

PROCEEDINGS OF THE 41ST ANNUAL MEETING OF THE



# Entomological Society of Alberta

Lethbridge, Alberta 14-16 October 1993

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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."

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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 41st ANNUAL MEETING

### Thursday, October 14

- 1800 Executive Meeting
- 1900 Registration and Mixer

### Friday, October 15

- 0830 Registration
  - 0900 Welcoming Remarks and Announcements
  - 0900 Symposium: "Overwintering Strategies In Insects"
  - 0915 Keynote Lecture: Dr. Roger D. Moon  
"Overwintering phenology of insects with facultative diapause"
  - 1000 Coffee Break
  - 1015 R.A. Butts and S. Armstrong "Cold injury and its impact on field and laboratory populations of Russian wheat aphid, *Diuraphis noxia*"
  - 1040 A.S. McClay "Studies on the overwintering survival of *Tephritis dilacerata*, a potential biocontrol agent for perennial sowthistle"
  - 1105 T.J. Lysyk "Diapause in horn flies"
  - 1130 Submitted Papers
  - 1230 Lunch
  - 1330 Submitted Papers
  - 1830 Banquet
- After Dinner Speaker: Renee Barendregt  
"Mountain Gorillas of Rwanda"

### Saturday, October 16

- 0900 Submitted Papers
- 1115 Business Meeting

## PRESIDENT'S REPORT 1993

I would like to thank my executive, especially southern director, Tim Lysyk, and secretary, Mark Goettel, who stepped in at very short notice to help me organize this meeting. We were able to attract 30 paper contributions to this meeting. I realize that it takes time to put together these talks and I want to thank everyone for doing so. I would, however, like to see more graduate student papers in the future and I want to encourage those working at Universities to encourage their students to attend. I want to thank treasurer Daryl Williams, editor David Langor, past-president John Spence, ESC director Bev Mitchell, and the two other regional directors, Michi Okuda and Robert Holmberg, for their dedicated service and support. This year the Society initiated contacts with school systems trying to educate young children about the wonder world of entomology. I believe that this will be a valuable ongoing activity in the Society for years to come. We have also initiated the editing of the Insect Collector's Guide, which is another tool that has served us well in the past and will continue to do so in the future.

My term as president can be characterized by a comment made by Bev Mitchell to George Gerber in discussing this Annual Meeting. He said, "I think that it is on Rick's TO DO list and he hasn't gotten around to doing it yet". I must admit that there were times when, as president, I wasn't sure what should be done. However, during this year I have come to believe that doing very little is exactly what should be done. I now realize that, for me, the function of the Entomological Society of Alberta is one of fellowship and learning. When I first started working in Alberta I thought of these annual meetings as being less important than some of the other conferences I tried to attend. I now think of this meeting as perhaps the most important. I visit, laugh, and talk with my friends. I learn more about systematics, morphology, and forest entomology than any agricultural entomologist would ever hope to learn. Above all, I am able to keep abreast of new technologies in entomology during times when economics will not allow me to travel far and wide in search of new information. I think that what applies to me applies to most of us here. I know now that this society survives on its own inertia because it is absolutely essential, and I, as president, play a very small role keeping the whole thing in motion.

Thank you for giving me the opportunity to serve as your president. I consider it a great privilege and honour. I would now like to pass the gavel into the capable hands of Alec McClay and I look forward to serving as past-president. I also look forward to seeing you all again at our 1994 Annual Meeting in Calgary

Rick Butts

## KEYNOTE SPEAKER

Roger D. Moon

Dr. Moon is a native Californian. He received his B.Sc in 1974 and Ph.D in Entomology in 1979 from the University of California, Davis. He was a research associate at the University of Nebraska from 1979 to 1980, and joined the faculty of the Department of Entomology at the University of Minnesota in 1980. Dr. Moon's research has focused on the ecology and population dynamics of insects affecting humans and livestock. He has extensive experience with biological control of muscoid flies using competitors and pathogens. He has conducted extensive research on sampling, age-grading, phenology, diapause, and modelling of livestock pests including face flies, horn flies, stable flies, and swine mange. He has published over 35 papers including refereed articles, book chapters, extension articles, and technical bulletins. Dr. Moon has been actively involved in the Entomological Society of America, American Mosquito Control Association, Central States Entomological Society, and the American Association for the Advancement of Science.

## ABSTRACTS OF SUBMITTED PAPERS

OVERWINTERING OF INSECTS WITH FACULTATIVE DIAPAUSE. R. D. Moon, Department of Entomology, University of Minnesota, St. Paul, MN, 55108, USA.

Among multivoltine species that overwinter in northern latitudes, abundance in a given year is determined by processes that govern the magnitude and timing of (1) recruitment into the overwintering state during the preceding autumn, of (2) survival during winter, and of (3) reappearance and subsequent population growth the following spring. Using face fly, *Musca autumnalis* DeGeer, as an example, abundance on cattle varied substantially among the 1988-91 breeding seasons, and efforts to understand year-to-year variance have focused to date on developing models to predict the timing of spring reappearance and the timing of diapause induction in autumn.

Age structures of spring populations in California, Iowa and Minnesota reveal that females overwinter in a pre-reproductive diapause, return to pastures in spring, and complete their first egg laying cycle when 70 day degrees above a base temperature of 12°C have accumulated after 1 January. Sufficiency of this simple heat unit model indicates diapause terminates sometime in winter, and timing of spring reproduction is determined solely by onset of permissive weather. Thereafter, reproduction of the overwintered flies and their offspring is continuous until facultative diapause intervenes several generations later in autumn.

Sampling of an autumnal population in southeastern Minnesota indicated abundance of the breeding subpopulation in pastures peaked in late August, whereas abundance of the diapausing subpopulation at nearby buildings peaked in mid October. Diapause is indicated by hypertrophied fat body in adults of both sexes, and inhibition of vitellogenesis in females. The pattern of disappearance from pastures in September and arrival at buildings in October indicates diapause induction occurred among teneral adults that emerged in August and September, and the delay in arrival at buildings suggests diapausing individuals underwent a period of development before they aggregated on buildings.

Laboratory studies were conducted to define the metamorphic limits of sensitivity and number of short days required to induce diapause, using Taylor's crossover designs (1985. J. Theor. Biol. 117:319) to define the constants of Saunders' RDN induction model (1982. Insect Clocks, Pergamon). Results revise and extend earlier findings; both sexes become sensitive to short days (or longer nights) approximately halfway through the pupal stage (70% of egg-adult development) rather than at eclosion as thought earlier. Further, diapause is induced in half the males and females if they experience 7 and 8 short days, respectively. Sensitivity persists until a time after eclosion equivalent to 1.5 gonotrophic cycles in females. It remains to be seen if this model can predict the phenology of diapause induction and development in the field.

**COLD INJURY AND ITS IMPACT ON FIELD AND LABORATORY POPULATIONS OF RUSSIAN WHEAT APHID, *DIURAPHIS NOXIA*.** R. A. Butts, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1; and S. Armstrong, Colorado State University, Akron, Colorado, 80720, USA.

In this study we investigated the impact of sublethal temperatures on Russian wheat aphid populations and determined some of the factors that would modify the level of cold injury incurred by the aphid in the field. Acclimation through exposure to cool temperatures (+5 °C) dramatically increased the length of time aphids can be exposed to subzero temperatures without injury. Snow cover in the field moderates temperatures at ground level and protects aphids from dramatic swings in winter temperatures. Isolated areas in fields will also protect the aphid from severe cold exposure. For instance, overwintering survival in Colorado was higher on banks with a southern exposure versus those with a northern exposure. Nucleating agents were highly effective in raising the supercooling point of individual aphids exposed to freezing temperatures. Host plant quality may also influence the chance of winter survival of the aphid in the fields in that Russian wheat aphid feeding does reduce the cold tolerance of the winter wheat plant. However, how this change in the host plant quality impacts on the aphid has yet to be investigated. Data accumulated in this study will be useful in developing an overwintering model for Russian wheat aphid infesting winter wheat.

