. Alberta, Edmonton, AB. The pteridine content of the head capsule of teneral flies from selected genetic lines (including eye colour mutants) of *Glossina morsitans morsitans* and *Glossina palpalis palpalis* was examined using fluorescence spectroscopy. Wild type *G. p. palpalis* exhibited greater pteridine content than wild type *G. m. morsitans*; this difference was related to duration of the puparial period rather than head capsule size. Within *G. m. morsitans* there was a 25% variation in fluorescence values between genetic lines. In comparison to conspecific wild type lines the *G. p. palpalis* mutants tan and brick had lower and the same pteridine content respectively, and the *G. m. morsitans* mutant salmon had higher pteridine content. Analysis of head capsule fluorescence in males from parental lines, F1s and F2s of reciprocal crosses of the *G. m. morsitans* lines with the highest and lowest pteridine content revealed that genetic control of pteridine content lies on the X chromosome and on one autosome.

Presence of Ecdysteroid Receptor in the Salivary Gland of the Tick *Amblyomma hebraeum*. Helen Mao and Reuben Kaufman, Biological Sciences, U. Alberta, Edmonton, AB. The salivary glands of the ixodid female tick, *Amblyomma hebraeum*, are responsible for excreting excess fluid from the blood meal back to the host. Within 3-4 days following engorgement, the salivary glands degenerate. This degeneration is controlled by an ecdysteroid hormone (Harris and Kaufman, 1981; 1985). This study was designed to detect an ecdysteroid receptor in the salivary glands of partially-fed female ticks by a radiolabeled ligand binding assay. The data demonstrate that ^3H -ponasterone A bind to a protein with high affinity ($K_d \approx 1 \text{ nM}$) and limited capacity ($B_{\text{max}} \approx 130 \text{ fmol/mg protein}$). Competition for this binding by unlabeled ecdysteroids demonstrates the following order of affinity for the receptor: ponasterone A = muristerone A > 20-hydroxyecdysone = muristerone A =

mesylinokosterone > ecdysone. Vertebrate steroids have no affinity for the ecdysteroid receptor. These results strongly suggest that the physiological action of ecdysteroids on the salivary glands is mediated by a specific receptor.

References:

- Harris, R.A. and Kaufman, W.R. (1981) Hormonal control of salivary gland degeneration in the ixodid tick *Amblyomma hebraeum*. *J. Insect Physiol.* **27**: 241-243.
- Harris, R.A. and Kaufman, W.R. (1985) Ecdysteroids: possible candidates for the hormone which triggers salivary gland degeneration in the ixodid tick *Amblyomma hebraeum*. *Experientia* **41**: 740-742.

Cluster flies (*Pollenia rudis* F) -- a frustrating pests of southern Alberta. Allan Schaaf, Big Horn Pest Control, Lethbridge, AB. Abstract was not submitted.

Incidence of Alfalfa seed chalcid injury in Saskatchewan. Julie Soroka, Agriculture Canada, Saskatoon, SK. The alfalfa seed chalcid, *Bruchophagus rodii* (Guss.), is a cosmopolitan pest of alfalfa seed production. Females oviposit in developing alfalfa seeds; these are destroyed when larvae feed upon them. Yield losses as high as 85% due to chalcid feeding have been reported. A four year survey of alfalfa seed fields in the province was undertaken to determine the incidence of alfalfa seed chalcid, and to investigate management practices and other factors which could influence infestation levels of the pest. The survey included a total of 119 samples from commercial seed fields, hay fields, and roadsides. From each sample 250 pods were randomly selected, and the numbers of healthy and chalcid-infested pods were recorded. In subsequent interviews, producers were asked about seeding, fertilizing, pest control, and other agronomic practices which could have influenced infestation levels.

The year strongly affected infestation levels, with the average number of infested seeds per 250 pods being 30.3, 24.8, 30.0 and 12.2 in 1990 to 1993, respectively. Over the four years seed losses from commercial fields averaged 4%, but ranged as high as 20% in one field near Zenon Park. There were no significant differences in the numbers of healthy or chalcid-infested seeds among seed field, hay field, or roadside samples. Likewise, size of field, age of stand, use or non-use of insecticides to control other insect pests, and use of irrigation had no significant effect on number of chalcids per 250 pods, although the number of healthy seeds was influenced by age of stand. The use of harvest residue burning, reported in the literature as an effective management tool, could not be tested because of an insufficient number of burned fields. It appears that alfalfa seed chalcid is ubiquitous throughout the province, the principal limiting factors being weather-related.

The Effect of Host Plant Species and Cultivar on Developmental Parameters of Diamondback Moth, *Plutella xylostella*. L.M. Dosdall, N.T. Cowle, and T.M. Micklich, Alberta Environmental Centre, Vegreville, AB. Developmental parameters of diamondback moth, *Plutella xylostella* (L.), were determined for larvae reared on excised and intact leaf tissue of two cultivars of each of four species of Cruciferae: *Brassica rapa* L. cvs. Tobin and Colt, *Brassica napus* L. cvs. Alto and Legend, *Brassica juncea* (L.) cvs. Domo and Cutlass, and *Sinapis alba* L. cvs. Ochre and Tilney. Developmental time from egg to fourth-instar larva did not differ significantly among species or cultivars for either males or females; however, significant differences were observed among cultivars of Cruciferae in developmental time from egg to pupa of *P. xylostella*. For both males and females, developmental time to pupa was shortest for specimens reared on intact tissue of *B. napus* cv. Alto and *B. juncea* cv. Domo. Moreover, weights of pupae reared on these hosts were greater, and adult emergence was more rapid than that for other species or cultivars of Cruciferae. In general, differences in developmental parameters were greater for specimens reared on intact host plant tissue than on excised tissue, and differences among cultivars within species were greater than differences between cruciferous species. Of the parameters measured in the study, greatest variability occurred in egg production. Egg production was generally less variable for specimens reared on excised tissue than on intact tissue, and

fewest eggs were produced by specimens reared on intact tissue of the two cultivars of *B. juncea*.

A status report on Wheat Midge (*Sitodiplosis mosellana*) infestations in Saskatchewan. O. Olfert, M. Braun, L. Harris and S. Hartley, Agriculture Canada, Saskatoon, SK & Crop Protection, Regina, SK. The orange wheat blossom midge is a dipterous insect belonging to the family Cecidomyiidae. Cecidomyiids are a notorious insect family, species of which can be found damaging most cultivated plants. Wheat midge, like its relative the Hessian fly, is an introduced pest species.

