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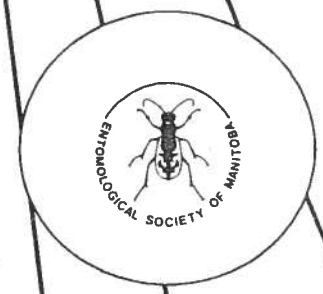

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CONTENTS

BEETLES ASSOCIATED WITH STORED GRAIN CAPTURED IN FLIGHT BY SUCTION TRAPS IN SOUTHERN MANITOBA

NOEL D.G. WHITE[1], PHILIP S. BARKER AND COLIN J. DEMIANYK

Agriculture and Agri-Food Canada, Cereal Research Centre, 195 Dafoe Road, Winnipeg, Manitoba Canada R3T 2M9

ABSTRACT

Flying beetles were collected in a Johnson-Taylor insect suction trap from April to September in the years 1987 to 1993 and 20 species associated with stored grain were collected. The most common species captured were the fungivores *Atomaria* spp., *Melanophthalma* spp., and *Cartodere constricta*. One to three adults of the granivorous species, *Cryptolestes ferrugineus*, *C. pusillus*, and *Tribolium castaneum*, were caught in several months of most years. The low frequency of these species does not reflect their common occurrence in granaries filled with cereals in Southern Manitoba. Other less frequent granivores found were *Tenebroides mauritanicus*, *Alphitobius diaperinus*, *Palorus subdepressus*, *Laemophloeus fasciatus*, *Latheticus oryzae*, *Gnathocerus cornutus*, *Attagenus* sp., and *Dermestes lardarius*. The relative abundance of beetles and seasonality of their flight activity is recorded and among years there was little correlation between weather and insect numbers.

INTRODUCTION

Many species of beetles have been associated with stored grain in western Canada in granary residues (Smith and Barker 1987; Barker and Smith 1987), in bulk-stored cereals (Madrid *et al.* 1990), and in cereal storage and processing facilities (Sinha and Watters 1985).

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The majority of species are fungivores (Campbell *et al.* 1989; Bousquet 1990), with the principal granivorous beetles being mainly the rusty grain beetle, *Cryptolestes ferrugineus* (Stephens) (Cucujidae); and the red flour beetle, *Tribolium castaneum* (Herbst) (Tenebrionidae) (Sinha and Watters 1985). Other granivores, including the flat grain beetle, *Cryptolestes pusillus* (Schönherr); the sawtoothed grain beetle, *Oryzaephilus surinamensis* (L.) (Cucujidae); the confused flour beetle, *Tribolium confusum* J. du Val (Tenebrionidae); the American black flour beetle, *Tribolium audax* Halstead (Tenebrionidae); the yellow mealworm, *Tenebrio molitor* L. (Tenebrionidae); and the larger black flour beetle, *Cynaeus angustus* (Le Conte) (Tenebrionidae) are occasionally found in grain residues (Smith and Barker 1987) as are the drugstore beetle, *Stegobium paniceum* (L.) (Anobiidae); and the granary weevil, *Sitophilus granarius* (L.) (Curculionidae) (Liscombe and Watters 1962). Granivores rarely found in stored grain include the rice weevil, *Sitophilus oryzae* (L.) (Curculionidae); and the lesser grain borer, *Rhyzopertha dominica* F. (Bostrichidae) (Madrid *et al.* 1990; Fields *et al.* 1993). *Rhyzopertha dominica* has been frequently captured in pheromone-baited flight traps across the prairies (Fields *et al.* 1993), although preliminary studies indicate that it does not overwinter successfully in stored grain in southern Manitoba (Fields and Van Loon 1990).

In the central United States, flying *R. dominica*; the foreign grain beetle, *Ahasverus advena* (Waltl); *C. pusillus*; *C. ferrugineus*; and the hairy fungus beetle, *Typhaea stercorea* (L.) have been caught outside granaries (Dowdy and McGaughey 1991, 1994; Hagstrum *et al.* 1994). In South Carolina, *S. granarius* and *S. oryzae* have been collected using sticky traps (Throne and Cline 1989, 1991). Suction traps have successfully captured *R. dominica* (Leos-Martinez *et al.* 1986) and a wide range of stored-product beetles, including *Cryptolestes* spp. and *Tribolium* spp. (Giles 1969).