STUDIES ON THE OVERWINTERING SURVIVAL OF *TEPHRITIS DILACERATA*, A POTENTIAL BIOCONTROL AGENT FOR PERENNIAL SOWTHISTLE. A. S. McClay, Alberta Environmental Centre, Bag 4000, Vegreville, Alberta, T0B 4L0.

The European tephritid fly, *Tephritis dilacerata* Loew, forms galls in the flower buds of perennial sow-thistle, *Sonchus arvensis* L. It emerges from the galls in late summer and overwinters as an adult. It has been widely released as a candidate biocontrol agent for perennial sow-thistle in Canada. None of these releases has so far led to establishment, and this has been attributed to inability of the insect to overwinter under climatic conditions of the Canadian prairies. Since the distribution of the insect in Europe extends into Scandinavia and Russia, however, this seems unlikely. I investigated the cold tolerance of *T. dilacerata* and its overwintering survival. The supercooling point of adult *T. dilacerata* was determined to be  $-17.6 \pm 4.9$  °C, which is not significantly different from that of some other biocontrol agents that have successfully overwintered in Alberta. Overwintering was studied in 30-cm screened cages under various conditions. There was no survival when cages were placed in a growth chamber at 6 °C, probably because of dessication. In 1991-92, survival outdoors was increased from 1.3% to 4.2% by providing a layer of plant litter in the cage. Survival was not enhanced by monthly feeding with a honey/yeast extract solution during overwintering. In 1992-93, a deeper litter layer was provided in the outdoor cages and snow fencing was used to ensure better snow cover. The survival of progeny from flies which had successfully overwintered in the previous year's experiment was 75.2%, while the rate for flies collected in 1992 from Austria was 72.0%. This gives no evidence for selection for increased cold hardiness among flies which had survived one Alberta winter, and indicates that survival is strongly dependent on microhabitat conditions. These results suggest that *T. dilacerata* should be able to overwinter in Alberta in protected sites with sufficient litter and/or snow cover. The failure of this species to establish so far may be related to other factors such as predation or the timing of releases.

DIAPAUSE IN HORN FLIES. T. J. Lysyk, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

The Horn Fly, *Haematobia irritans irritans* (L.), is an important pest of cattle. Adult horn flies spend most of their lives on cattle. Females leave the cattle periodically to oviposit on freshly deposited manure. Larvae develop exclusively within the pat, passing through three instars before the pupa is formed within or beneath the pat. Newly emerged adults re-infest cattle upon eclosion. Several generations occur throughout the summer until the overwintering generation is produced. The insect overwinters in a state of facultative diapause expressed in pharate adults within the puparium. Diapause is usually induced in late-summer and early fall. Early work suggested that diapause induction in the horn flies was controlled in the maternal generation by decreasing photoperiods and ultraviolet radiation. Temperatures to which the larvae were exposed were believed to mediate the proportion that entered diapause. Recent work has demonstrated that diapause induction occurs primarily during immature development and that maternal effects have little or no influence. The incidence of diapause increased

with decreasing immature rearing temperature, regardless of the photoperiod to which adults were exposed. Further laboratory work has determined the relationship between diapause induction and temperature during larval development. This relationship has been used to develop a temperature-based model of diapause induction. Field studies have confirmed the laboratory work, and predicted that diapause could also be induced in the spring as well as the fall. Simulation and field studies indicate that spring-diapausing horn flies are capable of making a substantial contribution to horn fly population increases later in the season.

CHROMOSOMAL AND EXTRA-CHROMOSOMAL BASIS OF HYBRID STERILITY IN *GLOSSINA MORSITANS SUBMORSITANS* x *G. M. CENTRALIS* CROSS. R. H. Gooding, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

The results of hybridizing *G.m. morsitans* with *G. m. centralis*, and with *G. m. submorsitans* were used to hypothesize the evolutionary relationships among these subspecies of *G. morsitans* and to make the following predictions on the outcome of crosses of *G. m. submorsitans* and *G. m. centralis*: 1. all males that have sex chromosomes from two subspecies will be sterile; 2. grandsons of *submoritans* females will not fertilize *centralis*; and 3. autosomes will have a greater influence on hybrid male sterility in the *submorsitans/centralis* cross than they did in the other crosses. In general, the experimental results confirmed these predictions. However, the maternally inherited factor that is associated with the asymmetry in mating success is rapidly inactivated by backcrossing to *G. m. centralis*, and linkage group II was the only autosome which significantly influenced hybrid male sterility.

AN EXCEPTION TO HALDANE'S RULE IN PONDSKATERS: A FRUSTRATED EXPLANATION. J. R. Spence and N. Berg, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Two closely related species of *Limnaporus* (Gerridae) hybridize in western Canada. In general, only male hybrids are produced in the first generation, these are fully fertile and produce offspring of both sexes, at least when backcrossed to the maternal species. These observations stand in contrast to Haldane's rule because males are the heterogametic sex. A series of crossing experiments shows that some complicated model involving 1) interaction of disparate sex chromosomes, 2) interaction of sex chromosomes and autosomes, and 3) interaction of sex chromosomes and cytoplasmic factors will be required to explain this curious exception to Haldane's Rule.



A PROPOSED SYSTEM FOR STABILIZING THE NAMES OF SPECIES, ILLUSTRATED WITH REFERENCE TO THE ICHNEUMONIDAE (HYMENOPTERA). D. S. Yu, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

The major instability in scientific names is due to changes in generic combinations. As name changes are a serious loss to information retrieval capabilities of the present nomenclatural system, it is proposed that the original binomen of a species (that is the generic and specific names as proposed by the first describer of the taxon) be preserved in the scientific name. The taxonomic placement is indicated by placing the current generic name in front of the original binomen. Thus taxonomic change will not impinge on the integrity of the nomenclatural binomen and the latter, which acts as a permanent and unambiguous identification label for the taxon, can be the key for storing and retrieving taxonomic and biological information.

THE DELIGHTS OF DISCOVERY: SMALL BEGINNINGS AND GRAND PATTERNS -- PTEROSTICHINE CARABIDAE OF SUBTRIBE EUCHROIINA.

G. E. Ball, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Discovery of a strikingly colored carabid beetle in an isolated mountain cloud forest in the Sierra Madre Oriental of northeastern Mexico was the beginning of an investigation of the genus *Dyschromus*, leading to the discovery of another 20 undescribed species in other Mexican mountain ranges. A subsequent search for the phylogenetic antecedents of *Dyschromus* led to redefinition of the subtribe Euchroina. Of the eight euchroine genera, two are known only from the mountain forests of eastern Australia; five from South America; and one from central Mexico and the Greater Antillean island of Hispaniola. The postulated relationships indicate much extinction in the Euchroina (the Australian and most of the South American genera have not more than three species each), and that development of large size, bright color, and wing loss have been important evolutionary themes. The distribution pattern suggests that the Euchroina is an old group, with its geographical range having been disrupted by plate tectonic events (separation of Australia and South America in Late Cretaceous or early Cenozoic time) producing separate Australian and South American stocks. The distribution pattern in the New World also suggests a substantial age for the Euchroina, with the isolates in Mexico and Hispaniola being accounted for by extinction and by geographical circumstances that date to Early-Middle Cenozoic time. Speciation of *Dyschromus*, in Mexico and Hispaniola, is probably relatively recent, for the species within each area are quite similar to one another.

