

PROCEEDINGS OF THE 44TH ANNUAL MEETING OF THE



Entomological Society of Alberta

Lethbridge, Alberta Oct. 1 - Nov. 2 1996

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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 and Agri-food 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."

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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 the Proceedings.

PROGRAM OF THE 44TH ANNUAL MEETING

Thursday, October 31

7:00 p.m. Mixer, Registration

Friday, November 1

8:00 a.m. Registration

8:30 a.m. Introduction and Welcome

8:45 a.m. Keynote address. T. G. Whitham, University of Northern Arizona, Flagstaff AZ. Plant stress and genetics affect community structure: interactions of pinyon pine, insect herbivores, mycorrhizae, microbes, birds and mammals.

9:45 a.m. Coffee

10:15 Submitted oral papers

12:30 Lunch

1:30 Submitted oral papers

3:00 Coffee

3:30 Submitted oral papers

5:00 Session ends

Saturday, November 2

8:30 Submitted oral papers

10:00 Coffee

10:30 Annual General Meeting

PRESIDENT'S REPORT 1996: Kevin Floate

Let me begin by thanking each of you for coming out to attend this year's annual meeting. As both presenters and as members of the audience, your continued support is what makes these meetings so successful, year after year. Although many of you have thanked me for organizing the meeting, it really was a group effort on the part of myself, Tim Lysyk, Rose DeClerck-Floate, and Troy Danyk. Sophie Versoza, Tracy Dickinson and Jennifer Otani helped with the projector and moderating. Troy deserves special recognition for having the foresight to stockpile a case of projector bulbs and a spare projector in case they were needed - and they were. Who would have guessed that we would burn out four projector bulbs in the first four talks!

My duties as President were not at all onerous, in part, due to the efforts of a capable Executive. However, there were a number of noteworthy activities conducted during the past year. Application forms for the Society's new "Undergraduate Award" and "Student Travel Grants" were mailed to 14 colleges and universities in Alberta. No requests were received for the former, but 4 travel grants were each funded for \$50. Both awards will continue to be offered to encourage student participation at annual meetings. At this year's meeting, members passed a motion to recognize the efforts of individuals, outside of professional obligations, that promote entomology to the public. This recognition will be in the form of the "Carr Award", named for Frederick Stephen Carr (1881-1934), who published the first list of beetles of the province and amassed a collection of 100,000 specimens that were donated to the University of Alberta in 1939. It also recognizes Frederick's son, John, and daughter-in-law, Bertha, both of whom also are avid entomologists. Members are asked to convey the availability of the undergraduate award and student travel grants to suitable candidates, and to forward nominations for the Carr Award to the Executive.

At this year's meeting, it also was decided that each member of the Society will receive a copy of the newly revised "The Insect Collector's Guide". Members are asked to provide their copy to interested individuals for photocopying, as a means of encouraging amateur entomology. The Society also passed a motion at the meeting to offer a book prize at regional science fairs, for projects with an entomological theme. I believe that efforts such as these, which nurture a developing interest in insects, will repay the Society many-fold in future years.

I thank you for allowing me to serve as President of the Society during the past year, and I look forward to seeing you all in Edmonton next year, at the joint annual meeting of the Entomological Society of Alberta and the Entomological Society of Canada.

KEYNOTE SPEAKER: THOMAS G. WHITHAM

Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ
86011 (Thomas.Whitham@nau.edu).

A genetic component to community structure: interactions of environmental stress, pinyon pine, insect herbivores, mycorrhizae, birds and mammals (Talk presented at meeting) Since the eruption of Sunset Crater in 1064 A.D., colonizing pinyon pines have encountered a new stressful environment for which they are not yet adapted. These stressful conditions have resulted in increased susceptibility to a keystone herbivore, the stem and cone-boring moth, *Dioryctria albovittella*. The impacts of these moths on plant growth and reproduction favour genetically resistant trees which represent a minority in this dynamic system. Insect-caused impacts on genetically susceptible trees affect mycorrhizae, seed dispersing birds and mammalian seed predators. Because the distributions of these diverse taxa map onto the underlying genetic-based resistance traits of the pinyon population, these studies suggest a genetic component to community structure. Furthermore, the responses of the 350+ species of this community to the recently altered environment of Sunset Crater suggest how global climate change could affect biodiversity.

Hybrid plants and hybrid zones as repositories of biological diversity: the need for conservation (Talk presented at Department of Biological Sciences, University of Alberta) While human-caused disturbances and the introduction of exotics can result in hybridization that negatively affects native species, natural hybridization among native species can have many positive effects and should be preserved as part of a dynamic ecosystem. Hybrid zones can be: 1. centers of plant speciation, 2. centers of biodiversity for arthropods, 3. essential habitat for the preservation of rare insects, 4. centers of insect speciation, 5. sources of biocontrol agents, 6. superior habitat for nesting birds, and 7. sources of economically important plants. I also review the current efforts to conserve hybrid plants and propose guidelines for their conservation.

ABSTRACTS OF SUBMITTED PAPERS

Reduced insect activity in dung voided by cattle treated with ivermectin. K.D. Floate, Agriculture & Agri-Food Canada, Lethbridge Ivermectin is a broad spectrum parasiticide with efficacy against a variety of cattle nematodes and arthropods. Most of the dose passes largely unaltered into the dung of the treated animal where it may prevent insects from developing in the dung pat. Because insects can accelerate dung pat degradation, this study was conducted to assess the risk of pastures becoming contaminated with undegraded pats following the use of ivermectin on range cattle.

In May 1994, fresh pats from untreated animals were placed in the field at the same time and in the same location as fresh pats from animals treated 1, 2, 3, 4, 6, 8, or 12 wks earlier with a recommended topical dose of ivermectin (500 mcg/kg body wt.). Emergence of *Sepsis* flies, eucoilid wasps, and two species of *Cercyon* beetles was significantly reduced in treatments post-1 to post-12 wk, relative to control pats. Emergence of the dung beetles, *Aphodius fimetarius* and *A. vittatus* was reduced in treatments post-1 wk, and treatments post-1 to post-2 wk, respectively. Differences between control and treatment groups were either not observed or unpredictable for other species (e.g., the dipteran taxa *Forcipomyia*, *Smittia*, *Psychodidae*; two staphylinid species). Similar results were obtained when this experiment was replicated in August 1994, and in a separate experiment in May 1995.

Dung degradation studies were done in 1994 and in 1995. In 1994, dung deposited by treated and untreated animals at the same time and site appeared to degrade at the same rate, but the effect of insect activity on dung degradation was inconclusive. Many pats were torn apart by birds foraging for insects or undigested seeds, and degradation was enhanced by rain and the growth of vegetation. In 1995, ivermectin was mixed in fresh dung at a level comparable to that in dung deposited by animals treated 1 wk previously with a topical application of ivermectin. After 80 days in the field, treated pats showed very few signs of insect activity and formed a hard, solid mass that hindered the growth of vegetation. In contrast, nearby control pats were largely degraded, leaving only a thin crust of the surface of the pat. Control pats showed numerous signs of tunneling and contained adult and larval dung beetles, fly maggots and other insect taxa.

In Canada, ivermectin is generally applied to young cattle entering feedlots or to grazing cattle in the fall when insect activity is normally reduced. Consequently, the effect of ivermectin use on pasture quality is largely moot. However, information from the present study can be used to minimize non-target effects of ivermectin if current use patterns for this parasiticide change.

The shape of a hybrid zone: Geographic variation of *Limnopus* water striders in western Canada. Christen Mirth, Christian Peter Klingenberg & John R. Spence, Dept. Biological Sciences, U. AB The water striders *Limnopus dissortis* and *L. notabilis* hybridize in a broad zone in western Canada, where their ranges come into contact. We compare the geographic patterns of morphometric and enzyme electrophoretic data to explore the geographic structure of this hybrid zone. Multivariate analyses of the variation in both the morphometric and allozyme data show that the gradient between the two species is the dominant feature; most variability in each data set is confined to a single dimension, and concordance between them is remarkable. In contrast, trend surface analyses show that the distributional patterns of these features are complex. Ecological and topographic features appear to be major determinants of introgressive hybridization in these two taxa.