The natural reservoirs of stored-product insects, both fungivores and granivores, have been considered by Linsley (1944) and include habitats under the bark of trees. In 1994, several *C. ferrugineus* adults were found feeding on fungus under the bark of a Saskatoon bush, *Amelanchier alnifolia* Natt. in Regina, SK (L. Harris, personal communication). Long-term monitoring of flying beetles associated with stored grain has not previously been done in western Canada. This monitoring can determine the species that are flying at a given location and reveal population fluctuations which could affect grain infestation by insects.

MATERIALS AND METHODS

Johnson-Taylor insect suction traps (model VI-12", Burkard Manufacturing Co. Ltd., Rickmansworth, UK) were used to collect flying insects. The insects were collected in a solution of 70% ethanol and a glycol mixture. One trap, located at the Agriculture and Agri-Food Canada Field Station at Glenlea, MB (49°38'N, 97°08'W), was run continuously from the end of April to the end of September each year from 1987 to 1993. The trap was annually

placed on a dike between a wheat field and the station buildings which included several granaries containing cool, dry wheat and oats with negligible insect infestations (White and Sinha 1990; White *et al.* 1995). A second trap was operated at the Agriculture and Agri-Food Canada Research Station at Morden, MB, from the last week in April to the last week of September 1987. This trap was located 3 m to the southeast of an old barn. In 1991, a trap was placed on the roof (7.96 m high) of the Agriculture and Agri-Food Canada Research Centre in Winnipeg, MB and run from April to October. The traps ran continuously and the catch was removed weekly. The insects caught were sorted using a dissecting microscope, and all species of beetles mentioned in Bousquet (1990) were placed in 7-mL vials and labelled (date, location). Uncertain identifications were confirmed by Y. Bousquet of the Biosystematics Research Centre, Agriculture and Agri-Food Canada, Ottawa, ON.

RESULTS AND DISCUSSION

Several species of beetles occurred regularly during the seven year study. The captures of common fungivores are illustrated in Figures 1—3. The most abundant species were *Atomaria* spp. (Chryptophagidae) with yearly Glenlea catches exceeding 2000 specimens except for 1989 and 1992 with 228 and 1798 specimens, respectively (Fig. 1A); *Melanophthalma* spp. (Lathridiidae) with yearly catches of up to 1221 (Fig. 1B); and the plaster beetle, *Cartodere constricta* (Gyllenhal) (Lathridiidae) with yearly catches up to 904 (Fig. 1C). In 1989, the two most common fungivores both had low catch totals, with *Melanophthalma* spp. being completely absent (Fig. 1B). No correlation, however, was found among years between insect numbers and climatic conditions when catches were compared to measurements of monthly precipitation or mean temperatures from the Glenlea climatological station (Environment Canada, Atmospheric Environmental Service). Other fungivores found with varying frequency were *Anthicus* spp., mainly the narrownecked grain beetle, *A. floralis* (L.) and *A. cervinus* LaFerté-Sénectère (Anthicidae) which had yearly catches of 14 to 429 adults (Fig. 2A); the foreign grain beetle, *Ahasverus advena* (Silvanidae) with highest total catches of 95 and 50 adults from Morden and Glenlea, respectively in 1987, and of 39 from Glenlea in 1991 (Fig. 2B). Catches of these species in the remainder of the years were low. The squarenosed fungus beetle, *Lathridrius minutus* (L.), and its close relatives (Lathridiidae), had yearly catches of 11 to 45 adults (Fig. 2C). The hairy-fungus beetle, *Typhaea stercorea* (L.) (Lathridiidae) (Fig. 3A) and the acute-angled fungus beetle, *Cryptophagus acutangulus* (Gyllenhal) (Cryptophagidae) (Fig. 3B) were rare or absent in most years. The Lathridiidae were identified as well as possible at the Biosystematic Research Centre, Agriculture and Agri-Food Canada, Ottawa, but it should be noted that the last revision of the family was in the 19th century.