USE OF ROUGH SETS TO IDENTIFY SITES FOR BIOCONTROL OF LEAFY SPURGE. P. Harris and R. Brandt, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Leafy spurge is a herbaceous perennial introduced from the Eurasian steppes which, on the Canadian Prairies, displaces forage and native plants. The latex in it is toxic to cattle, which avoid grazing areas with as little as a 10% spurge cover. At its origin, spurge is attacked by many specialized insects, and forms small widely separated sparse patches, so little grazing is lost. Leafy spurge is most harmed by root feeders such as *Aphthona* species (Coleoptera: Chrysomelidae), with 127 species mostly restricted to spurge. The result is that in most regions of Eurasia spurge is attacked by several *Aphthona* species separated by microhabitat needs. Five *Aphthona* species have been established in Canada, of which two are reducing spurge to less than a 5% cover in specific habitats. Two others are increasing and the last seems to require a more southern climate.

The purpose of this study is to identify site characteristics that could be used by land owners to release the right *Aphthona* spp. for their spurge infestation. Data on 53 site variables such as spurge height, soil texture and associated plant species, were collected by cooperators from release sites in the three prairie provinces. These variables were reduced to 29 by eliminating those that occurred infrequently. Success at a site was the number of beetles and their spread after release.

The data was analyzed with Datalogic/R produced by Reduct Systems Inc. of Regina, SK which employs mathematical techniques derived from rough sets theory to determine the contribution variables make to the outcome. The program requires a large and complete data set, so the analysis was restricted to the two beetle species for which we had most data: *A. migriscutis* (106 out of 414 sites) and *A. cyparissiae* (37 out of 160 sites).

The initial program run of the *A. migriscutis* data highlighted two variables that affected success, but were not related to site selection. One indicated that the inability to recover beetles after one year did not mean a failure since 9/15 sites in which no beetles were recovered one year after release had beetles in subsequent years. The second indicated that the success declined west of longitude 110°, which is approximately the Alberta-Saskatchewan border. Closer examination indicated that many *A. migriscutis* releases in Alberta were made on unsuitably heavy soils. Thus, the program indicated a different practice rather than site suitability and both these variables were removed for further analysis.

The most important site characteristics for *A. migriscutis*, in which a perfect fit is 1.0, were: the amount of organic carbon in the soil (0.62), height of the flowering spurge (0.52), the amount of bare ground (0.50), soil texture (0.27), and presence of the grass *Stipa viridula* (0.26). Using these variables, the program predicted the observed results with a 85% accuracy. The three most important rules formulated for selecting a successful release site were:

- Rule 1. No *Stipa viridula* present and soil organic carbon <2.8%.
- Rule 2. Spurge flowering stem height <49.7 cm.
- Rule 3. The amount of bare ground >15%.

The short height of the flowering spurge and the presence of bare ground in the rules indicates that *A. nigriscutis* requires dry soils and does not thrive in the slightly moister sites with the grass *S. viridula*. The program masks some variables useful for landowners, such as the presence of the grasses *S. comata* or *S. spartea* on native prairie sites. For example, in Spruce Woods Park, MB, where *S. spartea* and *S. viridula* occur in a mosaic, spurge with the former species yielded over 100 times more beetles than with *S. viridula* on a few meters away.

The important variables for predicting *A. cyparissiae* sites were height (0.45), density of flowering stems (0.43), soil organic carbon (0.38), aspect of the release site (0.34). These resulted in the program predicting the observed result with 67% accuracy. The most important rules formulated for success were:

Rule 1. Spurge height <61.4 cm on any aspect except north.

Rule 2. Flowering stem density >67.2/m<sup>2</sup> on any aspect except north.

The taller and dense spruge with the lack of need for bare ground or the absence of *S. viridula*, indicates that *A. cyparissiae* thrives in slightly moister sites than *A. nigriscutis*; but for land owners it would be helpful to have the same variables, such as spurge density, in the rules for both beetle species. These can be determined by conventional statistics, now that the relevant variables have been identified. The program also indicates that some failures should have succeeded. These can be re-examined and possibly receive another release. The need for complete data sets is a drawback to the program, but a new version in which this is unnecessary should be available soon and allow the use of the whole data base and hence produce stronger predictions.

USE OF NEURAL NETWORKS TO IDENTIFY SITES FOR BIOCONTROL OF LEAFY SPURGE. B. Hill and P. Harris, Research Station, Agriculture Canada, Lethbridge, Alberta, T1J 4B1.

Neural networks (NN) are computer simulations of biological neural systems. A mathematical model is formed which learns relationships from example data. Once a NN is 'trained' using inputs paired with known results (outputs), it can be used to predict outputs from new data. NN find subtle non-linear relationships in data and are adept at solving complex problems with many variables.

This paper describes our use of NN to classify and predict western Canadian sites that would be most suitable for biocontrol of leafy spurge via releases of *A. nigriscutis* (see Harris and Brandt, previous abstract). Data describing 104 actual release sites and the resultant degree of biocontrol (as indicated by beetle numbers after release) were used.

The site description input variables were: longitude, span (years since release), number of beetles originally released, % clay, % silt, % sand, % soil organic matter, direction and amount of slope, amount of shade, amount of bare ground, spurge height, and presence of *Stipa comata* and/or *S. viridula*. The output variable was beetle numbers, log transformed, then divided into four equal categories, 0, 1, 2, 3, with category 0 representing very few beetles (site a failure) through to category 3 representing the highest number of beetles (site a complete success).

A commercially available NN program, BrainMaker Pro from California Scientific, was used on a 386SX-20MHz Pc. The 'best' NN model consisted of 29 input, 6 hidden, and 1 output neuron and required 9514 iterations through the 94 training cases (approx. 2 h). The remaining 10 cases were used to test the model. The model predicted the correct category (0-3) in 80% of the test case. Sensitivity analysis on the model indicated that the most important variables were (relative weights): longitude (0.17), direction of slope (0.14), no. of beetles released (0.13), span (0.12), % silt (0.09), and presence of *S. viridula* (0.08). Biocontrol was best at a longitude near Regina, with a south facing slope, with >500 beetles released, at longer spans, with low % silt, and with *S. viridula* present. The variables, % soil organic matter, spurge height, and amount of bare ground were not as important as indicated by the rough set analysis (RSA) of Harris and Brandt (see previous abstract). Our NN modeling and the RSA were developed completely independently. The RSA results differed because the variables longitude, span, and no. beetles released were intentionally excluded from RSA. We will be comparing NN and RSA results using the same variables in the future.

Unlike MLR or RSA, NN modeling does not give a readily transferrable formula or 'set of rules'. To use our NN for future sites, we will have to obtain the same input data and feed it into our NN via the same BrainMaker software. NN modeling does give a holistic solution based on all the variables, will predict the degree of site success (rather than just success/fail), can identify which variables are most important, and will handle some missing data. We think NN modeling has potential for classifying and predicting data from biological problems.

**APHID-ANT INTERACTION REDUCES CHRYSOMELID HERBIVORY IN A COTTONWOOD HYBRID ZONE.** K. D. Floate, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

In a cottonwood (*Populus*) hybrid zone, *Chaitophorus* aphids attract aphid-tending ants which subsequently reduce herbivory by the leaf-feeding beetle, *Chrysomela confluenta*. Observation and experimental manipulations of aphids and beetle larvae on immature cottonwood trees demonstrated that: 1) via their recruitment of ants, aphids reduced numbers of beetle eggs and larvae on the host; 2) these interactions occurred within a few days of the host being colonized by aphids; and 3) although aphid colonies were ephemeral, their presence resulted in a 2-fold reduction in beetle herbivory.