The orange wheat blossom midge was first reported as a pest in this province in 1983 when a severe outbreak in NE Saskatchewan caused an estimated \$30 million loss in wheat yield. In the last 10 years, the pest population has gradually spread to the south and west into the area well below the parkland. In 1993, wheat midge infested approximately 12 million ha, primarily in the area north of a diagonal line running from the southeast corner of the province through North Battleford.

The life cycle of wheat midge is closely synchronized with the phenology of spring-seeded wheat. Wheat is the primary host plant of the midge, most other crops, including barley and oats, are not susceptible to midge. Wheat fields can be monitored during the susceptible period (emergence of head from the boot) by observing adult midge activity in the crop during the calm evenings. If, on average, more than one adult midge is seen per four to five wheat heads then an insecticide spray is recommended. Forecast maps are developed from soil samples collected in September. The intent of the map is to identify areas within the province that are at risk to damage caused by wheat midge. Significant damage and economic losses can occur in spring wheat when midge densities reach 600 cocoons per square metre. In areas where the density of wheat midge exceed 1200 per square metre grower's should seriously consider not growing wheat in 1994.

Seasonal biology of barley thrips, *Limothrips denticornis* L., in perennial grasses and cereals. Michi Okuda. Abstract was not submitted.

Comparison of *Altica* spp. consumption of Canada thistle leaf disks using image analysis. R. DeClerck-Floate, E. Kokko, and F. Leggett, Agriculture Canada, Lethbridge, AB. Image analysis of fresh leaf disks was useful in comparing consumption by the leaf beetles, *Altica cirsicola* and *A. carduorum*; the former being considered for Canada thistle biocontrol. Quantification of eaten leaf material through image analysis was objective, precise and rapid. *Altica cirsicola* had a greater rate of leaf consumption.

How do tropical dragonflies avoid spates? Gordon Pritchard, Biological Sciences, U. Calgary, Calgary, AB. The life history of *Cora marina* (Odonata:Polythoridae) in a permanent stream in NW Costa Rica is univoltine. Water temperature is 21 C year-round. The start of adult emergence is synchronous with the beginning of the 6-month wet season, and adults continue to emerge through the wet season. Eggs are laid into fallen logs above the water and newly-hatched larvae first appear 2-3 months later. Larval growth is very slow during the wet season but increases as the dry season commences. It is possible that slow larval growth is more apparent than real, as larvae are washed downstream by wet season spates; alternatively, larvae may be buried in the hyporheos where food is in short supply. The non-appearance of adults before the wet season suggests regulation of larval growth, but neither the mechanism nor the reason for this synchrony are known.

Aquatic invertebrates in groundwater wells, Kananaskis Country. Richard Casey, Lloyd Dosdall, and Gary Byrtus, Alberta Environmental Centre, Vegreville, Alberta & Alberta Environmental Protection, Edmonton, AB. This paper presents a summary of aquatic invertebrates that were sampled from groundwater monitoring wells. The samples were part of a surface water and groundwater monitoring program conducted at seven golf courses south and west of Calgary. Aquatic invertebrates were found in this hyporheic habitat at three of the golf courses, and >90% of the organisms were found in the wells at the

Kananaskis Country Golf Course. The Kananaskis wells were 30-80 m from the closest streams, Kananaskis River and Evan Thomas Creek. Depth of the wells below the ground surface was 3-10 m, and the average depth to the water level in wells was 2-7 m. We also collected kick-samples from the closest flowing water habitats to determine if the surface water fauna was the same as the groundwater. The invertebrates in the groundwater wells included a large range of arthropods and other invertebrate taxa including a total of eight families belonging to the Plecoptera, Ephemeroptera, and Diptera orders, Hydracarina, Crustacea (Cyclopoida and Amphipoda), Oligochaeta, Polychaeta, and Turbellaria (Polycelis coronata). Most of these taxa were typical of the nearby streams with three exceptions: a new genus of Athericidae (Diptera), two new species of an eyeless subterranean crustacean (*Stygobromus*), and a new species of a subterranean *Polychaeta* (Nerillidae) worm. The significance of these results will be discussed.

Body size and breeding biology in bark beetles. **Mary L. Reid, Biological Sciences, U. Calgary, Calgary, AB.** Bark beetles (Coleoptera: Scolytidae) are notable for their aggregation behaviour and prolonged parental care. However, average fitness is reduced from joining others. One hypothesis for these unusual features is that breeding sites are difficult to find. If so, we expect differences in aggregation and parenting behaviour among beetles of different body size, as smaller beetles have poorer dispersal abilities and are less likely to find uncolonized habitats. As predicted, I found that individuals arriving later in the colonizing process were smaller in both *Ips pini* and *Ips latidens*. In addition, smaller male *Ips pini* remained longer with their mates and brood before seeking new breeding opportunities, as expected if their dispersal prospects were worse than larger males. Thus, the scarcity of breeding habitat for bark beetles may be key to understanding their breeding biology.

Distinguishing categories of hybridizing plants by their associated insects: tests and considerations. **K.D. Floate, T.G. Whitham, G.W. Fernandes, and J.A. Nilsson, Agriculture Canada, Lethbridge, AB.** Discriminant analyses of associated insects can be used to segregate sympatric categories of hybrid plants from one another and their parental species. This was demonstrated with an accuracy of 99% and 98% in hybrid zones of rabbitbrush (*Chroothamnus*) and cottonwood (*Populus*), respectively. Considerations for the application of this method are discussed.

Are foraging bumble bees really little elephants? **Ralph V. Cartar and Mark V. Abrahams, Department of Zoology, U. Manitoba, Winnipeg, MB.** Foraging organisms typically face complex environments which vary in their degree of temporal and spatial autocorrelation (AC). To maximize fitness, they must integrate recent experience to influence present behavior in a manner appropriate to environmental scale. We studied the patch departure decisions of confined worker bumble bees (*Bombus occidentalis*) foraging on artificial 2-flower inflorescences. The environment contained strong spatial AC within inflorescences, but lacked spatial AC among inflorescences. As expected for such an environment, a bee's decision of whether to leave an inflorescence after a single flower visit usually depended only on her most recent experience (present flower, or present plus last visit). Hence, assuming that elephants have long memory windows, these bees ain't little elephants. This result helps resolve conflicting results in the foraging literature.