Pond-associated arthropods: Inventory initiatives in coastal montane British Columbia. Kamal Gandhi, Dept. Biological Sciences, U. AB Seasonal and permanent ponds provide important habitats for aquatic arthropods. Members of many

species use ponds for breeding, mating or feeding, and their life-cycles are closely associated with fluctuations in water level. Accelerated forest harvesting in the wet coastal regions of British Columbia might adversely affect these sensitive habitats, especially in high elevations where such ponds are common. Lack of taxonomic and distributional knowledge about most of the aquatic taxa compounds to the difficulty of making basic conservation recommendations. My study, therefore, aims to provide an inventory of pond-associated arthropods and to contribute to an understanding of the potential impact of forest harvesting on these fragile ecosystems.

Cliff-faces, alvars, and islands: The effect of habitat heterogeneity on the spider communities from the Niagara Escarpment in southern Ontario. C.M. Buddle, Biological Sciences, U. AB. Studies of the spider fauna from two regions of the Niagara Escarpment in southern Ontario were completed in 1995 and 1996. The first project tests the hypothesis that cliff-faces are marginal habitats because they are exposed to high environmental variability and therefore contain low diversity and abundance of spiders. A 700 m section of cliff-face near the town of Milton was chosen for study. Spiders were sampled with pan traps on the cliff-face and collections were compared to those from two adjacent habitats (the plateau forest above the cliff-face and the talus slope at the base of the cliff-face). Overall spider abundance did not differ among habitats, and web-building spiders were more abundant on the cliff-face. The cliff-face does not deter spiders; this habitat may actually support a more diverse spider community than the adjacent habitats. The second project investigated the spider fauna from the islands of Fathom Five National Marine Park at the northern end of the Niagara Escarpment. This work was designed to test the central assumptions of the theory of island biogeography: spider diversity should increase with island size and decrease with greater island distance from the mainland. Fifty-five species of spiders were collected using pan traps set in a variety of habitats available on the islands including marl beds, a dry alvar, and cedar stands. Cedar stands exist on all the islands and on the mainland and are therefore used for island-mainland comparisons. A detailed examination of Bears Rump island suggests that habitat heterogeneity may be the key factor influencing the distribution of spiders on the whole island as the hunting spiders common to the dry alvar appear to move easily into the adjacent cedar stand. This initial examination of spiders from Fathom Five National Marine Park suggests that islands with more diverse habitats contain distinct and diverse spiders and this occurs independent of island size and island distance from the mainland. Preliminary results from these projects show that habitat heterogeneity has a large effect on the spider fauna from the Niagara Escarpment.

Activity of an epigeic earthworm restructured pine forest floor: Does it restructure the oribatid mite community? M.A. McLean & D. Parkinson. Dept. Biological Sciences, U. Calgary Abstract was not submitted.

Effect of forest structure on dispersal in bark beetles. Trevor Hindmarch, Dept. Biological Sciences, U. Calgary Dispersal between habitats is a cost experienced by many organisms. This cost may be evident as mortality, reduced vigour, or the interruption of feeding and breeding activities. Dispersal is an important part of the life history of the pine engraver bark beetle, *Ips pini* (Coleoptera: Scolytidae). This experiment determined the effect of forest structure on dispersal in pine engravers. Pine engravers were marked, released, and caught in commercially baited pheromone traps at 50 m intervals, up to 200 m away from the point of release, in a commercially thinned lodgepole pine stand (600 trees ha⁻¹) and two unthinned stands (1800 and 2100 trees ha⁻¹). Fat reserves of beetles caught in the unthinned stand and one unthinned stand (1800 trees ha⁻¹) did not change detectably during dispersal, but the latter did show a trend indicating fat reserves were lower following dispersal. Fat reserves of beetles caught in the second unthinned stand (2100 trees ha⁻¹)

were significantly lower following dispersal. These results suggest that dispersal is affected by forest structure, and that dispersal costs are lower in open stands than in dense ones. Future experiments will investigate the effect of forest structure, which affects fat reserves, on reproductive strategies in pine engravers. This information may be useful in predicting population dynamics based on landscape patterns.

Effects of density on reproductive success of *Ips pini* (Coleoptera: Scolytidae): Is aggregation in dead trees beneficial? Geneva L. Robins and Mary L. Reid, Dept. Biological Sciences, U. Calgary In this study, the aggregating pine engraver beetle, *Ips pini* was reared in a range of low densities in laboratory conditions on lodgepole pine logs to determine if there was a fecundity advantage of breeding aggregations. Mean reproductive success for both males and females declined exponentially with increasing density. Therefore, a direct reproductive benefit for aggregation was not detected in this study. Maternal females appeared to be compensating for the detrimental effects of higher densities by leaving earlier to reduce the number of unproductive eggs. Some beetles voluntarily colonized the logs during the course of the experiment. These volunteer beetles settled independently of the original density despite the observed costs of density. *Ophiostoma* sp., a black-staining fungus, was found on the logs and could be competing with pine engravers for bark area, potentially favouring pine engraver aggregations. However, it remains perplexing why pine engravers actively aggregate in nature.

Consequences of group size for mate attraction in pine engraver bark beetles. Mary L. Reid, Dept. Biological Sciences and Kananaskis Field Stations, U. Calgary Bark beetles (Scolytidae) inhabiting dead trees often actively form breeding aggregations despite a considerable reproductive cost arising from the resulting high densities. One explanation for the occurrence of such breeding aggregations is that there is a mating advantage for males in larger groups, perhaps due to enhanced signaling with pheromones. I conducted two field experiments to examine the effects of group size on mating success in pine engravers, *Ips pini* (Say). In the first experiment, funnel traps were baited with small logs inhabited by unmated males in group sizes ranging from 1 to effectively 30 males. I found that the number of pine engravers caught in the traps was proportional to the number of males in the bait log, indicating that there was no mating advantage to being part of a larger group. In the second experiment, 2 breeding males were established in each of 14 windthrown lodgepole pine, and in half the trees commercial pine engraver pheromone baits were added to increase the apparent group size (but not the actual number of males available). Most males in both treatments attracted mates, but males with pheromone baits had significantly more mates and attracted mates sooner (as judged by the length of female egg galleries). However, this could arise because few males were actually available to females. Body size of females attracted to males with and without baits did not significantly differ. However, egg densities on baited logs were significantly lower than on unbaited logs, suggesting that females may be assessing density and changing their oviposition strategies accordingly. Thus, although males' mating success may be somewhat enhanced by being in groups, this was offset by lower oviposition rates of females.

The presence and impact of protozoan gut parasites on the host *Gerris buenoi* (Hemiptera: Gerridae). Rosalind Barrington-Leigh, Dept. Biological Sciences, U. AB. Abstract was not available.

Metabolic diversity of the hindgut symbionts - an aspect of cockroach success. L. Zurek and B. A. Keddle, Dept. Biological Sciences, U. AB The American cockroach, *Periplaneta americana*, is an omnivorous species and can feed on any organic material available. It can also withstand a substantial degree of starvation (up to 3 months

when water is available). It has been shown, that the dense and extremely varied microbial population in the hindgut contribute to the cockroach metabolism and development. The microbial metabolic diversity includes: carbohydrate and amino acid fermentation; degradation of cellulose, hemicellulose, carboxymethylcellulose, chitin and uric acid; methanogenesis; acetogenesis; sulfate-reduction; iron-reduction; denitrification. The significance of microbial fermentation, methanogenesis and sulfate reduction in the cockroach hindgut will be discussed. The potential of using the gut bacterial symbionts for biological control of omnivorous cockroaches will be examined. (Talk was cancelled)

The perilous life of a parasitoid: Risks of immunosuppression. J. Dunlop, M. McFarlane, J. Tansy, L. Zurek, B.A. Keddie. Dept. Biological Sciences, U. AB

Braconidae and Ichneumonidae (Hymenoptera) are two families which are noted for their parasitic lifestyle. Investigation of this trait has led to the discovery of polydnaviruses, entities which immunosuppress hosts and permit parasitoid development within hosts. Benefits for parasitoids possessing polydnaviruses are obvious, the risks less so. Observations of interactions with other microorganisms suggest that at times immunosuppression may lead to parasitoid death. These results may have important implications for biological control programs.