The aphid-ant interaction is most important in the hybrid zone where 93% of the beetle population is concentrated (for reasons unrelated to aphids and ants). Because beetle defoliation of immature trees is high (ca. 25%), the indirect effect of aphids in reducing herbivory is likely more beneficial to trees in the hybrid zone than in adjacent pure zones where beetle herbivory is virtually absent. Tree genotype likely affects the impact of the aphid-ant interaction on trees within the hybrid zone, since levels of herbivory differ between sympatric Fremont and hybrid cottonwoods.

PHYTOPHAGOUS INSECTS ASSOCIATED WITH WOLF WILLOW IN ALBERTA. A. S. McClay, Alberta Environmental Centre, Vegreville, Alberta.

Wolf-willow, *Elaeagnus commutata* Bernh. ex. Rydb. (Elaeagnaceae), is a deciduous, clonally spreading shrub which is common in moister sites throughout most of Alberta. Its native range extends through most of western Canada and the northwestern United States. It is the only North American representative of a primarily Asian genus. As the insects associated with it appear to be largely unknown, a preliminary survey was started in the summer of 1993. Insects were swept and hand picked from the plant at six sites in Alberta, and immature stages were reared through to adult when possible. Identifications to species are not yet available, but at least 14 phytophagous insects, representing 7 orders, and one mite have been found associated with the plant. The most abundant and characteristic species is a psyllid. Identification of these insects may indicate whether the insect fauna of *E. commutata* is related to that of Palaearctic *Eleagnus* species or whether it has been recruited primarily from North American sources.

ASSESSING THE ARTHROPOD BIODIVERSITY OF ASPEN SNAGS AND COARSE WOODY DEBRIS: THE METHODS AND THE MADNESS. J. Hammond, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

One of the most unique characteristics of old growth stands, especially in aspen mixedwood forests, is the presence of snags (standing dead and dying trees). These dead trees are an ideal habitat for many species that specialize in dead and rotting wood habitats. A relatively high percentage of biomass in aspen mixedwood forests is composed of non-marketable trees and snags, and consideration is now being given to the preservation of snags as animal habitat. Since harvesting of old growth aspen stands has not been exploited on a large scale, little empirical evidence on the effects of forest harvesting on aspen communities exists. The objectives of this study are to: describe the arthropod community associated with snags and how the community responds to forest disturbance.

ECOLOGY OF BIRCH LEAFMINERS IN ALBERTA (HYMENOPTERA: TENTHREDINIDAE). S. Digweed, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Exotic birch-leafmining sawflies had spread from eastern North America to Alberta by the 1970's. They now occur throughout central Alberta, but ranges of northern populations appear to still be expanding. *Profenusa thomsoni* (Konow) is most abundant (60-80% of total catch), followed by *Fenusa pusilla* (Lepeletier) (20-40%) and *Heterarthrus nemoratus* (Fallen) (<1%). *Fenusa pusilla* and *P. thomsoni* are temporally and spatially separated on birch trees.

Parasitism levels were low in 1992 and 1993. Most parasitoids of larvae were from the Eulophidae (Chalcidoidea) and appear to have switched to birch leafminers from other native leafmining hosts. No specialist parasitoids were detected, but those of *F. pusilla* will be introduced to Alberta from eastern North America in 1994. I will monitor their establishment on *F. pusilla* and study their

potential to attack *P. thomsoni*. I will use field experiments to examine additional community interactions involving birch leafminers, such as predation, host effects, and competition.

DEVELOPMENT AND DISCUSSION OF A MECHANISTIC PHENOLOGY MODEL FOR THE RANGELAND GRASSHOPPER *CAMNULA PELLUCIDA* (ORTHOPTERA: ACRIDIDAE). D. J. Lactin and D. L. Johnson, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

We describe a phenology model of the grasshopper, *Camnula pellucida*. This model assumes (1) that development is driven by body temperature; and (2) that hoppers attempt to optimize body temperature through thermoregulatory behaviour. The model requires daily values of maximum and minimum temperature, and of total solar radiation. Soil temperature and insect body temperature in full sun are estimated from interpolated hourly air temperature and solar radiation. Soil temperature drives post-diapause egg development; a linear function is used. Nymphal development is driven by body temperature; a non-linear function is used.

The hopper has a choice of three microclimates: the soil surface; in the vegetation in full sun; and in the vegetation in the shade. The hopper chooses the microclimate in which development is fastest.

The model is initiated with a population of post-diapause eggs. Developmental increments are calculated hourly from January 1 to December 31, and 25 cohorts are moved individually through development. Developmental rates vary consistently among cohorts; a genetic basis for this variance is assumed. Validation against field data reveals that field populations develop consistently faster than the model predicts. We discuss the possible sources of model bias and prioritize future research.

WHY DO WATERSTRIDERS DIE? LIFE HISTORIES AND THE STRUGGLE FOR SURVIVAL. C. P. Klingenberg and J. R. Spence, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Life histories are molded by natural selection. To understand life history evolution, we must know not only the mortality causes for juveniles and the determinants of mortality and reproductive success for adults, but we also have to understand how juvenile life history traits affect adult fitness.

To determine juvenile mortality causes in the waterstrider *Gerris buenoi*, we performed an experiment using field enclosures. Six screened enclosures had separate compartments for three treatments: open compartments for predator access, screened compartments for predator exclusion, and screened compartments with waterstriders individually confined to prevent cannibalism. Mortality rates were dramatically higher in the predator access treatment than in the other two treatments, which had high survival rates that did not differ significantly from each other. Therefore, predation is by far the most important mortality source in larval waterstriders.

Contrary to expectations from life history theory, development time and final body weight were negatively correlated in both sexes and in all treatments.

This indicates that these waterstriders vary in overall vigor rather than showing a trade-off between development time and adult size. Moreover, we did not find the high positive correlation between female size and lifetime fecundity predicted by current theory. As an alternative explanation, we suggest that larval development time is the dominant factor for life history evolution in waterstriders, and that body size evolves only as its correlate.

#### PARENTING BARK BEETLES: ARE BIGGER MALES BETTER?

M. Reid, Department of Biological Sciences, University of Calgary, Calgary, Alberta, T2N 1N4.

As with other insects, larger bark beetles (Coleoptera: Scolytidae) tend to have higher survivorship, dispersal ability, and mating success than smaller individuals do. Consequently, larger beetles could have greater reproductive success by seeking new breeding opportunities rather than by remaining with current broods. In this case, larger beetles may have lower reproductive success in a single brood than smaller beetles. On the other hand, larger individuals may be better parents or possess genes for large size and vigor that increase the success of a brood. Male pine engravers, *Ips pini*, provide parental care by helping their mates reproduce more quickly and by defending the egg galleries against predators. In this lab study, I examined the effect of body size of male pine engravers on their reproductive success in a single breeding attempt. Each male was mated with three females of a standard body size, and all emerging offspring were collected and measured. I found that larger males did desert their broods earlier than small males did, as predicted by the breeding opportunities hypothesis. Nonetheless, larger males had more offspring and larger sons. It is unknown whether the greater reproductive success of large males derives from more vigorous help (over a shorter time) or from "good genes". Clearly, however, large pine engravers can realize high reproductive success by having both more broods and more offspring per brood.