The Midgut Connective Tissue As A Barrier To Pathogen Invasion. **B. Andrew Keddie, Biological Sciences, U. Alberta, Edmonton, AB.** Lepidopteran midgut connective tissue, in this case defined as all the tissue found underlying and supporting the midgut epithelial layer, can form a substantial physical barrier to pathogen invasion. In older larvae circular muscles are distributed in almost a continuous sheet so that pathogens such as baculoviruses would be intercepted by this layer before entering the hemocoel. Since these viruses are not known to pass directly through a cell before replication, entry into the hemocoel (or other midgut associated tissues) is delayed by this replication requirement. In older larvae this delay may be sufficient to prevent the disseminated infection required to kill

an insect. In younger larvae the less complex connective tissue is less likely to intercept virus and the rate of dissemination and therefore mortality is increased. These observations help to explain the reduced susceptibility of older larvae to baculoviruses, that is, the presence of a more substantial midgut connective tissue in older larvae delays the systemic spread of virus and permits their development to adults.

Enhancement of bertha armyworm baculovirus activity by a fluorescent brightener compound. Martin Erlandson and Keith Moore, Agriculture Canada, Saskatoon, SK.

A series of nuclear polyhedrosis virus (NPV) strains have previously been isolated from bertha armyworm, *Mamestra configurata*, populations in Alberta and Saskatchewan. A number of these McNPV strains have been identified as potential biological control agents of bertha armyworm. A series of bioassays were run to determine the efficacy of a fluorescent brightener compound (Calcofluor white M2R) to enhance the virulence of one of these strains (McNPV-86/1). Incorporation of 1% fluorescent brightener with virus doses reduced the LD50 values, on day 10 post-inoculation for second-instar larvae in droplet-feeding assays, from 235.5 virus polyhedral inclusion bodies (PIBs) per larva to 2.0 PIBs/larva. Similarly, in diet surface and canola foliage contamination assays the incorporation of 1% fluorescent brightener reduced the LD50 values for McNPV-86/1 virus by a factor of 50 to 250 times. As well, the time lag between oral inoculation of larvae with virus PIBs and mortality was reduced. Lethal times for 50% mortality were reduced from 10.5 days to 6.5 days post-inoculation with the incorporation of 1% fluorescent brightener in droplet-feeding assays with second-instar bertha armyworm larvae. Although the mode of action of fluorescent brightener enhancement of NPV infection was not investigated in detail, the use of TCID50 assays with insect cell cultures detected high titres of McNPV-86/1 virus in larval hemolymph on day 2 post-inoculation for larvae infected with virus-brightener compound combinations compared to day 4 post-inoculation for larvae infected with virus alone. The results indicate the potential of fluorescent brightener compounds to enhance the virulence of McNPV in bertha armyworm larvae by reducing the amount of virus required to produce mortality and shortening the time required to produce mortality.

"China-white" disease of the army cutworm, *Euxoa auxiliaris*. Bob Byers, Agriculture Canada, Lethbridge, AB. The army cutworm was abundant in southern Alberta from 1990 to 1992 and caused significant crop damage, especially in the spring of 1990. Several thousand cutworms were collected from infested fields and reared to determine the incidence of parasitism and disease. Although the rate of parasitism was usually high, ranging from 19 to 88% (mean of samples was 59%), the incidence of definitive disease was low. The only consistently recognizable disease, with an incidence of 0 to 3%, was one that caused mature larvae to become opaque-white, turgid and inactive. Infected larvae remained alive for one to several weeks before turning brownish-black, often in a mosaic pattern. Electron microscopic examination of tissues and hemolymph of diseased larvae revealed that the causative agent was a cytoplasmic granulosis virus, and that most larvae were also sparsely infected with a microsporidium. In the laboratory, cutworms of several species could be readily infected with inoculum from diseased field collected army cutworms. However, after several passages the microsporidium became predominant and hindered further investigation.

The Australian Biological Resources Study (ABRS) is an agency charged with cataloguing all the animals and plants of Australia. Robin Leech, NAIT, Edmonton, AB.

It is funding, or has co-funded such works as the Flora of Australia (over 50 volumes) and the Fauna of Australia (over 60 volumes). In order to do this, it funds research on selected faunal or floral groups. From Canada, one can access ABRS on e-mail by using the gopher program. On the main e-mail menu, highlight CWIS, then the CWIS Systems; highlight PACIFIC, then Australian National Botanic Gardens; highlight Australian Biological Resources Study, then The Participatory Program Grant Scheme. Once one is at The Participatory Program Grant Scheme, one is there explore. Good Luck.

ENTOMOLOGICAL SOCIETY OF ALBERTA

MINUTES OF THE EXECUTIVE MEETING

Green Gables Inn, Canmore, Alberta
27 October 1994

Attendees:

Jim Jones, Alec McClay, Lloyd Dosdall, Andrew Keddie, David Langor.

1. **Call to order**

The meeting was called to order at 4.10 PM by President Alec McClay.

2. **Adoption of agenda**

MOTION: Keddie/Jones; That the amended agenda be adopted. CARRIED.

3. **Approval of minutes of previous Executive Meeting (19 April 1994)**

MOTION: Langor/Keddie; That the minutes of the Executive Meeting be adopted. CARRIED.

4. **Reports**

i) Treasurer's Report - Jim Jones

Jim Jones reported that as of 20 October 1994, the total credits of the ESA were \$16,588.17. This figure includes three outstanding cheques for a total of \$125.20, which have been issued but not yet cashed.

MOTION: Jones/Langor; That the Treasurer's Report be accepted. CARRIED.

There was some discussion by members on possible ways the Society could spend its assets including: 1) paying for the travel expenses of the Regional Director to attend the meetings of the Entomological Society of Canada; 2) providing a lump-sum payment to the ESC to help reduce its operating deficit; 3) improving the affordability of the next joint ESA/ESC meeting by lowering registration fees; and 4) making funds available to students to attend the ESA meetings.

ii) Editor's Report - David Langor

David Langor reported that copies of the Proceedings of the 1993 meeting of the Entomological Society of Alberta were mailed out in September. Additional copies will be distributed during the 1994 meeting. The total cost was less than \$500.00. The greatest time requirement in producing the Proceedings was for typing the copy, and it would be preferred in the future that members submit reports and abstracts in electronic format. Jack Scott was hired to produce the photographic plates.

MOTION: Langor/Keddie; That the Editor's Report be accepted. CARRIED.