Granivores occurred at very low frequencies, including *Cryptolestes ferrugineus* and *C. pusillus* in approximately a 50:50 ratio (Fig. 4A) and *Tribolium castaneum* (Fig. 4B). The catches of both genera do not reflect their common occurrence in stored grain, which ranged

between 1% to 8% of granaries filled with cereals in southern Manitoba in 1986 and 30% to 46% of granaries in 1987 infested with *T. castaneum* and *C. ferrugineus* (Madrid *et al.* 1990). Rare occurrences of granivorous species, represented by only one to four adults during the entire seven years of sampling at Glenlea, included the Cadelle, *Tenebroides mauritanicus* (L.) (Trogositidae); the lesser mealworm beetle, *Alphitobius diaperinus* (Panzer) (Tenebrionidae); the depressed flour beetle, *Palorus subdepressus* (Wallaston); *Laemophloeus fasciatus* (Cucujidae); the longheaded flour beetle, *Latheticus oryzae* Waterhouse (Tenebrionidae); the broadhorned flour beetle, *Gnathocerus cornutus* (F.) (Tenebrionidae); the black carpet beetle, *Attagenus unicolor* (Braham) (Dermestidae); and the larder beetle, *Dermestes lardarius* L. (Dermestidae).

Fewer species of stored-product insects were captured in the traps from Morden and Winnipeg, however, the three most-trapped species were the same as those caught at Glenlea. One *C. ferrugineus* was trapped at the 7.96-m elevated suburban setting of Winnipeg. Many of the flying insects captured in the suction traps have also been found in grain residues in western Canadian granaries, although residues contained more species of fungivores and similar frequencies of both fungivores and granivores (Smith and Barker 1987), whereas flight traps caught much lower frequencies of granivores. A beetle that has not been reported from stored grain but strongly resembles *C. ferrugineus* was *Placonotus zimmermani* (Le Conte) (Cucujidae); 31, 8, and 10 were caught in 1991, 1992, and 1993, respectively. This species has a tooth at the anterior corner of the pronotum that distinguishes it from *Cryptolestes*.

The predominant fungivores in bulk-stored cereals in Manitoba are *Cartodere constricta*, *Ahasverus advena*, *Typhea* sp., and *Cryptophagus* sp. (Madrid *et al.* 1990) which does not reflect the most common flying species at Glenlea, i.e. *Atomaria* spp., *Melanophthalma* spp., and *Anthicus* spp. This may indicate that predominant flying species prefer fungal sources other than stored grain.

The observations of this report are novel in recording the relative abundance and seasonality of beetles flying outside granaries in Canada and associated with stored grain, with the exception of studies by Fields *et al.* (1993) on *Rhyzopertha dominica*. Introduction of insects and phoretic mites (Barker 1991) into grain bulks during aeration or by entrance through granary seams immediately after harvest in August and September could occur. If grain was not cooled sufficiently or localized "hot-spots" developed from mold respiration (Wallace and Sinha 1962) communities of insects and mites would become established (Sinha *et al.* 1962; Sinha 1974).

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Research Centre, Agriculture and Agri-Food Canada, Ottawa, ON for identifying selected specimens.