***Bacillus thuringiensis* (Btk): Are we opening and killing a can of worms? Michele L. Williamson, Dept. Biological Sciences, U. AB**

Bacillus thuringiensis Berliner ssp. *kurstaki* (Btk) has been aerially sprayed for a number of years over the boreal forest near Big River, Saskatchewan to control spruce budworm (*Choristoneura fumiferana* (Clemens)). However, little is known about Btk's effects on non-target Lepidoptera. This study focused on non-target Lepidoptera in wetland gaps that are sprayed inadvertently during control operations. Deposition and laboratory bioassays suggested that enough viable Btk was applied during sprays to have the potential to affect susceptible non-target Lepidoptera.

Susceptibilities of individual non-targets to Btk were quantified to determine whether these species have the potential to be affected during field sprays. Four Btk levels were sprayed with aerial and backpack applicators on larvae of *Epinotia crenana* (Kft.) that were reared in mesh bags on *Salix planifolia* (Pursch). Three Btk levels (cultured Btk, diluted Dipel 48AF and no Btk) were applied to larvae of *E. crenana* and *Nycteola frigidana* (Wlk.) reared in the laboratory. Both aerial and backpack sprays increased larval and pupal mortalities of *E. crenana* and decreased adult emergence. Cultured Btk and diluted Dipel had the same negative effects on *E. crenana* and *N. frigidana*. Populations of these non-target species may be affected by Btk during spray control operations.

Effects of cultured Btk vs. carrier ingredients were isolated by the laboratory experiment mentioned above. For both lepidopteran species, cultured Btk increased larval and pupal mortalities of *E. crenana* and *N. frigidana* and decreased adult successes. *Bacillus* was found in Btk-treated larvae of these non-targets and bioassayed *Trichoplusia ni* (Hubner) that died during rearing. Thus, Btk killed these Lepidoptera.

Establishment of the stem weevil *Mecinus janthinus* on Dalmatian toadflax in BC. R. DeClerck-Floate, Agriculture and Agri-Food Canada, Lethbridge & B. Wikeem, BC Ministry of Forests, Kamloops The European weevil, *Mecinus janthinus*, was introduced to Canada in 1991 to control Dalmatian toadflax. Field releases were made in 1994 throughout the BC interior using a Kamloops-reared colony. Selected releases were monitored in 1995-1996 for establishment. The weevil was recovered at all release sites except for Princeton, BC. Success of *M. janthinus* populations varied among sites, and may be partly dependent on over-winter survival of adults. Adult mortality ranged from 11% (Trail) to 87% (Lillooet). However, despite major annual reductions in population

size at sites due to adult mortality, there is evidence that the weevil also has a high reproductive capacity and can rapidly increase in number on a yearly basis. Continued monitoring of weevil populations and cold tolerance studies will tell us if *M. janthinus* is a good candidate for biocontrol of toadflax in Canada.

Integrating phenology modeling and geographic analysis to evaluate a candidate (*Altica carduorum*, Coleoptera: Alticidae) for biological control of Canada thistle (*Cirsium arvense*, Asteraceae) on the Canadian Prairies. D.J. Lactin, P. Harris, D.L. Johnson, F.-H. Wan, Agriculture and Agri-food Canada.

Leaf-feeding beetles, *Altica carduorum*, from a population in N.W. China have been identified as candidate agents for biocontrol of Canada thistle, *Cirsium arvense*. We assessed the potential of beetles from this population to establish on the Canadian Prairies. We applied a simple phenological model to determine where sufficient heat accumulates to allow completion of at least one generation per year. The model was applied both with and without a submodel of adult beetle thermoregulation (basking in sunlight to increase body temperature). The model was driven using meteorological data from a grid covering the agricultural region of the Canadian Prairies, ca. 670,000 km² in area, at a resolution of 50 x 50 km. In each grid square, we calculated the percentage of the years 1960-1989 in which the model indicated that at least one generation could have been completed; these proportions were categorized (0 - 80%; 80-99%, and 100%) and mapped. We also produced maps of *C. arvense* density over the simulation region, and compared these to the maps of predicted beetle distribution using geographic information system overlay methods (SPANS GIS 5.0 for OS/2). The model results suggest that *A. carduorum* can establish over much of agricultural Alberta, Saskatchewan and Manitoba. Without thermoregulation, the predicted range (*i.e.*, the area in which one generation was completed in every year) is restricted to the warmer parts of the Prairies, where *C. arvense* is generally sparsely distributed and occurs at a low density. Inclusion of thermoregulation nearly doubled the predicted range to cover most of the range of *C. arvense* on the Canadian Prairies, missing only the cooler peripheral areas at higher elevations. These results suggest that this strain of *A. carduorum* has potential to overlap the range of *C. arvense* on the Canadian Prairies, and so has potential to control this weed.

Trends and effects of parasitism of grasshoppers in Alberta. Troy Danyk, Dept. Biological Sciences, Simon Fraser University & Dan Johnson, Agriculture and Agri-Food Canada, Lethbridge

From 1993 to 1996, we collected adults of *Camnula pellucida*, *Melanoplus bivittatus*, *M. packardii* and *M. sanguinipes* from roadside ditches near Turin, AB. The insects were maintained in the lab and dipteran parasitoids (Anthomyiidae, Tachinidae and Sarcophagidae) were collected. *Melanoplus sanguinipes* was most heavily parasitized (in terms of numbers of parasitoids per 100 grasshoppers or "%"); Anth., 1-9%; Sarc., 2-13%, Tach., 0-3%. Parasitism in *M. packardii*: Anth., 5-9%, Sarc., 0-1%, Tach., 1-4%. *Melanoplus bivittatus* were parasitized by tachinids (1-2%) and sarcophagids (1% in one year). Only anthomyiids (5% in one year) were recovered from *C. pellucida*. Six species of sarcophagids have been identified: *Acridiophaga angustifrons*, *A. gavia*, *A. reversa*, *Blaesoxipha atlanis* (most common), *Kellymyia kellyi* and *Sarcotachinella sinuata*; the anthomyiid(s) and tachinid(s) have not been identified to species. We performed an experiment to determine the suitability of grasshoppers for development of *B. atlanis*. Forty adult grasshoppers of each species were singly, manually parasitized with first-instar larvae of *B. atlanis*; 40 grasshoppers of each species were unparasitized controls. Additional insects were used to estimate initial dry masses of treatment and control insects. Grasshoppers were maintained for 9 days at 25C and 16-hour photoperiod. Total mortality of male and female *M. sanguinipes* was 95% and 75%. Total mortality of *C. pellucida* was 90% and 75% for males and females. The rate of mortality in *C. pellucida* prior to day 4 exceeded

that of *M. sanguinipes*. No control insects in these two species died. Mortality of male and female *M. bivittatus* was 35% and 40%; 5% of unparasitized males died. Mortality for male and female *M. packardii* was 30% and 35%; 5% of control males died. Unparasitized males in all species experienced a mean loss in dry mass; control females gained dry mass. In *C. pellucida* and *M. sanguinipes*, parasitized males and females lost more mass than control counterparts. In *M. bivittatus*, there was no difference in mass loss between parasitized and unparasitized insects. In *M. packardii*, only parasitized females lost more than control counterparts. Eighty percent of recovered parasitoid larvae in *M. sanguinipes* survived; 10% died within the host. In *C. pellucida*, 27% of parasitoids developed to adult; 47% died within the host. No adult parasitoids developed from *M. packardii*; 94% of parasitoids died as second-instar maggots, the remainder as first-instar larvae. In *M. bivittatus*, 83% of parasitoids died as first-instar larvae, the remainder as second instar maggots. In conclusion, suitability for development of *B. atlanis* in hosts ranks as follows: *M. sanguinipes* > *C. pellucida* > *M. packardii* > *M. bivittatus*. This contrasts with the ranking of sarcophagid parasitism in the field (*M. sanguinipes* > *M. packardii* > *M. bivittatus* > *C. pellucida*). The difference may be the result of host preferences expressed by female parasitoids in the field. The mortality observed in *M. bivittatus* and *M. packardii*, caused by parasitoids that failed to develop past the second-instar stage, may indicate that parasitoid-associated chemicals or microorganisms play a role in parasitism by sarcophagids.