In the discussion that followed, it was agreed that in the future the Society's by-laws should be included in the Proceedings (as they were several years ago).

iii) Report of the Regional Director to the ESC - Bev Mitchell

Alec McClay relayed a report to the Executive on behalf of Bev Mitchell which focused mainly on the topic of animal rights and its implications for conducting entomological research. He noted that there is a need for entomologists to be better informed in this regard and to channel helpful information to our national society.

MOTION: Keddie/Jones; That the Regional Director's Report be accepted. CARRIED.

iv) Secretary's Report - Lloyd Dosdall

Lloyd Dosdall reported that the ESA minutes were taken and distributed, and that meeting notices were mailed out with the assistance of Jim Jones and Nancy Cowle. Based on the small number of returned notices, it appears that the ESA mailing list is reasonably accurate.

MOTION: Dosdall/Jones; That the Secretary's report be accepted. CARRIED.

5. Business Arising from the Executive Meeting of April 19, 1994

Jim Jones reported that he had not yet consulted with Consumer and Corporate Affairs to ensure that our Society has met its requirements; however, he reported that our current Certificate of Revival was dated 6 October 1993 and suggested that this is the probable date for renewal of our status. Jim indicated that he would contact Consumer and Corporate Affairs in the near future.

Alec McClay reported that he had not yet undertaken a re-evaluation of policy for student scholarships and prizes with the Awards Committee, but that this would be completed before his term of office ends.

6. New Business

i) Publishing Costs of the ESA Proceedings

Andrew Keddle reported that he has compiled eight complete sets of the Proceedings for the period 1983 to 1992 inclusive. In the past, these have been bound in 10-year intervals with a binding cost of approximately \$10 to \$15 per copy.

MOTION: Keddle/Jones; That five sets of the ESA Proceedings be bound, and distributed to the ESA Archives (1 copy), the University of Calgary Library (1 copy), the University of Alberta Cameron Library (1 copy), the Department of Biological Sciences Strickland Library (1 copy) and the Alberta Environmental Centre Library (1 copy). CARRIED.

ii) ESA Archivist

Alec McClay reported that the Society's by-laws should be changed to indicate that the archives have been relocated from the University of Alberta to the Agriculture Canada Research Station in Lethbridge. It was agreed that an amendment to the by-laws should be drafted by the ESA Executive at their next meeting.

iii) Joint Meeting of the Entomological Societies of Alberta and Canada, 1997

Alec McClay reported that various convention facilities had been checked in downtown Edmonton and that the Crown Plaza (formerly the Chateau Lacombe) has been booked for the Joint Meeting of the Entomological Societies of Alberta and Canada from October 4-8, 1997. Alec also reported that Bev Mitchell will not head up the Organizing Committee for the national meeting and that a replacement person should be chosen. David Langor agreed to serve as Local Arrangements Chair if no other volunteer was found, and Tim Lysyk will serve as Chair of the Scientific Program Committee.

iv) Grants for Student Travel

It was agreed that Andrew Keddle would present a motion at the Annual Meeting proposing that the ESA allocate up to \$500 per year in support of student travel expenses to the ESA annual meeting. This amount represents the approximate annual investment income of the ESA. Applications would be forwarded to the ESA President and evaluated by the Executive.

v) Executive Elections

Alec McClay stated that the positions of Vice President, Regional Director for Southern Alberta, Editor, and Auditor were vacant. The Executive Committee agreed that rather than presenting a slate of candidates at the Annual Meeting it would be more appropriate to solicit

nominations from the floor. However, the Executive would still attempt to identify suitable candidates prior to the Annual Meeting.

vi) ESA Annual Meeting, 1995

The Executive discussed various sites for the 1995 Annual Meeting in "northern" Alberta, including Red Deer, Edmonton, and Rocky Mountain House. It was proposed that the meeting be held in Edmonton; David Langor and Andrew Keddie will be in charge of local arrangements, and Lloyd Dossall and Alec McClay will develop the scientific program.

7. Adjournment

MOTION: Langor/Keddie: That the meeting adjourn. CARRIED.

ENTOMOLOGICAL SOCIETY OF ALBERTA

MINUTES OF THE ANNUAL MEETING

Green Gables Inn, Canmore, Alberta
29 October 1994

1. Call to order

The Meeting was called to order at 11:45 AM by President Alec McClay.

2. Adoption of agenda

MOTION: Pohl/Keddie; That the amended agenda be adopted. CARRIED.

3. Approval of minutes of previous Annual Meeting (16 October 1993)

MOTION: Jones/Dolinski; That the minutes from the 1993 Annual Meeting be adopted. CARRIED.

4. Reports

i) Treasurer's Report - Jim Jones

Jim Jones reported that as of 20 October 1994, the total credits of the ESA were \$16,588.17. This figure includes three outstanding cheques that total \$125.20, which were issued but not yet cashed. The relatively low interest rate on the term deposit was discussed. Jim Jones pointed out that although the term was only 60 days, it gave flexibility in moving the funds if necessary. The Treasurer agreed to investigate whether it was possible to invest in a flexible account with a greater interest rate.

MOTION: Jones/Leech; That the Treasurer's Report be accepted. CARRIED.

ii) Editor's Report - David Langor

On behalf of David Langor, Alec McClay reported that the Proceedings of the 1993 ESA meeting were mailed out in September, and additional copies were distributed during the 1994 meeting. The total cost was less than \$500.00. The greatest time requirement in producing the Proceedings was in typing the copy, and in the future it would be preferred in the future that members submit reports and abstracts in electronic format.

MOTION: Leech/Jones; That the Editor's Report be accepted. CARRIED.

iii) Report of the Regional Director to the ESC - Bev Mitchell

Alec McClay reported on behalf of Bev Mitchell. President Safranyik will be appointing an ad hoc committee to consider how the ESC should change its manner of conducting business in order to operate within the resources of a Society with 400 members rather than

nearly 1000 members as had existed previously. The book entitled *Diseases and Pests of Vegetable Crops in Canada* has been published jointly by the ESC and the Canadian Phytopathological Society. It is hoped that sales of the book will help improve the Society's cash flow difficulties and reduce the short-term debt incurred by undertaking the project. There is concern by some ESC members regarding proposed legislation affecting numerous aspects of biodiversity and species protection. For example, there is proposed legislation to limit the movement of insect specimens in the postal service and this could hamper many aspects of entomological research. Members should contact Steve Marshall for more details on this issue and to offer assistance in combating regressive legislation.