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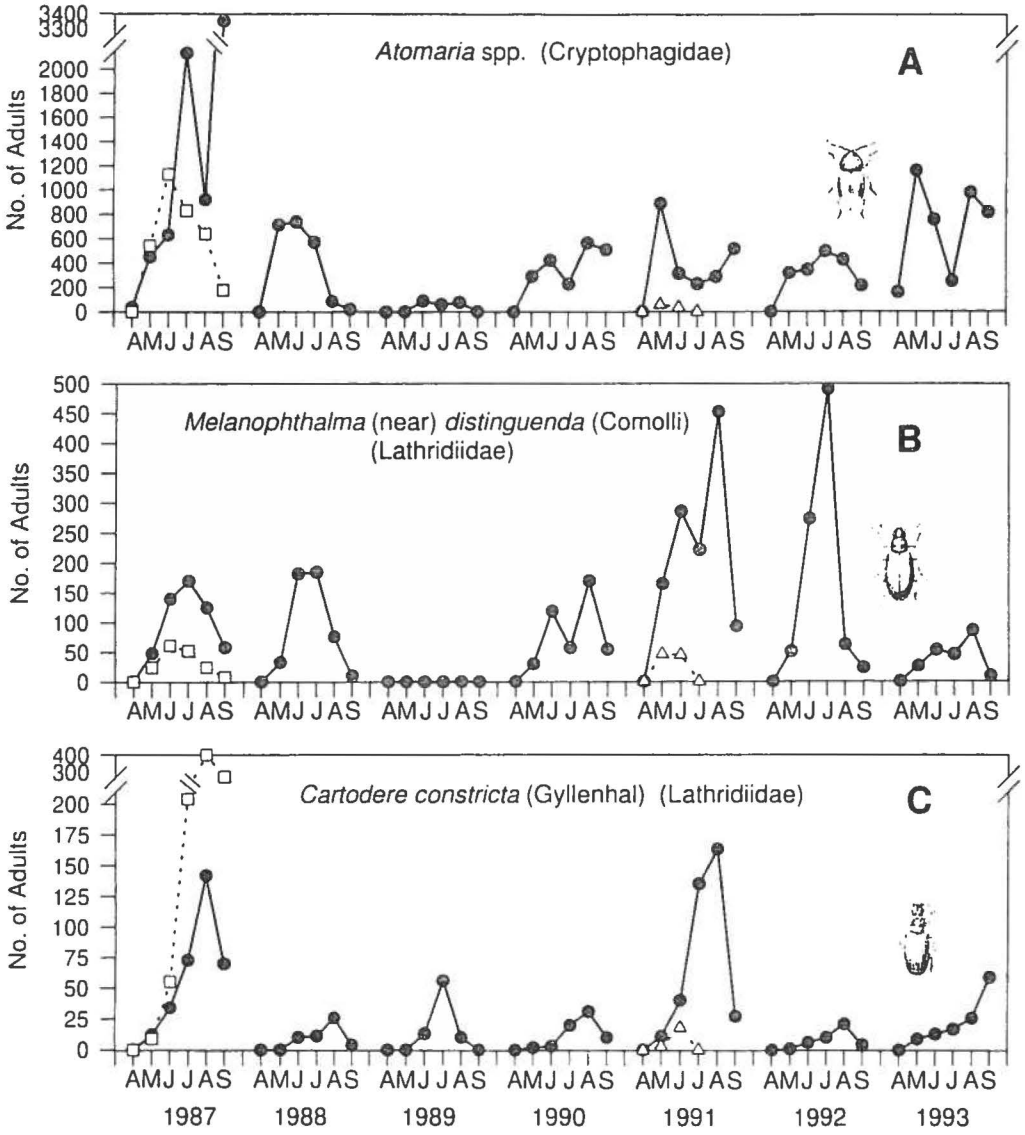

Fig. 1. Number of adult (A) *Atomaria* spp.; (B) *Melanophthalma spp*; and (C) *Cartodere constricta* caught in suction traps at Glenlea, MB from 1987 to 1993 (●—●), at Morden, MB in 1987 (□—□) and at Winnipeg, MB in 1991 (△—△).