Revelations about spider ballooning: Or, why spiders get there first. Robin Leech, Biological Sciences, NAIT & Alan Cady, Dept. Zoology, Miami U. Some spiders disperse aerially by ballooning. Entering the air column, assuming a height within the air column, and leaving the air column are active and responsive actions on the part of the spiders. Spiders are nektonic, not planktonic. How spiders do this is discussed in detail from unpublished observations, and accounts for spiders usually being the first-found live terrestrial animals on new islands. The zoogeographical implications are discussed.

***Lygus elisus* reproduction in relation to Canola crop phenology.** J.K. Otani & R.A. Butts, Agriculture and Agri-Food Canada, Lethbridge *Lygus elisus* is found commonly feeding on *Brassica napus* in Southern Alberta where the insect has been shown to decrease yield. Understanding in what reproductive state dispersing *L. elisus* adults enter *B. napus* and how these individuals utilize the crop should contribute to *Lygus* sampling and control methods. Studies were conducted to determine if *L. elisus* disperses to Canola in response to host crop phenology or if dispersal is a result of the reproductive requirements of the insect.

A field study was conducted using staggered seeding dates of Canola during 1994 and 1995. Sweep-net collections of *Lygus* were made in the Canola stands during the rosette, bud, and early flower stages of host development. The *Lygus* species, proportion of male to female, and reproductive status of female *L. elisus* were determined from sweep-net field collections. The stage of egg development and mating status of female *L. elisus* was determined by dissection.

Based on 1994 field data, a larger proportion of *L. elisus* males than females immigrated to the Canola during the rosette stage however egg development and reproductive status of the female occurred independent of crop stage. Although my 1995 data is still being analyzed, a high proportion of male *L. elisus* immigrated to the Canola during the rosette, bud and early flower stages of host development. A high proportion of immigrating female *L. elisus* were mated and contained chorionated eggs during all host crop stages in 1995.

Lygus elisus immigration probably occurs independent of Canola crop phenology. Although there is no apparent relationship between Canola phenology and reproduction in *L.*

elisus, finding female *L. elisus* ready to oviposit from rosette to early flower stages of Canola development impacts significantly on the pest potential of this insect in Southern Alberta.

Body size and mating in a Bibionid fly. Ralph V. Cartar, Dept. Biological Sciences, U. Lethbridge, Lethbridge I studied the mating consequences of body size in a Bibionid fly (*Dilophus caurinus* McAtee). These short-lived flies gather at inflorescences of death camas (*Zygadenus venenosus*) to obtain nectar. The sex ratio at inflorescences is strongly male-biased, and unmated males attempt to copulate with unmated nectar-feeding females. Since larger body size confers a competitive advantage in male-male competition, I predicted (1) that mated males should be larger than unmated males. Since fecundity increases with body size in females, and since males spend a significant portion of their adult life span in copulo, I predicted (2) males should mate preferentially with larger females. Since mating opportunities should decline through the day, I predicted (3) size-assortative mating should be strongest early in the day. Predictions (1) and (2) were supported. An unexpected finding was that copulating pairs with the greatest disparity between male and female size were significantly less likely to de-couple when disturbed. These results implicate the joint effect of male-male competition and male choice in influencing the observed size-based mating patterns in these lustful flies.

The boys of summer: Temporal changes in field sex ratio of *Tiphodytes gerriphagus* using *Limnopus dissortis* eggs. Joao M. Sousa, Dept. Biological Sciences, U. AB Theoretical models by Hamilton and Waage predict that sex ratio (proportion of males) will increase as both foundress number and egg batch size increases. A test of these hypotheses is made for field collected *Limnopus dissortis* eggs which are primarily parasitized by the scelionid wasp *Tiphodytes gerriphagus* in western Canada. As predicted, *T. gerriphagus* sex ratio increased with both increasing field parasitism rates (foundress number) and *L. dissortis* egg production (egg batch size). As host egg production dropped in late summer, parasitoid sex ratio decreased. This suggests that egg batch size may be a greater influence on *T. gerriphagus* sex ratio than interactions with other wasps.

The potential for using the entomopathogenic fungi *Beauveria bassiana* and *Metarhizium flavoviride* in combination to control grasshoppers: Overcoming the detrimental impacts of temperature. G. Douglas Inglis, Dan L. Johnson & Mark S. Goettel, Agriculture and Agri-food Canada, Lethbridge

Environmental conditions present the principal impediments to development of the entomopathogenic fungi *Beauveria bassiana* (isolates from Montana and Alberta) and *Metarhizium flavoviride* (isolates from Africa, West Africa and Brazil) as grasshopper control agents. In laboratory and field experiments, we demonstrated the detrimental influence of high temperature on mycosis of grasshoppers infected with *B. bassiana*. Temperatures above 35°C prohibit development and effectiveness of *B. bassiana*, and grasshopper body temperatures are elevated to this temperature and higher while basking. In our field tests, successful reductions in grasshopper populations with *B. bassiana* have been restricted to cases in which weather was cool and overcast. Maps of expected heat accumulation in grasshopper bodies indicate large regions in many years where ambient heat and sun could reduce effectiveness of *B. bassiana*. *M. flavoviride* has a higher temperature threshold and tolerance than *B. bassiana*. Experiments to assess the influence of environment on mycosis of grasshoppers caused by *B. bassiana* and *M. flavoviride*, alone and in combination, were conducted. In a 25°C environment, there was no difference between treatments in the prevalence of mortality or in the rate of progress of disease. However, *B. bassiana* performed better in fluctuating cool conditions, and *M. flavoviride* performed better in fluctuating warm conditions (when the controlled cabinet temperature was increased during daylight hours to simulate the effects of basking). Application of both pathogens simultaneously resulted in a

final prevalence of disease that was greater than *M. flavoviride* in the hot temperature environment, and at least equal to *B. bassiana* in the cool temperature environment. Present research at Lethbridge is directed towards further tests of *Beauveria-Metarhizium* combinations, geographic analysis of long-term weather patterns to determine expected effectiveness by region, and the activity of adjuvants to enhance disease.

Some entomological tidbits - 1996. J.R. Byers, D.L. Johnson, R.A. Butts, Agriculture and Agri-food Canada, Lethbridge The green grass bug, *Trigonotylus coelestialium*, has become abundant in recent years in irrigated cereal crops in southern Alberta. Infestations occur only in fields where the residue from a previous years cereal crop has been left on the surface. Severe infestations can cause stunting of seedling barley and wheat.

The cabbage seed pod weevil, *Ceutorhynchus assimilis*, was found in southern Alberta for the first time in July, 1996. This insect is a significant pest of Canola in the northwestern USA and poses a potential threat to early seeded spring Canola on the Canadian Prairies.

Jumping cocoons of an ichneumonid parasite (probably *Phobocampe* sp.) were found in Lethbridge in large numbers on bare ground beneath elm trees infested with fall cankerworm, *Alsophila pometaria*. Evidently the parasitoid emerged from the host while still in the tree and the cocoons dropped to the ground. The 'jumping' behaviour is probably an adaptation enabling the cocoon to find protected sites on the soil surface.

Patterns of fluctuating asymmetry in fly wings. Christian Peter Klingenberg, Grant S. McIntyre & Stefanie Zaklan Dept. Biological Sciences, U. AB

Fluctuating asymmetry is often used as a measure of developmental instability, because it reflects differences in the developmental expression of the same genotype on the two body sides. Nevertheless, developmental instability is a poorly understood concept. Analysis of morphometric variation among individuals has been used traditionally to examine developmental relationships among morphological traits. We apply this approach to detect patterns of fluctuating asymmetry in two data sets of fly wings, from tsetse flies (*Glossina morsitans*) and *Drosophila melanogaster*. The data consist of two-dimensional coordinates of landmarks (vein intersections, etc.), and therefore allow us to use the new methods of geometric morphometrics. ANOVAs of geometric shape variation show significant fluctuating as well as directional asymmetry. Principal component analyses of residuals from *Procrustes* superimpositions reveal localized patterns of variation in landmark position that recur in analyses of among-individual variation as well as fluctuating asymmetry, and for both tsetse flies and *Drosophila*. This correspondence of patterns suggests a common origin in conserved developmental processes.