MOTION: Pohl/Declerck-Floate; That the Regional Director's Report be accepted. CARRIED.

iv) Secretary's Report - Lloyd Dosdall

Lloyd Dosdall reported that the ESA minutes were taken and distributed, and that meeting notices were mailed out with the assistance of Jim Jones and Nancy Cowle. Based on the small number of returned notices, it appears that the ESA mailing list is reasonably accurate.

MOTION: Dosdall/Keddie; That the Secretary's report be accepted. CARRIED.

v) Report of Working Group to Investigate the Use of Insects in Elementary Education - Bev Mitchell

On behalf of Bev Mitchell, Alec McClay reported that the Working Group held discussions with teachers and school board representatives and identified two major problems with improving the use of insects in elementary education: 1) difficulties in supply of insects on a province-wide basis, and 2) budget constraints in education that have left teachers with little time and no resources to move into the areas the Working Group first envisaged. However, the "Bug Room" at the Provincial Museum of Alberta and the "Butterfly House" at the Devonian Botanic Garden have attracted large numbers of elementary students. Many ESA members routinely visit classrooms to augment science curricula. It was recommended that the Working Group be disbanded, at least temporarily.

Mike Dolinski added that in general teachers felt that it was too difficult to cope with any added responsibilities, and that the killing of insects was unacceptable. He also pointed out that Terry Thormin of the Provincial Museum has initiated an "Entomology Club" with a newsletter. Financial constraints have hampered rapid progress in developing the club, but the ESA will be contacted in the future to provide some financial assistance.

MOTION: Leech/Griffiths; That the Working Group to Investigate the Use of Insects in Elementary Education be disbanded. CARRIED.

vi) Development of Educational Modules in Integrated Pest Management - Mike Dolinski

Mike Dolinski reported that two educational modules, at about the Grade 6 level, are being developed on the topics of integrated pest management and environmental toxicology. The modules are being produced by Alberta Environmental Protection and the Department of Education with the financial support of the Pest Management Alternatives Office. The opportunity exists for the ESA to contribute financially to this project and to gain recognition for this contribution.

Robin Leech and Jim Jones volunteered to assist with editing the IPM module.

MOTION: Dolinski/Jones; That the ESA support, to a maximum of \$1,000.00, development of an educational module in integrated pest management. The full proposal for funding will be forwarded later this year to the Executive Committee for evaluation and approval, and will include project objectives and financial requirements. CARRIED.

vii) President's Report - Alec McClay

Alec McClay welcomed members of the Entomological Society of Saskatchewan to the joint meeting in Canmore, and thanked Hector Cárcamo and Gordon Pritchard for their efforts in organizing the meeting. Alec also thanked members of the ESA Executive for their work during the year. Alec reported that the Executive met earlier in the year to initiate planning for the joint meeting with the Entomological Society of Canada to be held in 1997. The joint meeting will be held in Edmonton's Holiday Inn Crowne Plaza on October 4-8, 1997 and all members of the Society were encouraged to participate in the planning of the joint meeting. Alec expressed appreciation to ESA members actively involved with increasing public awareness and interest in entomology. Alec congratulated Society members who received recognition at the Annual Meeting of the Entomological Society of Canada in Winnipeg, including George Ball and Joe Shemanchuk who were made Honorary Members, Bob Byers who became a Fellow of the Entomological Society of Canada, and Scott Digweed, winner of the student paper competition.

5. Reports of Standing Committees

i) 1994 Annual Meeting Organizing Committee - Gordon Pritchard

Gordon Pritchard reported that there were approximately 55 registrants for the meeting and 31 scientific papers were presented. The keynote address was given by Henk Wolda and the topic of the meeting symposium was "Human Activities and Biodiversity of Arthropods". John Acorn delivered the after-dinner address at the banquet.

MOTION: Pritchard/Leech; That the Report of the Organizing Committee be accepted. CARRIED.

ii) Resolutions Committee - Jim Jones

Jim Jones presented the following resolutions:

Whereas the Organizing Committee has done a splendid job of putting together an interesting and informative meeting,

Therefore, be it resolved that the membership of the Entomological Society of Alberta offer its thanks to the Organizing Committee as a whole, and particularly to Gordon Pritchard and Hector Cárcamo.

Whereas the theme of the 1993 meeting, "Insect Biodiversity" was well-received, and whereas the symposium's success hinges on the keynote speaker's address,

Therefore, be it resolved that the Society send a letter of appreciation to Dr. Wolda.

Whereas the members and guests attending the post-banquet presentation on butterflies were treated to an informative and humorous presentation by John Acorn, Therefore be it resolved that the Society send a letter of appreciation to Mr. John Acorn.

MOTION: Jones/Williamson; That the resolutions be accepted. CARRIED.

6. Business Arising from the Annual Meeting of 16 October 1993

i) Insect Collections Committee

MOTION: Pohl/Griffiths; That the Insect Collections Committee be discontinued, and that the provision for maintaining an Insect Collections Committee be struck from the by-laws of the Entomological Society of Alberta. CARRIED.

ii) Report on the status of the Insect Collector's Guide - Tim Lysyk

Lloyd Dosdall reported on behalf of Tim Lysyk that the Guide has now been entered in electronic format, and that minor revisions remain to be completed. A draft will be available soon for circulation to ESA members.

MOTION: Leech/Keddie; That the report be accepted. CARRIED.

7. New business

i) **Student Travel Awards**

MOTION: Keddie/Williamson; That the Entomological Society of Alberta shall allocate up to \$500 per year to be awarded to graduate or undergraduate students to support attendance at the annual meeting of the Entomological Society of Alberta. Applications for awards shall be submitted to the ESA President by September 15, prior to the Annual Meeting. Applications will be evaluated for approval by the Executive of the ESA. CARRIED.

ii) **1995 Annual Meeting**

MOTION: Leech/Cowle; That Edmonton be the site for the 1995 Annual Meeting of the Entomological Society of Alberta. CARRIED.

David Langor and Andrew Keddie will be in charge of local arrangements, and Lloyd Dosdall and Alec McClay will develop the scientific program.

iii) **ESA Co-funding of Organic Growers Video**

MOTION: Okuda/Griffiths; That the ESA co-fund a video production being undertaken by Michi Okuda on organic field and vegetable crop production to the amount of \$2000.

Discussion on the motion focused on the entomological content of the video, the need to provide more details to members before a decision regarding funding could be made, and the need to have clearly established protocols for such proposals.