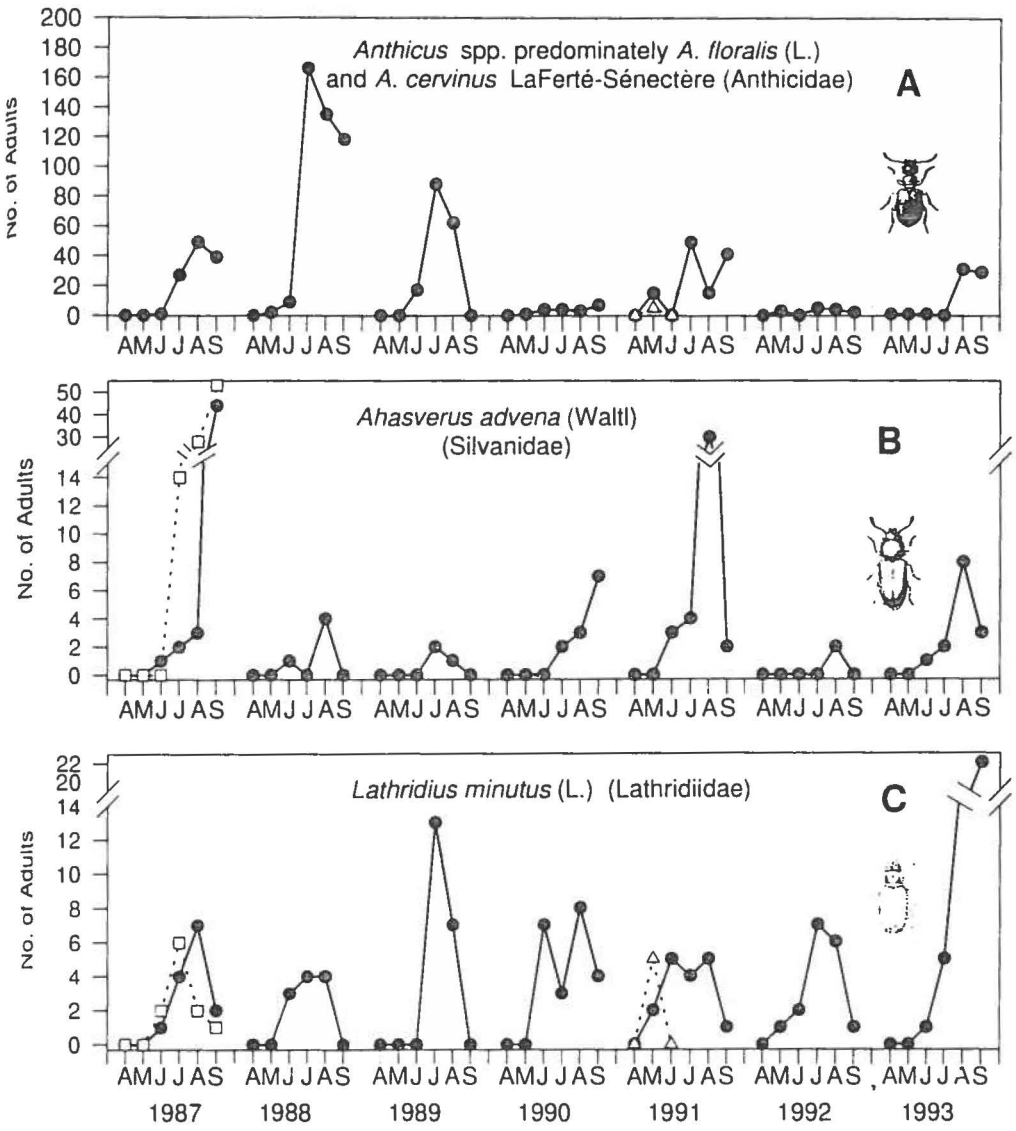

Fig. 2. Number of adult (A) *Anthicus* spp.; (B) *Ahasverus advena*; and (C) *Lathridius spp.* caught in suction traps at Glenlea, MB from 1987 to 1993 (●—●), at Morden, MB in 1987 (□—□) and at Winnipeg, MB in 1991 (△—△).