Tropical butterflies in Alberta: Rearing *Heliconius* in the laboratory. Brent V. Karner, Dept. Biological Sciences, U. AB Based on an increased demand for tropical butterflies and associated products, *Heliconius melpomene* (the postman) and *Heliconius charitonia* (the zebra) have been used as test species for the formulation of an artificial diet for the rearing of tropical butterfly species. The ability to rear these insects under artificial conditions is discussed. Any successful artificial diet for tropical butterflies must supply both nutrients and feeding stimuli to the insect. Important nutrient considerations are investigated and the importance of plant sterols are stressed. A current artificial diet that is being tested has shown 80% rearing success from egg to adult in some trials.

Sex Ratio Strategies in Bark Beetles. Risa D. Sargent & Mary L. Reid, Dept. Biological Sciences, U. Calgary There is a large amount of data available in the literature concerning bark beetle (Coleoptera: Scolytidae) biology, and because sex ratio

biases are commonly reported this presents an excellent opportunity to examine sex ratio strategies. The diversity of mating systems within Scolytidae means that selection may favour different sex ratio strategies in different species. Documented patterns of sex ratio bias in several species were compared to those predicted by sex ratio theory, and a preliminary experiment was designed up to test the predicted pattern in pine engraver beetles, *Ips pini* (Say). Pine engraver beetles were predicted to bias their sex ratio towards the sex that benefits most from being large (males) where conditions were good, and towards the sex that benefits least from being large (females) where conditions were poor. The results show a pattern opposite to that predicted, although similar to other reports in the literature. Possible explanations and further tests of the system are discussed.

Mimicking forest tent caterpillar defoliation using scissors: Foliage response of trembling aspen. Andrea Durand, Dept. Biological Sciences, U. AB The possible regulation of the cyclic population dynamics of forest tent caterpillar (*Malacosoma disstria* Hübner) by induced changes in host quality (specifically trembling aspen, *Populus tremuloides* Michaux) has not been critically investigated. This study investigated how trembling aspen suckers responded to artificial defoliation treatments, that mimicked the type of feeding damage made by 5th instar caterpillars. Trees were defoliated either completely (100%) or partially (50%) with scissors. The 100% defoliated trees produced approximately 4 times as many new leaves than the control and 50% defoliated trees. The proportion of new leaves produced also varied between aspen clones.

ABSTRACTS FOR SUBMITTED POSTERS

Sensory structures of the Japanese scarab beetle. R.A. Yeomen Abstract was not submitted.

Intersectional cottonwood hybrids are particularly susceptible to the poplar bud gall mite. Andrea R. Kalischuk, Lori A. Gom, Kevin D. Floate, and Stewart B. Rood, Agriculture and Agri-Food Canada, Lethbridge Native and artificial cottonwood (poplar) hybrids commonly display cauliform-like galls which are caused by the poplar bud gall mite, *Aceria parapopuli*. Susceptibility to the mite gall was investigated in all cottonwoods on an island in the Oldman River at Lethbridge, Alberta, and at four other riparian sites from southeastern British Columbia to southeastern Alberta. The Lethbridge site includes an intersectional trispecific hybrid swarm involving the narrowleaf cottonwood (*Populus angustifolia*) and the balsam poplar (*P. balsamifera*) of section Tacamahaca, and the prairie cottonwood (*P. deltoides*) of section Ageiros. The other sites include only single species or the two section Tacamahaca cottonwoods. Trees were identified by examining leaf form and grouped into eight species or hybrid categories. The extent of gall infection for each tree was determined by observing leafless trees in the winter through binoculars and counting galls for one minute. Of the 352 Lethbridge trees, 63% were infected with galls and the extent of infestation varied significantly across leaf shape groupings (ANOVA $n=8$, $F=23.29$, $p=0.0001$). 78% of the intersectional hybrids (i.e. *P. deltoides* x either *P. angustifolia* or *P. balsamifera*), 56% of the intrasectional (i.e. *P. angustifolia* x *P. balsamifera*) hybrids and 36% of the trees with leaves typical of pure species displayed some galls. 9% of the Lethbridge trees were heavily infested (>50 galls/tree/minute) and these were almost all intersectional hybrids. At the riparian sites with only single species or intrasectional hybrids, very few bud galls were observed and no trees were severely infested. Conversely, artificially planted intersectional hybrids near those sites displayed severe infestations, confirming the occurrence of mites throughout the region and the susceptibility of intersectional hybrids. The susceptibility of intersectional hybrids to insect pests probably hinders growth and reproduction and thus, disfavours these hybrids. Since hybrid poplars

are widely planted for horticultural or silvicultural applications, the current study suggests that future selections consider intrasectional rather than intersectional hybrids for their resistance to the bud gall mite.

Effect of Selected Bacteria on Stable Fly Feeding and Growth. T.J. Lysyk, L. Kalischuk-Tymensen, L. B. Selinger & K.-J. Cheng, Agriculture and Agri-Food Canada, Lethbridge Larvae of the stable fly, *Stomoxys calcitrans* (L.), require decaying organic matter to complete growth and development. Larvae are typically reared in mixtures of wheat bran, alfalfa meal, dried brewer's grain, sawdust, and brewer's yeast. This media is effective for rearing purposes, but is not suitable for running controlled bioassays using pathogenic bacteria. The purpose of this study was to evaluate growth and development of stable fly larvae on bacteria isolated from stable fly eggs to develop an in vitro rearing and bioassay method.

Stable flies were obtained from a laboratory colony maintained at LRC. Bacteria were isolated from healthy feeding stable fly larvae, and isolates identified as *Aeromonas* sp., *Flavobacterium odoratum*, *Acinetobacter* sp., *Empedobacter*, and *Serratia* sp. Isolates were grown on Egg Yolk Media #4 (Schmidtman and Martin, J. Med. Entomol. 29: 232-235) at room temperature overnight. Cells were suspended in sterile distilled water to an optical density of 0.1 at 600 nm. Egg Yolk Media #4 plates were inoculated with 50 ml of each suspension. Five plates of each isolate, as well as an isolate of *E. coli* and sterile plates were each inoculated with 25 sterilized stable fly eggs placed on sterile 2 cm x 4 cm Whatman #1 filter paper. Plates were incubated at 25°C until pupation. Survival to pupation, and eclosion was determined, and the weight of pupae determined for each plate. The experiment was replicated twice.

Stable fly larvae were able to complete development when feeding on four bacterial isolates. Larvae fed *Acinetobacter* had the highest percent pupation, followed by *Flavobacterium*, *Empedobacter* and *E. coli*. Eclosion success was not affected by the isolate, but pupal weight was. *E. coli* produced the heaviest pupae, and little difference in pupal weight was found among the other isolates. Stable flies failed to develop on sterile plates, or plates inoculated with *Aeromonas* or *Serratia*. *Serratia* has previously been reported as a fly pathogen. *Aeromonas* may inhibit growth by production of a chitinase.

ENTOMOLOGICAL SOCIETY OF ALBERTA MINUTES OF EXECUTIVE MEETING

Friday, November 1, 1996, Main Conference Room, Lethbridge Research Centre

Present: Kevin Floate, President; Jan Volney, Vice-President; Andrew Keddie, Past President; Alec McClay, Secretary; Jim Jones, Treasurer; Michele Williamson, Editor; Rosemarie DeClerck-Floate, Director for Southern Alberta; Greg Pohl, Director for Northern Alberta

Absent: Hector Cárcamo, Director for Central Alberta; Dave Langor, Regional Director to the ESC

The meeting was called to order at 5:00 p.m.

1. Approval of agenda

Keddie/Williamson. CARRIED.

2. Approval of minutes, Executive Meeting of April 19, 1996.

Williamson/Keddie. CARRIED.

3. Reports:

3.1 Treasurer

The 1994 accounts have now been signed off by the auditors, Spence and Pohl. The 1995 accounts are ready for the auditors although a \$10 expenditure could not be accounted for. Jones will make the necessary filings with Consumer and Corporate Affairs.