#### SYSTEMIC BIOAVAILABILITY OF FENVALERATE AFTER APPLICATION TO THE SKIN OF ANGUS STEERS. T. J. Danielson, L. R. Goldsteyn and J. L. Elder, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Fenvalerate, a pyrethroid insecticide, is a component of insecticidal ear tags employed in the cattle industry. Information regarding the absorption of fenvalerate through the skin of cattle is, however, very limited. Pharmacokinetic modeling techniques were applied to plasma concentration/time data obtained after intravenous infusion and topical application of fenvalerate of Angus steers in order to assess dermal absorption. Concentration of fenvalerate in plasma after topical application ( $1 \text{ mg/kg/cm}^2$ ) were between 0.5 and 1.0 ppb (0.5 to 1.0 ng/ml) and persisted at that level for more than 7 days suggesting a very long terminal phase half-life. After intravenous dosing, the terminal phase half-life was less than 12 hours. Systemic clearance after intravenous infusion was determined to be 8 - 11 ml/kg/min. The longer terminal phase half-life after topical application suggests that absorption of fenvalerate through cattle skin occurs more slowly than elimination. Topical treatments were therefore considered to resemble



infusions to steady state and a maximum rate of fenvalerate influx was calculated from the relationship:  $\text{influx (ng/min/cm}^2\text{)} = \text{concentration at steady state (1 ng/ml)} \times \text{systemic clearance (10 ml/kg/min)}$ . From this relationship the maximum flux of fenvalerate through cattle skin was calculated to be  $10 \text{ ng/min/cm}^2$  and maximum percentage absorption over 7 days, based on a dose of  $1 \text{ mg/cm}^2$ , less than 10%.

**DERMAL ABSORPTION OF DEET IN CATTLE.** W. G. Taylor and T. J. Danielson, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Model-independent pharmacokinetic methods were applied to investigate the plasma disposition characteristics of N,N-diethyl-m-toluamide (DEET insect repellent) after single-dose treatment of experimental cattle by rapid intravenous (iv) injection ( $2.5\text{--}2.7 \text{ mg/kg}$ ) and by dermal application ( $10 \text{ mg/kg}$ ) to the hair-clipped back. DEET was determined in jugular blood samples by capillary gas chromatography with a nitrogen-selective detector and an internal standard of N,N-dipropyl-m-toluamide. The assay was validated over the concentration range of  $19\text{--}1910 \text{ ng/ml}$  of plasma. Comparison of areas under the plasma concentration-time curves after iv and dermal treatments of four Hereford heifers indicated that  $72.9 \pm 8.3\%$  (mean  $\pm$  SD) of the dermally applied dose was absorbed into the systemic circulation. The time to peak plasma concentrations following dermal treatments was  $37.5 \pm 8.7 \text{ min}$ . Linear (dose-proportionate) pharmacokinetics was demonstrated with four additional cattle by comparing systemic clearance after iv infusion to steady-state plasma levels of approximately  $0.5 \text{ ul/ml}$  and  $2.5 \text{ ul/ml}$ . The rapid and extensive systemic absorption of DEET observed in this investigation is likely to account for the relatively short duration of insect repellent action when sprays of this repellent are used to protect cattle under field conditions.

**VACCINATION: A NOVEL CONTROL STRATEGY FOR CATTLE GRUB (*HYPODERMA LINEATUM*) INFESTATIONS.** R. W. Baron, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Acquired resistance is recognized as an important factor in controlling cattle grub infestations, and has been shown to be dependent upon a strong cell-mediated immune response. Calves immunized with a purified combination of hypodermin A, B, and C plus monophosphoryl lipid A (MPL) developed a strong antigen-specific cellular immune response by completion of immunization which persisted to 12 weeks post-infestation. The response of peripheral blood lymphocytes to mitogen stimulation (pokeweed and concanabalin A) was also elevated at 4 and 12 weeks post-infestation. Western blot analysis demonstrated that immunized calves responded to hypodermin A, B, and C. The antigen-specific antibody response at the time of the maximum grub count was also elevated significantly in vaccinated calves and those receiving only MPL when compared to control calves. Immunized calves produced  $5.0 \pm 6.9$  grubs per animal while adjuvant controls (MPL) produced  $16.4 \pm 6.1$  and infested controls  $32 \pm 10.9$  grubs per animal.



**BOT FLY PARASITISM IN HOWLER MONKEYS.** D. D. Colwell and K. Milton, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Howler monkeys (*Alouatta palliata*) on Barro Colorado Island, Panama were surveyed for the presence of monkey bots (*Metacuterebra baeri*). Prevalence of parasitism was higher in male monkeys than females although intensity of the infestations was higher in the females. Little difference in prevalence and intensity was noted between age classes. There is little information available on the biology or ecology of this fly, which appears to be a major factor limiting the population of howler monkeys at this site.

In order to gain more information about this insect we attempted to culture third instar larvae, expressed from tranquilized monkeys, under controlled conditions. Fully black (mature?) third instars pupated within 1-3 days of removal from the host. Flies emerged from pupae after approximately 38 days when cultured at 26°C. A tethering technique was used to mate flies and females, and females were induced to oviposit on an artificial substrate. Egg complements were approximately 1400 eggs/female. Larvae hatched from eggs after culture for 5 days at 26°C. Hatch was stimulated by sudden warming and exposure to increased CO<sub>2</sub> levels associated with human breath. Larvae did not penetrate unbroken skin, but rapidly entered the nasal passages or migrated under the eyelids of experimental rabbit hosts. Larvae successfully developed to the third instar in these abnormal hosts, but no larvae survived to pupate.

**THE MANY FACETS OF AGRICULTURAL PHOTOGRAPHY.** E. Gushul, 1714 - 15 Ave. South, Lethbridge, Alberta, T1K 0W9.

The speaker reviews his 22.5 years as an Agriculture Research photographer at the Agriculture Canada Research Station. Each of the seventy-plus Research Officers had a project which required a special photographic procedure. High quality photos were necessary for publication. The slides show some of the great variety of assignments and the methods used to achieve satisfactory results. The speaker was very greatly involved with entomological photography, from insects in the field, to recording photographically the Proceedings of the Annual Meetings of the Entomological Society of Alberta.

**EFFECTS OF DISTURBANCE AND DEPLETION ON PITFALL CATCHES OF GROUND BEETLES.** H. Carcamo, S. Digweed, C. Currie, and J. Spence, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Site disturbance may affect catches of epigaeic arthropods in pitfall traps, and local depletion of populations may occur when sampling without replacement. In this study we manipulated levels of site disturbance and potential depletion using these trapping treatments: (1) permanent: pitfall traps were not disturbed except in collection of weekly samples; (2) disturbed: traps were moved weekly to a position within 20-30 cm of an initial position; (3) revolving: traps were moved weekly to new sites on an orbit around the permanent and disturbed trapping stations. To elucidate the potential effect of depletion at different spatial

scales, we repeated the experiment at 10, 25 and 50m, where this is the distance between trapping treatments. Preliminary results suggest that disturbed traps caught more carabids than permanent traps but not more than revolving ones. Also, total carabid catches were considerably lower for trapping treatments placed within 10 m of each other. There were no differences in catches between the 25 and 50 m treatments. Total number of carabid species captured was not affected by any treatment.

**THE EFFECTS OF SEEDING DATE AND PLANT DENSITY ON ROOT MAGGOT (*DELIA* SPP.) INFESTATIONS IN CANOLA.** L.M. Dosdall, M. J. Herbut, and N. T. Cowle, Alberta Environment Centre, Vegreville, Alberta, T0B 4L0.