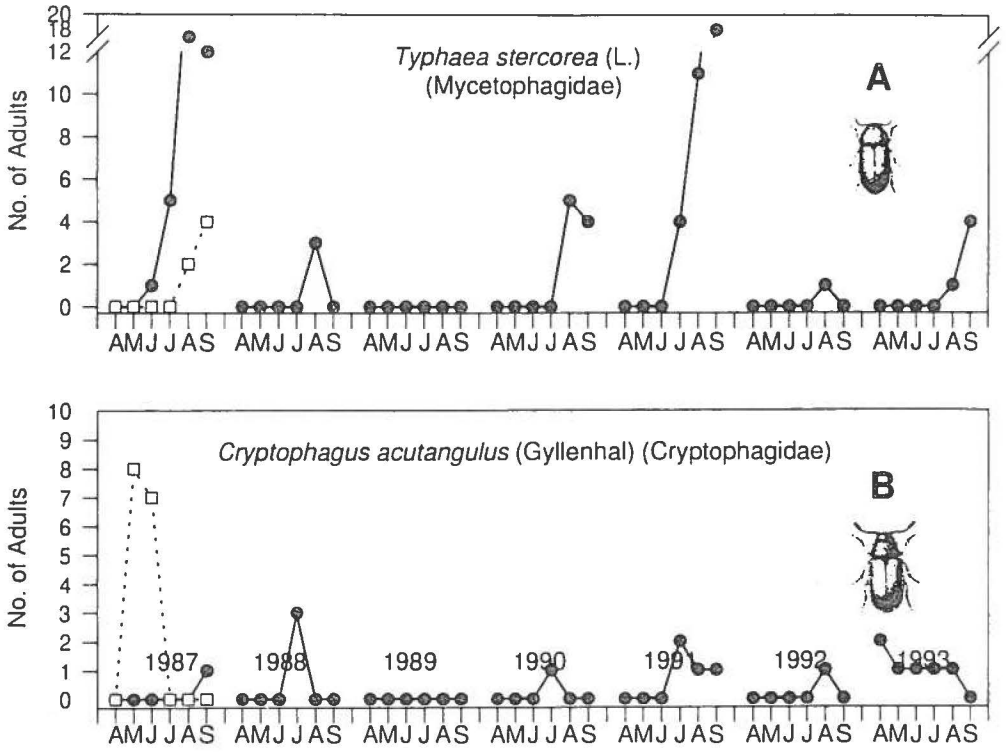

Fig. 3. Number of adult (A) *Typhaea stercorea*; and (B) *Cryptophagus acutangulus* caught in suction traps at Glenlea, MB from 1987 to 1993 (●—●), at Morden, MB in 1987 (□—□) and at Winnipeg, MB in 1991 (△—△).