MOTION: Griffiths/Williamson; That the motion be tabled, and that the Executive Committee should develop a systematic approach for granting funding assistance for such proposals. CARRIED.

iv) **Elections of Officers**

The following positions were filled:

Regional Director for Southern Alberta - Rosemarie Declerck-Floate
 Editor - Michele Williamson
 Vice-President - Kevin Floate
 Auditor - Greg Pohl

8. Adjournment

MOTION: Leech/Floate; That the meeting adjourn. CARRIED.

Entomological Society of Alberta
FINANCIAL STATEMENT
 To 31 December 1993

| | |
|--|-----------------------|
| Bank assets, 1 January 1994: | \$16,980.88 |
| Bank drafts minus Assets from Edmonton | <u>\$76.97</u> |
| Total | \$17,057.85 |

CREDITS

MEMBERSHIPS:

| | | | |
|-------------------|--------------------|-------------|-----------|
| Regular | 1995: 25 @ \$10.00 | 250.00 | |
| | 1994: 17 @ \$10.00 | 170.00 | |
| | 1993: 3 @ \$10.00 | 30.00 | |
| | 1992: 0 @ \$10.00 | 0.00 | |
| | 1991: 0 @ \$10.00 | 0.00 | |
| Student | 1995: 9 @ % 5.00 | 45.00 | |
| | 1994: 1 @ \$ 5.00 | 5.00 | |
| | 1993: 0 @ \$ 5.00 | 0.00 | |
| | 1992: 0 @ \$ 5.00 | 0.00 | |
| Corporate | | 10.53 | |
| Currency exchange | | <u>6.18</u> | |
| Total memberships | | 516.71 | \$ 516.71 |

INTEREST:

| | | |
|---|--------------|-----------|
| Term deposit (60-day) interest paid | 183.34 | |
| Term deposit (6-month) interest paid | 329.81 | |
| Community account interest paid, Brooks | 19.12 | |
| Term Deposits interest paid, Edmonton | <u>12.13</u> | |
| Total interest | 544.40 | \$ 544.40 |

ANNUAL MEETING 1994:

| | | | |
|---------------------|-----------|----------|-------------|
| Registrations | | | |
| | @ \$15.00 | 555.00 | |
| | @ \$25.00 | 225.00 | |
| | @ \$35.00 | NA | |
| Banquet tickets | @ \$25.00 | 1,150.00 | |
| Total registrations | | 1,930.00 | \$ 1,930.00 |

Total Revenue **\$ 3,073.55**

EXPENDITURES**MEETING EXPENSES:**

| | |
|-----------------------------------|----------|
| Annual Meeting | |
| Banquet charges & keynote speaker | 2,522.68 |
| Executive Meetings | |
| Travel, Parking etc. | 153.45 |

PROCEEDINGS:

| | |
|---------------------------------|--------|
| Proceedings duplication charges | 408.95 |
|---------------------------------|--------|

POSTAGE & MAILING CHARGES:

| | |
|---|--------|
| Meeting notices & general mail to members | 173.78 |
|---|--------|

PHOTOGRAPHIC SERVICES

| | |
|--|--------|
| Film & processing for the 1993 Proceedings | 109.33 |
| Film & processing for the 1994 Proceedings | 136.81 |

BANK CHARGES

| | |
|-----------------------------|-------|
| Community Account, Brooks | 10.00 |
| Community Account, Edmonton | 7.05 |

CORPORATE SERVICES

| | |
|------------------------|-------|
| Society Annual Returns | 16.00 |
| Cash Float | 0.00 |

| | |
|---------------------------|--------------------|
| Total Expenditures | \$ 3,538.85 |
|---------------------------|--------------------|

BALANCE SUMMARY

| | |
|-------------------|-----------------|
| Assets & Revenues | 20,131.40 |
| Expenditures | <u>3,538.05</u> |
| Balance | 16,593.35 |

[This financial statement was prepared by Jim Jones, Treasurer]

ENTOMOLOGICAL SOCIETY OF ALBERTA MEMBERSHIP LIST

(Revised: September 1994)

Honorary Members:

CARR, John L. 24 Dalrymple Green N.W., Calgary, AB, T3A 1Y2, (Res.) 288-4634.
GURBA, Joseph B. 9415 - 144 St., Edmonton, AB, T5R 0R8, (Res.) 452-6752.
GUSHUL, Evan T. 1714 - 15 Ave. South, Lethbridge, AB, T1K 0W9, (Res.) 328-2426.
JACOBSEN, Larry A. 1011 - 14 St. South, Lethbridge, AB, T1H 2W3, (Res.) 327-3754.
LARSON, Ruby I. 2503 - 12 Ave. South, Lethbridge, AB, T1K 0P4, (Res.) 327-2089.
NELSON, W.A. (Bill) 1030 Fern Crescent, Lethbridge, AB, T1K 2W3, (Res.) 327-4736.

Regular Members:

ACORN, John 15714 - 86 Ave., Edmonton, AB, T5R 4C4, (Res.) 488-1080.
BALL, George E. see address #1, (Res.) 483-4951, (Bus.) 492-2084, (Fax.) 492-9234.
BALL, Kay 8108 - 138 St., Edmonton, AB, T5R 0C9, (Res.) 483-4951.
BARR, Bill B. 11588 - 80 Ave., Edmonton, AB, T6G 0R9.
BATTIGELLI, Jeff see address #1, (Bus.) 492-4652, (E-Mail) jlbattige@gpu.srv.ualberta.ca
BJORNSON, Susan see address #1, (Res.) 436-5649, (Bus.) 492-3080, (Fax) 492-9234. (E-Mail) sbjornso@gpu.srv.ualberta.ca
BRANDT, J. see address #4, (Res.) 471-0947, (Bus.) 435-7326, (Fax) 435-7359
BRANDT, R. see address #2, (Bus.) 327-4561, (Fax) 382-3156.
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Library Members: Paid Subscriptions:

British Museum of Natural History, Acquisitions Section, Department of Library Services,
Cromwell Road, London, U.K. SW7 5BD.
Colorado State University Libraries, Serials Section, Fort Collins, Colorado, U.S.A.
80523.
D.H. Hill Library Acquisitions Department, North, Carolina State University, P.O. Box 5007,
Raleigh, North Carolina, U.S.A. 14853.
Senckenbergische Bibliothek, Bockenheimer Landstr. 134 - 138, 6000 Frankfurt am main 1,
Germany.
Unicamp-Univ. est de Campinas, Biblioteca Central, Caixa Postal 6136 13 100, Campinas-
sp. Brazil.
University of Wyoming Library, Continuations, Box 3334, Laramie, Wyoming, U.S.A.
82071.