Treasurer's report ACCEPTED: Volney/Keddie

3.2 Editor

The Proceedings of the 1995 Annual Meeting have been mailed out. The Society has been registered with the MicroMedia Directory. About 70% of the abstracts for the 1996 meeting have already been submitted by e-mail. Jones and Floate agreed to check through the status of the Society's library subscriptions.

Editor's report ACCEPTED: Jones/DeClerck-Floate

3.3 Regional Director to ESC

A report was submitted by Pohl on behalf of Langor (see minutes of General Meeting)

Regional director's report ACCEPTED: Volney/Williamson.

4. Old business

4.1 Provincial Occupation Profile for "Entomologist"

This profile has been prepared and will be sent out to Alberta high schools by the Department of Advanced Education.

4.2/ 4.3 Undergraduate Award/ Travel Grants

Action:

Jones

Jones,
Floate

Floate sent out application forms for the travel grant and undergraduate awards in August. Five applications were received for the travel grants, but one student did not attend. The Awards Committee voted to grant \$50 to each of two graduate and two undergraduate students. No applications were received for the undergraduate award.

4.4 Amateur Award

A proposal has been drafted by Floate which would include recognition by means of a plaque to be placed in the Bug Room at the Provincial Museum. He has discussed this with Terry Thormin who is in favour, but still needs to get approval from the Museum authorities. A motion approving the award will be presented at the General Meeting.

4.5 Insect Collector's Guide

An estimate of around \$1,500 has been received from Athabasca University Media Services for printing 500 copies with a four-colour cover. A bid of around \$1,000 was obtained from Quality Colour Press. A decision on how to publish or distribute the Guide will be made at the General Meeting.

4.6 Science Fairs

DeClerck-Floate reported that four of the regional Science Fairs had agreed to accept entomology book prizes offered by the Society. The Edmonton committee had asked for a donation of \$100 towards the running expenses of the fair. Two regions had yet to respond. DeClerck-Floate will propose a motion to the General Meeting for approval of the book prizes.

5. New business

5.1 Joint ESC/ESA meeting in 1997

A report from the Local Arrangements Committee was submitted by Pohl on behalf of Langor. A keynote speaker is still being sought on the theme of "Insects in Global Ecosystems". Symposia are being organized on "Biodiversity – What Next?" and "Insects and Ecosystem Productivity". A search for a suitable logo for the meeting is also under way.

5.2 Insects of the Yukon book

A request for financial support for the publication of this book by the Biological Survey of Canada will be presented by Lloyd Dosdall at the General Meeting.

5.3 Banff study (information item)

A letter was received from Anthony P. Clevenger of Banff National Park, requesting the names of entomologists in Alberta interested in collaborating on a project in the Park to help assess the effectiveness of highway mitigation measures such as under- and overpasses in maintaining habitat connectivity for non-flying insects. This will be passed on to members.

McClay

6. Adjournment.

The meeting was adjourned at 6:35 p.m.

ENTOMOLOGICAL SOCIETY OF ALBERTA MINUTES OF ANNUAL MEETING

Saturday, November 2, 1996, Main Conference Room, Lethbridge Research Centre

1. The meeting was called to order at 10:35 a.m.

2. Approval of agenda

The agenda was approved with the addition of two items. Leech/Dosdall.
CARRIED.

3. Approval of minutes, Annual Meeting 1995.

Leech/Pohl. CARRIED.

4. Greetings from ESC

Dr. Steve Marshall, President of ESC, was unable to attend the meeting. He sent a letter to be read at the meeting with the following message:

Greetings from the Entomological Society of Canada, and congratulations on the 44th Annual Meeting of the Entomological Society of Alberta. It bodes well for the future of entomology in Canada to see regional societies such as yours doing so well, even though the number of employed entomologists in Canada has declined dramatically over the past few years. As you are no doubt aware, the Entomological Society of Canada has been undergoing a Strategic Review which has recently come out with a series of recommendations to enable the Society to better serve its membership and the changing entomological community. Those recommendations were approved at this year's very successful Annual Meeting in Fredericton. As a result, the next few years will see our Society undergo substantial restructuring, including many changes to committees, the Governing Board and publications operations. By next year's annual meeting in Edmonton these changes will have been implemented, and by the time we meet with the Entomological Society of America in the joint ESC-SEQ-ESA meeting in Montreal in the year 2000, we will be a more streamlined, cost-efficient Society. Thanks for your support, and thanks for doing what you can to be sure that all of our colleagues are part of the Entomological Society of Canada!

5. Reports:

5.1 Treasurer (Jones)

The 1995 balance sheet and an interim report up to October 23 1996 were presented.

Treasurer's report ACCEPTED: Jones/Leech.

5.2 Editor (Williamson)

The Proceedings of the 1995 Annual Meeting have been mailed out. The editor thanked the photographers, Robin Leech, Robin McQueen, and Susan Bjornson. The editor thanked Jack Scott for preparing the photographic plates. Authors of papers at this meeting were asked to submit abstracts by e-mail as soon as possible.

Editor's report ACCEPTED: Williamson/Shemanchuk

5.3 Regional Director to ESC (Langor, presented by Pohl)

Action:

In 1996, the major focus of the ESC was a Strategic Review of the structure and operations of the Society, with the aim of developing recommendations for attaining long-term financial viability, and effectiveness in maintaining basic scientific and educational functions. Five subcommittees were created:

1. Organizational structure (Chair: George Gerber)
2. Publications (Chair: Guy Boivin)
3. Revenue Enhancement (Chair: Hugh Danks)
4. Headquarters Operations (Chair: Gary Gibson)
5. Relations with Affiliated Societies (Chair: George Ball)

Major recommendations are as follows:

Organizational structure

1. Reduce the number of Directors-at-large, to three.
2. Eliminate the offices of Assistant Bulletin Editor and Editor of the Memoirs.
3. Consolidate the Scholarship Committee and Graduate Research & Travel Grants Committee into a Student Awards Committee.
4. Consolidate the Science Policy Committee and Public Education Committee into a Science Policy and Education Committee.
5. Eliminate the Annual Meeting and Endangered Species Committees

Publications

1. Discontinue publication of the Memoirs.
2. Contract out the Publication of Can. Ent., provided that quality is maintained and cost reductions are realized.
3. Apply extra page charges to non-members and those who do not submit electronic versions of manuscripts.

Revenue Enhancement

1. Seek advertising in ESC publications.
2. Consider ways to participate in and help generate revenues from Joint Annual Meetings, in consultation with regional societies.

Headquarters Operations

1. No significant savings through reduction of headquarters operating expenses were identified.
2. Recognize Headquarters Committee as a standing committee instead of ad hoc.

Relations with Affiliated Societies

1. Mandate regional representation on the Science Policy and Education Committee
2. Establish a section of the Bulletin to deal specifically with news from Regional Societies.

Linda Gilkeson was elected as second Vice-President; John Spence and Lloyd Dosdall as Directors-at-Large; and George Gerber and Bernie Roitberg as members of the Fellowship Selection Committee. The 1996 Gold Medal was awarded to Dr. Jarmila Kukalova-Peck and the C. Gordon Hewitt Award to Dr. Tim Lysyk. Montreal was chosen as the site for the Joint Annual Meeting of the Entomological Societies of Canada and America, which will be held on 2 – 7 December, 2000.

Regional director's report ACCEPTED: Keddie/Dosdall.

Dosdall added that at the ESC's last board meeting the proposal for revenue sharing of income from joint meetings between the regional societies and ESC was not approved.