Various seeding dates and plant densities were evaluated in 1991 and 1992 for reducing the impact of root maggots (*Delia* spp.) (Diptera: Anthomyiidae) on both species of canola (*Brassica rapa* L. and *B. napus* L.). Oviposition by females and root injury at the end of the season were used to assess root maggot infestations. Results indicated that both seeding date and plant density have importance for the cultural control of root maggots in canola. In general, seeding in the latter part of May rather than in early or mid-May resulted in a decrease in the mean number of root maggot eggs laid per plant and less root injury at the end of the season. Increasing plant density caused a significant reduction in injury to canola taproots from feeding by root maggot larvae. Both egg numbers and root injury were correlated with basal stem diameter indicating that females selected larger plants for oviposition; consequently, plants sown early in the season and at low densities were larger at the time of most oviposition by *Delia* spp. and so were subjected to greatest numbers of eggs and most root injury.

**DO IRRIGATION SYSTEMS INFLUENCE INSECT ABUNDANCE IN ALFALFA (*MEDICAGO SATIVA* L.) GROWN FOR SEED?** B. D. Schaber, Agriculture Canada Research Station, Lethbridge, Alberta, T1J 4B1.

Pest insect populations have been manipulated in some crops by changing irrigation practices. In this study, insect populations were monitored in alfalfa (*Medicago sativa* L.) grown for seed with sprinkler or flood irrigation. Lygus bugs (*Lygus* spp.), plant bugs (*Adelphocoris lineolatus* Goeze), and minute pirate bugs (*Orius tristicolor* White) were more abundant in flood-irrigated plots. Alfalfa weevil (*Hypera postica*, Gyll.), pea aphids (*Acyrtosiphon pisum*, Harris), ladybird beetles, and lacewings (*Chrysopa oculata* Say) tended to be more abundant in the sprinkler-irrigated plots.

**TRICHOPLUSIA NI: A NOVEL HOST FOR THE BRACNOID COTESIA CONGREGATA.** A. Keddle, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Under laboratory conditions the braconid parasitoid *Cotesia congregata*, a specialist on members of the Sphingidae, was successfully reared for two generations on *Trichoplusia ni*, a member of the Noctuidae. Upon dissection *T. ni* larvae were observed to contain variable numbers of parasitoid larvae, (1 - 219) and numerous teratocytes. Immunohistological staining of parasitized and unparasitized insects revealed cross-reactivity (of antibodies prepared against polydnavirus structural proteins) with various cells, tissues, and the teratocytes. Haemocytes apparently destroyed in parasitized caterpillars stained heavily. The surfaces (basal lamina) of many tissues in both parasitized and unparasitized caterpillars were stained, and the outer surface of the parasitoid larva also stained. Within the parasitoid larvae a group of unidentified cells, possibly cells destined to be part of the female reproductive system, also stained. No staining was observed in another noctuid species in which *C. congregata* oviposited but was unable to develop.

**GUESS WHO CAME TO DINNER? (PART II).** S. Bjornson, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3; and M. Steiner, Alberta Environment Centre, Vegreville, Alberta, T0B 4L0.

The barn mite, *Tyrophagus putrescentiae* Schrank, is utilized as an alternative food source for the thrips predator *Amblyseius cucumeris* (Oudemans) during mass colonization and shipment. Light and transmission electron microscopy have revealed contaminants among *T. putrescentiae* colonies, including a *Chytridiopsis*-type microsporidium and a septate gregarine. These potential pathogens may adversely affect barn mite colonies and indirectly influence the viability of *A. cucumeris* during colonization and shipment.

**BTK IMPACTS ON NON-TARGET LEPIDOPTERA IN BOREAL FOREST GAPS: A RESEARCH PROPOSAL.** M. Williamson, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

My objective is to investigate how the aerial application of *Bacillus thuringiensis* var. *kurstaki* (BTK), used to control spruce budworm, may affect non-target Lepidoptera in boreal forest stands in northern Saskatchewan. I propose to (1) quantify the impact of BTK treatments on Lepidoptera living in non-forest or gap communities; (2) study the speed and extent of recovery of this fauna after BTK application; (3) study the impact of BTK application on parasitoids using lepidopterous hosts within forest and non-forest communities. These effects will be quantified by sampling replicate gaps before and after spraying in the following treatment blocks: (1) 2 yrs of successive aerial application of BTK, (2) 1 yr of application, (3) 1 yr of application of only inert ingredients used with BTK, and (4) no treatment (control blocks). The Lepidoptera community will be sampled using the following techniques: larvae by branch sampling, beating and sweep-netting and adults by light trapping (moths) and netting (butterflies). Larvae will be reared to adults in the laboratory for

species identification. Manipulative experiments will further explore immediate impacts of BTK on larvae feeding on Bebb's willow (*Salix bebbiana*) aerially sprayed in the field and on lab-reared painted lady (*Vanessa cardui*) and mourning cloak (*Nymphalis antiopa*) feeding on manually sprayed potted host plants. Indirect impacts of BTK on parasitoids will be obtained from their emergence patterns on reared lepidopteran larvae.

ALTERNATIVES TO INSECTICIDES FOR CONTROL OF BIRCH LEAF MINERS. R. McQueen, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

Two introduced species of birch leaf miner, *Fenusa pusilla* and *Profenusa thomsoni*, cause conspicuous and unsightly damage on several species of ornamental birch in the City of Edmonton. The only control available is with insecticides, usually dimethoate applied as a soil drench. This insecticide is expensive, highly toxic and often ineffective. I want to find alternatives to this insecticide that will provide an effective control of birch leaf miner in an urban setting, and that will be acceptable to people living in the community. These alternatives include (1) trapping adults with sticky traps, (2) augmenting populations of effective soil and ground predators (3) modifying the ground habitat so that the survival rate of birch leaf miner larvae decreases.

AN INSECT, A GALL, AND A MYCOPARASITE. C. Currie, Department of Entomology, University of Alberta, Edmonton, Alberta, T6G 2E3.

*Epuraea obliquus* (Coleoptera: Nitidulidae) has a life cycle which is closely associated with western gall rust (*Endocronartium harknessii*). The larvae and adults feed on spores located on the surface of the gall. Western gall rust is parasitized by the fungus *Scytalidium uredinicola*, which causes reduction in spore germinability and production. I established that *E. obliquus* is a vector for this mycoparasite. Adult beetles fly from gall to gall, transporting *S. uredinicola* spores as they go. Beetles emerging in spring can also infect galls, because *S. uredinicola* spores can overwinter on them. A potential new method of biological control of western gall rust is to enhance dissemination of *S. uredinicola* by using *E. obliquus* as a vector.

**ENTOMOLOGICAL SOCIETY OF ALBERTA**  
**MINUTES OF EXECUTIVE MEETING**  
Agriculture Canada Research Station, Lethbridge  
October 14, 1993

Present:	Rick Butts	Mark Goettel	Alec McClay
	Bev Mitchell	Daryl Williams	

Absent	Robert Holmberg	David Langor	Tim Lysyk
	Michi Okuda	John Spence	

Meeting called to order at 6:13 pm.

Approval of Agenda:

MOTION: That the agenda be adopted - McClay/Williams. CARRIED

Adoption of minutes:

MOTION: That the minutes of the 15 October 1992 Executive Meeting be adopted - Williams/McClay. CARRIED

Business arising from previous meetings.

Working group to investigate the use of insects in elementary education:  
Bev Mitchell and Mike Dolinski have been active. They experienced difficulty in getting teachers interested. Will defer their attempts until Fall. A bug room was set up in the Provincial Museum. A 90 min presentation is planned at the Fall Teacher's Convention.

Insect Collection Contest (temporary) Committee: No report.