Library Members: Free Subscriptions:

Agriculture Canada Research Station, Library, P.O. Box 3000, Lethbridge, Alberta,
T1J 4B1, (Bus.) 327-4561.
Alberta Provincial Museum and Archives, 12845 - 102 Ave., Edmonton, Alberta, T5N 0M6.
Glenbow Alberta Institute, 130 - 9 Avenue S.E., Calgary, Alberta, T2G 0P3.
National Library of Canada, Canadian Acquisition Division and Legal Deposit Office, 392
Wellington Street, Ottawa, Ontario, K1A 0N4.
Northern Forestry Centre, Library, 5320-122 Street, Edmonton, Alberta, T6H 3S5.
University of Alberta, Library - Periodicals Section, Edmonton, Alberta, T5G 2E3.
University of Calgary, Library, Calgary, Alberta, T2N 1N4.
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Note: area code for Alberta is 403.

ENTOMOLOGICAL SOCIETY OF ALBERTA

BY-LAWS

ARTICLE I

Title

This society shall be known as the Entomological Society of Alberta in affiliation with the Entomological Society of Canada.

ARTICLE II

Object

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, horticulture, forestry, public health, industry, and for its own sake, among the people of the Province of Alberta.

ARTICLE III

Membership, Dues, and Expenditures

- a. Any persons interested in entomology may become a Full Member by submitting a completed membership application form and membership fee payment to the Secretary of the Society.

Honorary Life Membership may be conferred on anyone who has performed long and distinguished service in the field of entomology. The total of Honorary Life Members shall not exceed five percent of the total membership at the time of election. An Honorary Life Member will enjoy all the rights and privileges of Full Members but will be exempt from payment of dues. All Full Members are entitled to propose the name of prospective Honorary Life Members provided each such proposal is supported by two other Full Members and documentation is submitted in writing to the Secretary at least one month prior to the Annual Meeting. Such Honorary Life Members will be elected at an Annual Meeting.

- b. A member may withdraw from the Society upon giving notice to the Secretary.
- c. An annual fee necessary for the operation of the Society shall be levied for each member as provided for in Section 1 of the Rules and Regulations.
- d. The Executive shall have power to meet expenses required in the normal operation of Society business. Such expenditures shall be subject to subsequent ratification at the Annual Meeting by the majority of the members present.
- e. A member who neglects to pay the annual fee for two consecutive years shall automatically cease to be a member.

ARTICLE IV

Meetings

Meetings may be called each year by the President at times and places suitable to the majority of the members. The fall meeting shall be considered the Annual Meeting and shall be held in the locality decided upon the preceding Annual Meeting. One-quarter of the total paid-up membership shall constitute a quorum.

ARTICLE V**Officers**

These officers shall constitute the Executive of the Society with full power to act on behalf of the Society within the bounds of the Rules and Regulations, and to appoint committees as necessary.

ARTICLE VI**Council**

The Council shall consist of the five Officers, the immediate Past-President, a Regional Director to the Entomological Society of Canada, and three Ordinary Directors. The Ordinary Directors shall represent the various fields of entomology and the geographical areas of Alberta as widely as possible.

ARTICLE VII**Elections**

Elections shall be held once a year at the Annual Meeting, and Officers so elected shall take office at the beginning of the following calendar year and remain in office for a term of one year.

The office of President shall not normally be held by the same person for two consecutive years. The Vice-President shall normally follow his/her term of office with a term as President. The Secretary, Treasurer, and Editor shall be eligible for immediate re-election.

The Directors shall also take office at the beginning of the calendar year following their election. The Regional Director shall be elected for a period of three years, with his/her term of office beginning at the end of an Annual Meeting of the Entomological Society of Canada. A Regional Director is not immediately eligible for re-election.

The term of office of each Ordinary Director shall be three years, with one Director replaced in each year. Ordinary Directors are not immediately eligible for re-election.

ARTICLE VIII**Vacancies**

Vacancies in any office (except that of President) on the Council between elections shall be filled by appointment by the President, with the concurrence of Council, the tenure of such co-opted members to germinate at the end of the calendar year during which the appointment is made. A vacancy in the office of President shall be filled by the Vice-President who will then serve his normal term as President.

Members elected at the Annual Meeting to fill vacancies on Council shall complete the period of service of the Council members whose places they have taken. On completion of this term they shall be eligible for re-election only if their period of service (co-opted and/or elected) has not exceeded 18 months.

ARTICLE IX**Duties of Officers**

The President shall preside at all meetings and act ex-officio on all committees. The Vice-President shall, in the temporary absence or disability of the President, perform the duties and exercise the powers of the President, shall chair the Science Fair Liaison Committee and the Membership Committee, and shall perform such other duties as shall from time to time be imposed upon the Vice-President by the Council.

The Secretary shall maintain a record of all meetings and act as custodian of minute books and current correspondence, and shall forward appropriate material to the Agriculture Canada Station in Lethbridge for storage in the Society's archives.

The Treasurer shall receive and disburse all funds, handle all correspondence relating to membership in the Society, and prepare the annual financial statement.

The Editor shall receive and record reports and publications on behalf of the Society and act as editor of the Proceedings.

ARTICLE X

Signing Officers

The signing officers of the Society shall be the Treasurer and either the President or Secretary.

ARTICLE XI

Alteration of the By-Laws

The By-Laws may be altered or amended at any Annual Meeting of the Society with the approving vote of three-fourths of the members present and in good standing.

Such alterations must be made by Notice in Motion, which shall have been sent to the Secretary and a copy of such forwarded to all members at least two weeks before the Annual Meeting.

November, 1994.