5.4 Joint meeting (Langor, presented by Pohl)

REPORT OF THE LOCAL ARRANGEMENTS COMMITTEE, FOR THE 1997 JOINT MEETING OF THE ESC/ESA

The Committee met on two occasions in 1996 (a third meeting is set for mid-December). Arrangements are proceeding on schedule and without major problems. The committee consists of David Langor (chair, transportation), Bev Mitchell (meeting accommodation), Jens Roland (banquet and receptions), Kay Ball (associates program), James Brandt (audio-visual), Robin Leech (photography), Mike Dolinski (finance, soliciting), Greg Pohl (registration), Daryl Williams (printing), Andy Keddie (publicity), and Jim Ryan (treasurer). The joint meeting will be held on Oct. 4-8 at the Crowne Plaza/ Chateau Lacombe in Edmonton. A block of guest rooms have been set aside for the meeting at \$92.00 per night for a single/double. A sub-block of 20 rooms have been get aside for students at a special rate of \$59.00 per night. The meeting space is excellent and eight meeting rooms have been reserved for our use. The Students Reception and General Reception (Mixer) will be held on Sunday night, the President's Reception on Monday Night, and the Banquet on Tuesday night. All functions will be held at the Crowne Plaza. Options for the associate persons program include a tour of Elk Island National Park and Ukrainian Village, a shopping expedition to Old Strathcona and West Edmonton Mall, and a visit to the Provincial Museum and Space & Sciences Centre. Finance soliciting has been very successful thus far. To date, approximately \$9,500 has been secured from industry and government. We are shooting for \$20,000! We will shortly choose a logo for the meeting. The first notice of the meeting will appear in the next issue of the Bulletin of the ESC. The first call for papers and registration, as well as a tentative program, will appear in the March 1997 issue of the Bulletin.

Joint meeting report ACCEPTED: Williamson/Jones.

5.5 President (Floate)
see report presented at start of the proceedings

President's report ACCEPTED: Leech/Jones

6. Old business

6.1 Amateur Award

The proposal to establish an award to recognize the efforts of amateur entomologists was presented by Kevin Floate:

Amateur Award – Awarded by the Society to an individual in recognition of efforts, excluding professional obligations, that promote entomology to the public. Examples of such efforts include the presentation of insect-related talks, public showings of insect photographs or collections, and the writing of articles on an entomological theme. Applicants to be nominated by members of the Society. Award to consist of an engraved plaque to take home and the recipient's name would be placed on a plaque permanently mounted at the Provincial Museum of Alberta in the "Bug Room". The prize may or may not be awarded annually depending on the quality of applicants and the availability of Society funds.

The Carr family have agreed to allow the award to be named the "Carr Award" in recognition of Frederick Stephen Carr's pioneering contribution to entomology in the province.

Motion: that the Carr Award be established as proposed. Volney/Jones:
CARRIED.

6.2 Insect Collector's Guide

Arrangements for publication or distribution of the Insect Collector's Guide were discussed.

The cost of printing by Athabasca University or a commercial printer was discussed. Motion: that a copy of the Insect Collector's Guide be distributed to each member of the Society and that members be authorized to make further copies for their own use or distribution as required. Pohl/Goettel: CARRIED.

7. New business

7.1 Science Fairs

Motion: That an appropriate entomological book prize be offered to the Regional Science Fairs of Alberta for entomology-related projects, and when necessary, the Society will provide a member to judge such projects and present the prize. DeClerck-Floate/Williamson CARRIED.

7.2 Awards Committee - Amendment to Rules and Regulations

Motion: That Rule 4a be amended by deleting the words "student prizes" and inserting instead the words "Undergraduate Award, Student Travel Grants, and Amateur Awards".

Williamson

Leech/Dosdall: CARRIED.

7.3 Insects of the Yukon

That the Entomological Society of Alberta provide a donation of \$1,500 to the Biological Survey of Canada Foundation towards the publication costs of the book "Insects of the Yukon". Dosdall/Shemanchuk. CARRIED.

Jones

7.4 Highway mitigation measures in Banff National Park

A letter was received from Mr. Anthony Clevenger of Banff National Park requesting assistance from ESA members for a project on the effects of highway overpasses on dispersal of non-flying insects in Banff National Park. Information can be obtained from the ESA Secretary.

McClay

7.5 1998 Annual Meeting

Athabasca was proposed as the site of the 1998 Annual Meeting. There were no objections but it was decided to leave a formal acceptance of the invitation until the 1997 meeting.

Holmberg

7.6 Elections

The following slate was proposed to fill vacant positions on the executive:

Vice-President: Mark Goettel

Treasurer: Greg Pohl

Director (Northern): Kris Justus

Director (Central): Mary Reid (replacing Héctor Cárcamo who has resigned)

As there were no further nominations the slate was declared elected.

6. Adjournment.

The meeting was adjourned at 11:50 a.m.

ENTOMOLOGICAL SOCIETY OF ALBERTA

FINANCIAL STATEMENT for 1996

For Year Ending 31-Dec-96

Submitted on Aug-96

	1995	1996
ASSETS		
Bank Assets on December 31 (previous year)	\$16,621.54	\$14,077.86
TOTAL ASSETS	\$16,621.54	\$14,077.86
REVENUE		
MEMBERSHIPS		
Regular 1997 @ \$10.00		\$260.00
1996 @ \$10.00	\$380.00	\$60.00
1995 @ \$10.00	\$330.00	\$130.00
1994 @ \$10.00	\$130.00	\$10.00
1993 @ \$10.00	\$0.00	\$0.00
1991 @ \$10.00	\$0.00	\$0.00
Student 1997 @ \$ 5.00		\$70.00
1996 @ \$ 5.00	\$95.00	\$10.00
1995 @ \$ 5.00	\$20.00	\$0.00
1994 @ \$ 5.00	\$10.00	
1993 @ \$ 5.00	\$0.00	
Corporate	\$10.00	\$7.81
Exchange	\$3.42	\$2.71
Total	\$978.42	\$590.52
INTEREST		
Term Deposit (60-day) interest paid	\$306.00	
Term Deposit (6-month) interest paid	\$561.54	\$395.26
Community account interest paid, Brooks	\$38.41	\$29.97
Common Share Interest Paid, Brooks	\$30.57	
Term Deposits interest paid, Edmonton		\$53.62
Total	\$936.52	\$478.85
ANNUAL MEETING		
Registrations @ \$40	\$1,320.00	\$1,120.00
@ \$35	NA	\$560.00
@ \$30	\$810.00	NA
@ \$25	\$50.00	NA
@ \$15	\$30.00	\$225.00
@ \$10	NA	\$70.00
Total	\$2,210.00	\$1,975.00
TOTAL REVENUE	\$4,124.94	\$3,044.37

EXPENDITURES

MEETING EXPENSES	\$10.00	\$23.23
Annual Meeting		
Banquet Charges & Keynote Speaker	\$2,960.24	\$2,121.29
Executive Meetings		
Travel, Parking etc.	\$92.52	\$53.95
ESC/ESA Joint Meeting for 1997		\$100.00
AWARDS		
Amateur, Book Prize & Pub. Grant	\$3,151.13	\$1,992.75
PROCEEDINGS		
Proceedings duplication charges	\$150.41	\$903.78
POSTAGE & MAILING CHARGES		
Meeting notices & member mail	\$236.51	\$0.00
PHOTOGRAPHIC SERVICES	\$0.00	\$208.35
BANK CHARGES		
Community Account, Brooks	\$14.50	
Community Account, Edmonton		\$50.44
CORPORATE SERVICES		
Society Annual Returns	\$53.31	\$8.00
Cash on hand	\$0.00	
TOTAL EXPENDITURES	\$6,668.62	\$5,461.79
Assets + Revenues	\$20,746.48	\$17,122.23
Expenditures	\$6,668.62	\$5,461.79
BALANCE	\$14,077.86	\$11,660.44

ENTOMOLOGICAL SOCIETY OF ALBERTA MEMBERSHIP LIST

(Revised: Sep. 1997)

Honourary 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
LARSON, Ruby I.	2503 - 12 Ave. South, Lethbridge, AB, T1K 0P4, (Res.) 327-2089
NELSON, W.A. (BIII)	1030 Fern Crescent, Lethbridge, AB, T1K 2W3, (Res.) 327-4736

Regular Members:

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Library Members: Free Subscriptions:

Agriculture and Agri-Food Canada Research Station, Library, P.O. Box 3000, Lethbridge, AB, T1J 4B1, (Bus.) 327-4561

Alberta Provincial Museum and Archives, 12845 - 102 Ave., Edmonton, AB, T5N 0M6

Glenbow Alberta Institute, 130 - 9 Avenue S.E., Calgary, AB, T2G 0P3

National Library of Canada, Canadian Acquisition Division and Legal Deposit Office, 392 Wellington Street, Ottawa, ON, K1A 0N4

Northern Forestry Centre, Library, 5320-122 Street, Edmonton, AB, T6H 3S5

University of Alberta, Library - Periodicals Section, Edmonton, AB, T5G 2E3

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ENTOMOLOGICAL SOCIETY OF ALBERTA BY-LAWS

ARTICLE 1**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**Memberships, 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.