MOTION: That the Executive recommend that the Insect Collection Contest be discontinued - Williams/McClay. CARRIED

Insect Collectors Guide (temporary) Committee: Tim Lysyk has entered the text onto the computer. Text will be distributed for changes shortly.

Officer's Reports.

Treasurer's report: Daryl Williams reported that Society funds were kept in 3 different types of accounts; a 1-year term deposit, a 2-month renewing deposit and a chequing account.

Secretary's report: Mark Goettel reported that he had issued one "ESA Bulletin." There were difficulties with the membership list with many Proceedings being returned by the post office. He recommended that Proceedings be mailed out to current members only and that the membership list be kept as current as possible.

Editor's report: On behalf of David Langor, Daryl Williams reported that the 1992 Proceedings should be ready within the next few weeks. These were delayed due to the lateness of the Auditor's Report.

Regional Director's report: Bev Mitchell reported that we need representatives on ESC committees such as the Endangered Species, Common Names, Scholarships and Membership Committees.

## Committee Reports.

1993 Annual Meeting Organizing Committee: Rick Butts reported that there were 55 confirmed registrants, 69 banquet tickets sold and that he expected about 75 people would attend.

Nominations Committee: Alec McClay reported that the nomination for Treasurer was Jim Jones and that he would find others for the other positions during the meeting.

Membership Committee: Alec McClay reported that we had at least 4 - 5 new members.

Science Fair Liason Committee: No report. The executive recommended that this committee be disbanded.

Awards Committee: No report.

## New Business.

Auditor's report for 1992: Daryl Williams reported that this was now done.

Appointment of resolutions committee: Jim Jones was appointed to lead a resolutions committee.

## Adjournment.

MOTION: That the meeting be adjourned - Goettel/McClay. 7:21 pm

## **ENTOMOLOGICAL SOCIETY OF ALBERTA MINUTES OF THE ANNUAL MEETING**

Agriculture Canada Research Station, Lethbridge  
16 October 1993

Meeting called to order at 11:20 AM by President Rick Butts.

Approval of Agenda.

MOTION: That the agenda be approved -Spence/Gooding. CARRIED

Adoption of minutes of previous Annual Meeting.

MOTION: That the minutes of the previous meeting be adopted -  
Shemanchuk/Keddie. CARRIED

Business arising from previous Annual Meeting.

Working group to investigate the use of insects in elementary education:  
Bev Mitchell reported that the group was active in the past year..  
Teachers at the Edmonton Public and Separate School Boards and  
the Alberta Teachers Association were approached. There was much  
enthusiasm which was encouraging. It was made clear, though, that  
any "experimentation" could not be destructive to life.  
MOTION: That the report be accepted - Mitchell/McClay. CARRIED

Discussion ensued. Several suggestions were made that we provide  
literature. Bev pointed out that there was no lack of literature and  
materials. There was also no lack of entomologists willing to help.  
Teachers were simply reluctant to take on new responsibilities in an  
already overburdened curriculum.

Insect Collection Contest (temporary) Committee: Rick Butts reported that  
there was no report. He recommended that this committee be  
disbanded.  
MOTION: That the Executive investigate if this item is in the Bylaws  
and take the necessary steps to delete it - Shemanchuk/Ball.  
CARRIED.

Insect Collector's Guide (temporary) Committee: Tim Lysyk reported that  
the bulk of the text was entered into the computer and that revisions  
were needed to bring it up to date. MOTION: That the report be  
accepted - Lysyk/Spence. CARRIED

## Message from the Entomological Society of Canada.

George Gerber thanked the ESA for the opportunity to speak. He reported that a new editor for the Canadian Entomologist has been found as Al Ewen was stepping down. The new editor will be Peter Kevan who will be taking charge on 1 January 1994. The Publications Committee is looking into streamlining the operations. Submission of manuscripts in electronic form is being considered.

Eighty-one percent of the membership voted to withdraw from the Canadian Federation of Biological Sciences; however, since we need to give 1 years notice, we need to pay the 1994 membership dues. President Gerber appealed to members to include the extra fee with their annual membership fees as this was placing a great strain on the Society's resources.

President Gerber appealed for nominations for the various achievement awards as the number of nominations was low.

## Reports of officers.

**Treasurer's Report:** Daryl Williams presented the interim treasurer's report. Our balance remains at over \$17 000 and the monies are deposited in 3 types of account; a 1-yr term deposit, a 2-month renewing deposit and a chequeing account. **MOTION:** That the treasurer's report be accepted - Williams/Mitchell. **CARRIED**

**Secretary's Report:** Mark Goettel reported that he had issued one "ESA Bulletin" during the year. There were difficulties with the membership list with several Proceedings being returned by the post office. He recommends that Proceedings be mailed out to current members only and that the membership list be kept as current as possible. **MOTION:** That the report be accepted - Goettel/Lysyk. **CARRIED**

**Editor's Report:** Dave Langor reported that the Jasper Proceedings will be sent out within 1-2 weeks and promised that the Proceedings of the present meetings would be out by February if everyone were to submit their reports and abstracts before the end of November. **MOTION:** That the report be accepted - Langor/Shemanchuk. **CARRIED**



Regional Director's Report: Bev Mitchell reported that not all members of the ESA were members of the ESC. He handed out a brochure on the ESC and appealed that ESA members ensure that they also belong to the ESC. MOTION: That the report be accepted. Mitchell/Keddie. CARRIED

President's Report: President Butts thanked his executive, especially southern director Tim Lysyk and secretary Mark Goettel who stepped in at very short notice to help organize the meeting. This year the society initiated contacts with school systems trying to educate young children about entomology. Also, the society initiated the editing of the insect collector's guide. Butts says he believes the main purpose of the society is to facilitate fellowship and it seem to be fulfilling that role very well. MOTION: That the report be accepted - Butts/Jones. CARRIED

#### Reports of Standing Committees.

1993 Annual Meeting Organizing Committee: Tim Lysyk reported that there were approximately 58 registrants for the meeting, 30 papers were presented, and 78 people attended the banquet

Membership Committee: Alec McClay repeated Bev Mitchell's call and encouraged everyone to join the Entomological Society of Canada.

Science Fair Liason Committee: MOTION: That this committee be disbanded - Butts/Shemanchuk. CARRIED

Awards Committee: John Spence encouraged nominations for ESC Awards. MOTION: That the report be accepted - Spence/Keddie. CARRIED

Nomination Committee: Alec McClay presented the following slate:

President.....	Alec McClay
Past President.....	Rick Butts
Vice President.....	Andrew Keddie
Secretary.....	Lloyd Dosdall
Treasurer.....	Jim Jones
Director (south).....	Tim Lysyk
Director (center).....	Hector Carcamo
Director (north).....	Robert Holmberg
Director (ESC).....	Bev Mitchell
Editor.....	David Langor
Auditors.....	J. Volney and J. Spence

MOTION: That nominations cease - Spence/Ball. CARRIED  
As there were no other nominations, the slate was declared elected.

Resolutions Committee: Jim Jones presented the following resolutions:

MOTION: Whereas the Organizing committee has done a splendid job of putting together an interesting and informative meeting on short notice,

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 Rick Butts, Tim Lysyk, and Mark Goettel.

Whereas the theme of the 1993 meeting, "Overwintering Strategies in Insects", 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 thanks to Dr. Roger Moon.

Whereas, the members and guests attending the after-the-banquet presentation were both enlightened and entertained by the speech and photos of the talk entitled "Mountain Gorillas of Rwanda",

Therefore, be it resolved that the Society send a letter of appreciation to Mr. Renee Barendregt.

New Business.

1994 Annual Meeting: Gordon Pritchard announced that he will be hosting the next meeting in the central region.

Adjournment.