ENTOMOLOGICAL SOCIETY OF ALBERTA

RULES AND REGULATIONS

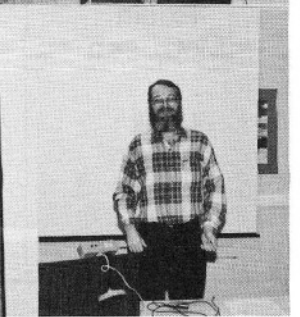
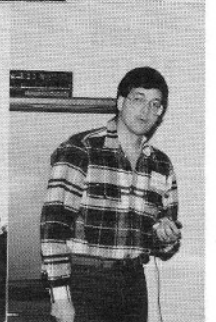
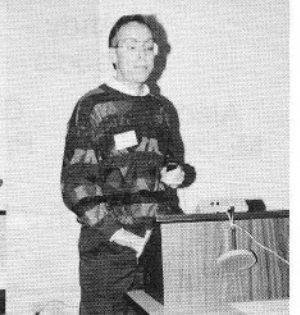
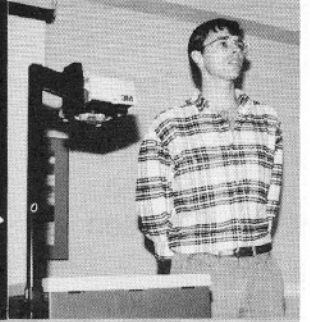
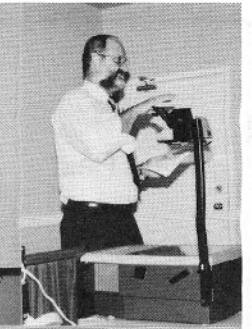
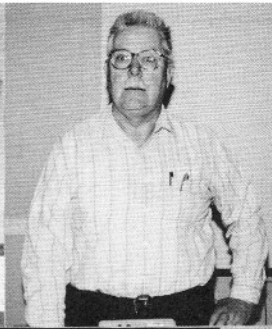
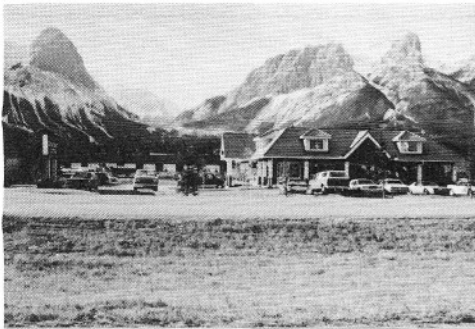
1. a. The annual fee for full membership shall be \$10.00.
- b. The fiscal year of the Society shall coincide with the calendar year; fees are payable in advance, at the time of the Annual Meeting.
2. a. The interim financial statement shall be presented by the Treasurer at the Annual Meeting and the final, year-end statement at the first general meeting following the end of the fiscal year.
- b. Two auditors shall be elected at each Annual Meeting to examine the accounts of the current year and the annual financial statement.
3. a. Registration fees for student members of the Entomological Society of Canada attending the Entomological Society of Canada meetings shall be reduced when these meetings are held in Alberta with the Entomological Society of Alberta as host.
4. The following standing committees shall exist to assist the ESA Council achieve the objectives of the Society:
 - a. Awards Committee - members: Past President, Regional Director to ESC, and the Regional Directors of the ESA. Duties: to solicit and generate nominations of the Entomological Society of Alberta members for Entomological Society of

Canada awards (e.g., Gold Medal, Gordon Hewitt, Norman Criddle) and Entomological Society of Alberta awards (e.g., Honorary Membership, Student prizes).

- b. Environment Council of Alberta - one ESA member shall be elected to represent the society.
 - c. ESA-ESC Joint Meeting Committee - to be established a year preceding any joint meeting of the Entomological Society of Canada and the Society; members to be selected from Society membership.
 - d. Nomination Committee - members: the Past President, Vice-President, and one member in good standing shall prepare a nomination slate prior to each Annual Meeting and the Vice-President shall present the slate of nominated Executive Council members at the Annual Meeting.
 - e. Resolutions Committee - members: two Society members shall be appointed by the Nomination Committee immediately preceding each Annual Meeting.
 - f. Science Fair Liaison Committee - members: Vice-President (as chairman) and three Ordinary Directors. Other members to be appointed as necessary by the Committee. Duties to maintain contact with the principal Science Fairs in Alberta.
 - g. Membership Committee - members: Vice-President (as chairman), and three Ordinary Directors. Duties: to publicize the objectives and activities of the Society in such a way as to recruit new members to the Society.
 - h. All elections and appointments are not to exceed one year unless otherwise approved by the Society.
5. a. The Rules and Regulations may be changed by a motion approved by the majority of the members present at any general meeting.

November, 1994

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|--|--|--|--|---|--|
| the Canmore Landscape | | courtesy of Green Gables | | the Homoptera fashion modelled by Henk Wolda | Owen Olfert I caught a midge this BIG |
| Greg Pohl stands alone | Jim Hammond | | Michele Williamson BTK impacts ... | | Jeff Battigelli Attention! |
| John Acorn | Dave Langor | | Susan Bjornson Listen, Sporty! | Robin McQueen I dunno ... the leafminers crashed | |
| Grant McIntyre | Helen Mao | Al Schaaf Hee Hee Those flies get everywhere | Julie Soroka | | Lloyd Dosdall It means, Hhhmmmm ... |
| Michi Okuda | John Acorn Butterflies are neat | Rosemarie DeClerck- Floate | Gordon Pritchard Dragonflies you must not fight! | Richard Casey | Kevin Floate Talk 1: Bright & Alert |
| Kevin Floate Talk 2: Here I go again | Hector Carcamo Point 1: I have 4 fingers | Scott Digweed Itsy bitsy spider climbs up the wall | | Owen Olfert | Andy Keddie Hi There! |



| | | | | |
|---|--|--|--|---|
| Mary Reid | Ralph Cartar | Martin Erlandon You must rise and brighten | Bob Byers | Carole Challoner John Acorn Saying cheese |
| The Receptive Audience I: Susan Bjornson | The Receptive Audience II: Graham Griffiths | Pat Scholefield You want me to believe ... | Lloyd Harris Keith Moore A Saskatchewan exchange | |
| Hector Carcamo Andy Nimmo | Jim Hammond Hector Carcamo You put your name here | The Receptive Audience III: Gerry Hilchie Kevin Floate | Robin Leech A final word | |
| Andy Keddie Alec McClay Gordon Pritchard The Executive Lifestyle | Ron Gooding | Jim Jones Miichi Okuda This is WORK! | | |
| Alec McClay Lloyd Dosdall We mean business | Scott Digweed Donna White Al Meyer An afternoon jaunt | Corinne Franke Gary Byrtus Martin Erlandson | | |
| Robin McQueen Look what I got! | Jacek Zloty Hector Caracamo Yeah, right there | Mike Dolinski The meeting is over for 1994! | Robin McQueen Corinne Franke Owen Olfert Congrats, Robin! | |



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