Honourary Life Membership may be conferred on anyone who has performed long and distinguished service in the field of entomology. The total of Honourary Life Members shall not exceed five percent of the total membership at the time of election. An Honourary 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 Honourary 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 Honourary 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 for 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 terminate 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/her 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.

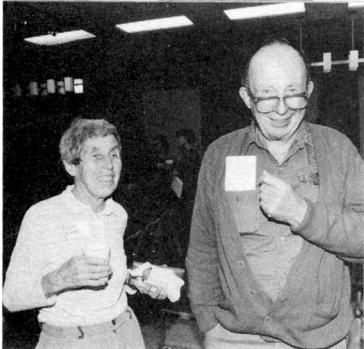
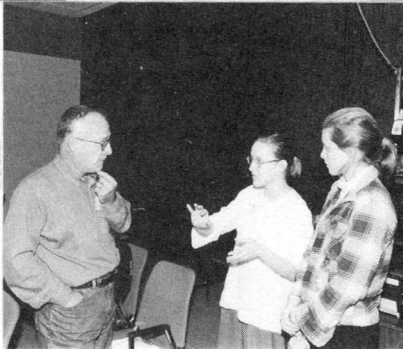
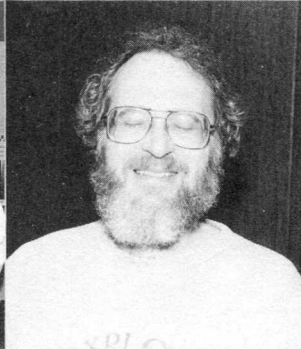
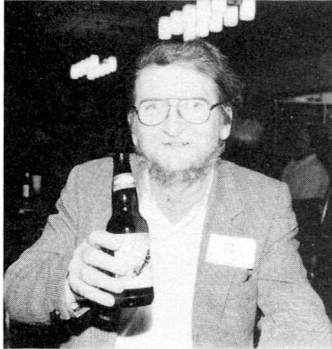
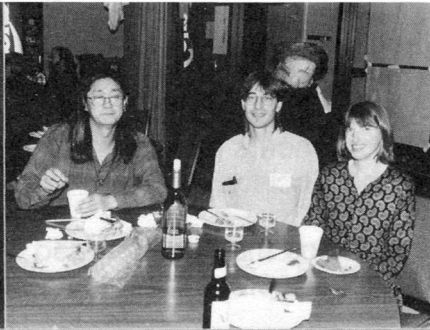
ENTOMOLOGICAL SOCIETY OF ALBERTA RULES AND REGULATIONS

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., Honourary Membership, Undergraduate Award, Student Travel Grant, Amateur Award).
 - 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 chair) and three Ordinary Directors. Other members to be appointed as necessary by the Committee. Duties: to maintain contact with the principal Science Fairs in AB.

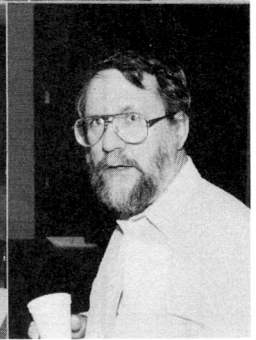
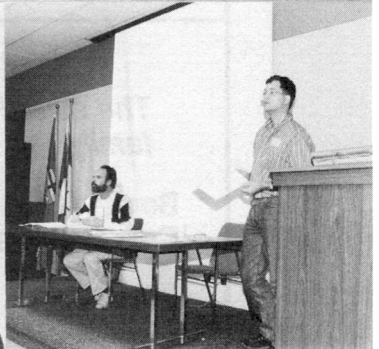
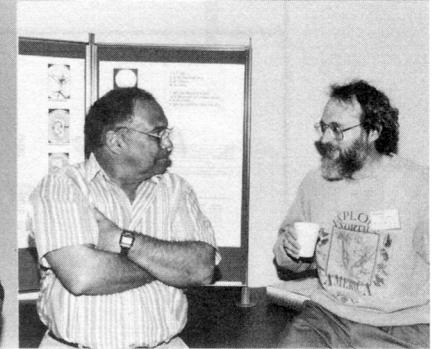
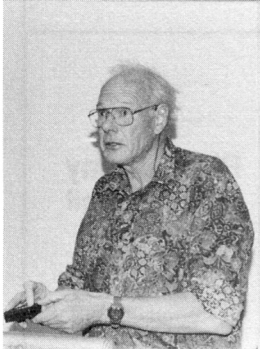
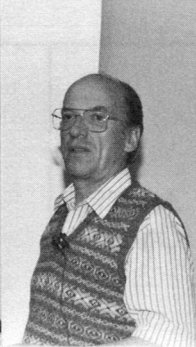
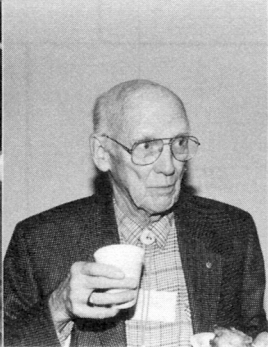
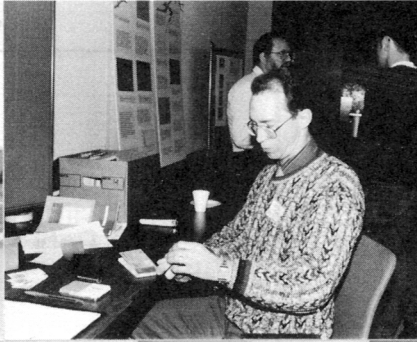
- g. Membership Committee - members: Vice-President (as chair), and three Ordinary Directors. Duties: to publicize the objectives and activities of the Society in such a way as to recruit new members to the Society.
 - h. All elections and appointments are not to exceed one year unless otherwise approved by the Society.
5. a. The Rules and Regulations may be changed by a motion approved by the majority of members present at any general meeting.

Aug. 1997

<i>Optimal Foraging I: Dead cow carnivory</i>	Derrick Kanashiro	Greg Pohl	Barb Deneka	<i>Optimal Foraging II: Omnivory</i>
<i>Optimal Foraging III: The liquid diet</i> Graham Griffiths	Jennifer Otani	Greg Pohl	<i>Blink!</i> Andy Keddie	Lloyd Dosdall Joe Shemanchuk
<i>I'm here</i> Brent Kamer	Tom Whitham	Christen Mirth	Bill Nelson	Kay Ball
		Rosalind Barrington-Leigh		
<i>The award family</i> Bert Carr	John Carr	Christian Klingenberg	Ralf Carter	Kevin Floate
			Farrah Rashid	Joao Sousa
Julie Dunlop	Rob Lucas	Christel Leonhardt	Rose DeClercke-Floate	<i>F0 & F1 of entomologists</i> The Mengersens
				Rosalind Barrington- Leigh



<i>Going to the meeting</i> Al Schaaf		<i>Collecting monies</i> Jim Jones		<i>Keeping notes</i> Alec McClay
<i>Listening intelligently</i> Tim Lysyk	<i>The honourable</i> Bill Nelson	Bob Byers	Andrea Durand	<i>The Vice-Pres</i> Jan Volney
Peter Harris	Troy Danyk Correction: Dan Johnson	Ernest Mengersen	<i>Bark beetles are cool</i>	<i>V P & P P</i> Jan Volney Andy Keddie
Kamal Gandhi <i>the wise</i> Troy Danyk Correction: Dan Johnson	Rick Butts	Jennifer Otani	<i>The Pres</i> Kevin Floate	<i>Business order</i>
Drs. Ball Bill Nelson	Kamal Gandhi Graham Griffiths <i>Bug-eyed</i> Michele Williamson		<i>Beetle phermone results</i>	Robert Holmberg



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