The meeting adjourned at 12:30 PM on a motion by Tim Lysyk.

**Entomological Society of Alberta**  
**FINANCIAL STATEMENT**  
 To 31 December 1993

Bank assets, 1 January 1993:

**\$17,008.88**

**CREDITS**

MEMBERSHIPS:

Regular	1994:	36 @ \$10.00	360.00
	1993:	43 @ \$10.00	430.00
	1992:	17 @ \$10.00	170.00
	1991:	1 @ \$10.00	10.00

Student	1994:	9 @ \$ 5.00	45.00
	1993:	2 @ \$ 5.00	10.00
	1992:	1 @ \$ 5.00	5.00

Corporate	17.00
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Currency exchange	<u>9.21</u>
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Total memberships	1056.21	1,056.21
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INTEREST:

Term deposit monthly interest	239.18
Term deposit maturity interest	<u>575.39</u>

Total interest	814.57	814.57
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ANNUAL MEETINGS, 1993:

Registrations		
regular	58 @ \$35.00	2030.00
accomp. pers.	21 @ \$15.00	<u>315.00</u>

Total registrations	2345.00	<u>2,345.00</u>
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**Total Credits**

**21,224.66**

**EXPENDITURES****ANNUAL MEETINGS, 1993:**

Catering	1119.00	
Honorarium, banquet speaker	100.00	
Expenses, keynote speaker	134.40	
Airfare, keynote speaker	748.53	
Bar services	461.19	
Nametag holders	<u>40.00</u>	
Total, Annual Meeting	2603.12	2,603.12

**PUBLICATION COSTS:**

Printing costs, 39th Proceedings	585.29	
Printing costs, 40th Proceedings	<u>460.15</u>	
Total Printing Costs	1045.44	1,045.44

**MISCELLANEOUS:**

Expenses, keynote speaker, 1992 meeting	125.00	
Photocopy charges	31.20	
Mailing charges	208.71	
Photographic services	21.36	
Corporate services	74.00	
Cash float held by Treasurer	36.00	
Banking charges	<u>21.98</u>	
Total	518.25	<u>518.25</u>

<b>Total Expenditures</b>	<b>4,166.81</b>
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**BALANCE SUMMARY**

Total Credits	21,224.66
Total Expenditures	<u>4,166.81</u>
Balance	17,057.85

Bank Assets on 31 December 1993	<b>\$17,057.85</b>
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[This financial statement was audited by Jan Volney and John Spence]

## CORRECTION - ESA Officers for 1990 and 1991

The lists of Officers of the ESA for 1990 and 1991, which appeared on the inside front cover of the Proceedings of the 39th Annual Meeting of the Entomological Society of Alberta, are incorrect. The corrected lists are as follows:

	1990	1991
President	B. Schaber	D. Langor
Vice-President	D. Langor	J. Spence
Past President	G. Pritchard	B. Schaber
Secretary	R. Linowski	M. Geottel
Treasurer	G. Hilchie	D. Williams
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Director - North	A.T. Finnamore (1990)	R. Holmberg (1993)
Director - Central	J Jones (1992)	J. Jones (1992)
Director - South	R. Butts (1991)	R. Butts (1991)
Regional Director	A. McClay (1992)	A. McClay (1992)

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(Revised: September 1994)

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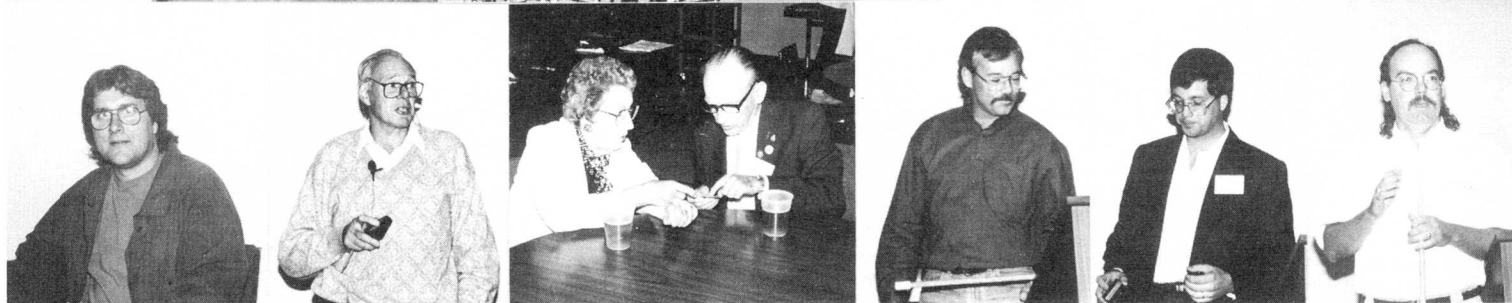
Alberta Environmental Centre  
 Bag 4000  
 Vegreville, Alberta, T9C 1T4

Note: area code for Alberta is 403.

THE VENUE		Watch out Leafy Spurge		Fed up with the drudgery of farm life, Carmen leaves her kin to seek enlightenment at the Entomological Society of Alberta meeting		Ron Gooding  Damn cow patties! They're all over the place					
Great Eats		Evan Gushul		Rick Butts      Mark Goettel		Come on guys, I smell beer. Wait!! It's a trap! Fall back, fall back! Aaaaaaaaahh.....		Scott Digweed			
Hector Carcamo  Colin Hergert      Alec McClay  Lyoyd Doddall			Hector Carcamo      Al Meyer  Michelle Williamson  Robin McQueen      Daryl Williams			Troy Danyk      Robert Ouedraogo		Dan Johnson			
Burt Schaber  Hey Lysyk! Wake up and listen!		Derek Lactin  Look Mom, no cavities		Mary Reid		Wes Taylor		Bernie Sonntag  A welcome from the director		George Gerber  Greetings from the ESC President	
Robin McQueen		Rick Butts      Ken Richardson      Bernie Hill  Bernie sings for his supper, but went hungry			Anna Hergert  Clara Shemanchuk      Margaret Nelson				David Langor		
Alec McClay  Excuse me, where is the nearest washroom?		Jim Prus      Sophia Verzosa			Bernie Hill  .....and now for my next selection....		Wes Taylor      Joe Shemanchuk		Rick Butts		



Terry Danielson Bob Baron		Gordon Pritchard Bert Finnamore <i>Hey Gordon, I bet I can spit farther than you!</i>		Bert Finnamore Lloyd Dosdall Graham Griffiths		Andy Keddie
George Ball <i>Serene in retirement</i>	Roger Moon <i>Keynote speaker</i>	Michelle Williamson	Lloyd Dosdall	Simon Wilkins Bernadette Wilkins <i>Honest dear, I had only 3 beers!</i>		
<i>Praying for a short business meeting</i>	George Ball		Alec McClay	George Ball Bill Nelson Burt Schaber		
	George Gerber	Kay Ball		Al Schaaf Joe Shemanchuk <i>The Golden Boys</i>		
<i>Gerry, I'm a little shy. Would you please turn off the light.</i>	John Spence <i>...in repose</i>	Susan Bjornson	Terry Thormin Colin Hergert Greg Pohl		Christian Klingenberg	
<i>Hola Amigos!!!</i>  Hector Carcamo		Cameron Currie <i>Come on punk, make my day!</i>	Dicky Yu	Renee Barendregt	Bev Mitchell	<i>Wake me up when I'm done.</i>  James Hammond
Tim Lysyk <i>I'm no angel!</i>	Peter Harris	Hazel Gushul Evan Gushul	Doug Colwell	Kevin Floate	Rick Butts <i>OK, who threw the damn pointer?</i>	



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