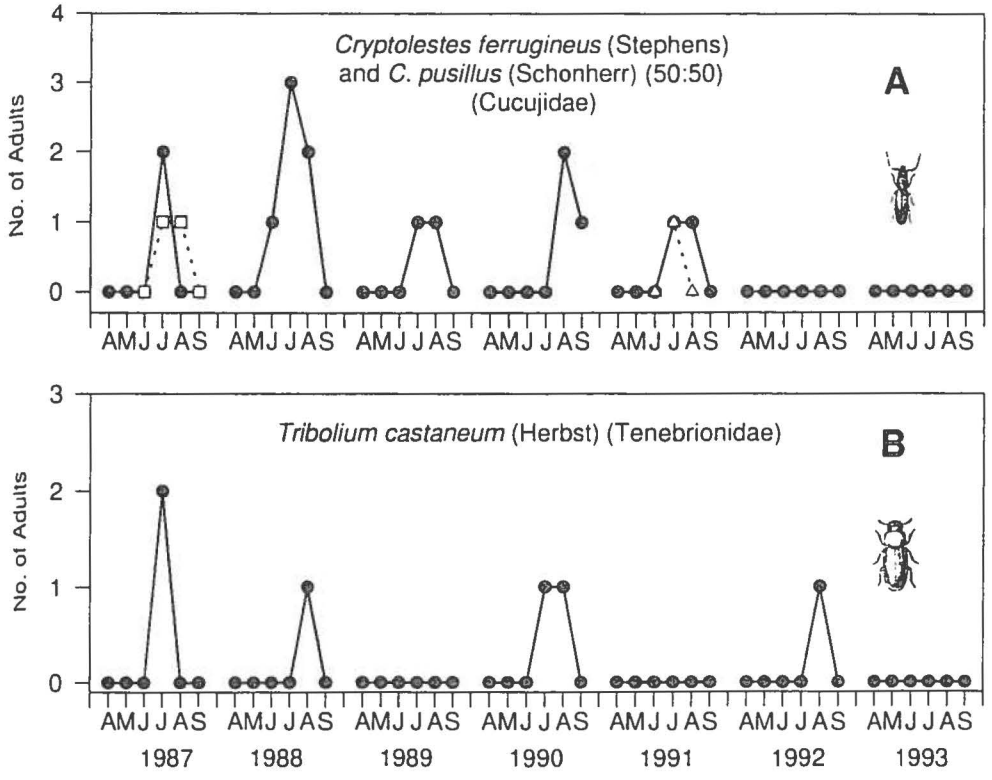

Fig. 4. Number of adult (A) *Cryptolestes ferrugineus* and *C. pusillus* and (B) *Tribolium castaneum* caught in suction traps at Glenlea, MB from 1987 to 1993 (●—●), at Morden, MB in 1987 (□—□) and Winnipeg, MB in 1991 (△—△).

INCIDENCE OF DAMAGE TO SPRING WHEAT BY THE ORANGE WHEAT BLOSSOM MIDGE IN MANITOBA DURING 1993[2]

BARKER, P.S., R.I.H. McKENZIE AND E. CZARNECKI

Agriculture and Agri-Food Canada, Winnipeg Research Centre, 195 Dafoe Road, Winnipeg, Manitoba Canada R3T 2M9

ABSTRACT

Adult orange wheat blossom midge, *Sitodiplosis mosellana* were collected in a suction trap at Glenlea, Manitoba, from the first week of July to the second week of August of 1993. Samples of mature wheat heads collected from 21 localities indicated high levels of infestation of wheat by *S. mosellana* throughout the province in 1993. The cultivar Roblin suffered a higher percentage of infestation than Biggar in samples collected from 13 of 15 locations in Manitoba but similar numbers of damaged kernels were found per spike in both cultivars.

INTRODUCTION

The orange wheat blossom midge, *Sitodiplosis mosellana* (Géhin) has occurred in Manitoba for many years (Barker 1984*a*, Barker 1984*b*), but no data has been collected on infestation levels in wheat since 1984. Wheat blossom midge damage is not usually noticed because damaged seeds are lost during harvesting, and also because many damaged seeds are removed from the harvested grain during the cleaning process and are thus not often found during inspection. Barker (1984*b*) characterized the damage caused by the midge as a shrivelling with longitudinal wrinkles in the pericarp and a bending of severely damaged seeds into a "J" shape. Lightly affected seeds may merely have a straw-coloured stripe on the pericarp. Some of the larger affected seeds may have a split pericarp (Dexter *et al.* 1987) and may also germinate while still in the spike. In addition to the loss of crop, there is the possibility that lightly damaged seeds, which are not removed from the grain, may contribute to a reduction of the baking quality of the wheat (Fritzsche and Wolffgang 1959; Helenius and Kurppa 1989; Kurppa 1989).

Winnipeg Research Centre Contribution No. 1590.

High levels of damage caused by midge were found in wheat in 1992 at Crandall (30%) and Hamiota (40%) in Manitoba. This survey was conducted because large numbers of adult midge were caught in a suction trap at Glenlea, MB, at the time of wheat spike emergence in 1993, and an outbreak of midge was expected to take place at Glenlea that year. Suction traps have been used to determine the dates of midge flights so that insecticidal sprays can be synchronized with these flights (Bayon *et al.* 1983). The objective of this work was to establish the distribution and level of infestation of wheat by the orange wheat blossom midge in Manitoba in 1993.

MATERIALS AND METHODS

Adults of the orange wheat blossom midge were collected by a Johnson-Taylor suction trap (Bayon *et al.* 1983; Lamb 1983) from the last week of June to the second week of September, 1993. The trap, which ran continuously, was placed on a dyke at the Glenlea, MB, Agriculture and Agri-Food Canada field station. The catch was collected at weekly intervals and the numbers of midges captured were determined using a dissecting microscope. Samples of adult midges were sent to R. Gagné, Systematic Entomology Laboratory, U.S.D.A., National Museum Natural History, Washington, to confirm identification.

Wheat spikes were subsequently collected from the wheat cultivar Red Bobs (hard red spring) which was being used to spread rust inoculum among experimental lines of wheat at the Glenlea station. Spikes of the wheat cultivar Glenlea (hard red spring) were taken from the Agriculture and Agri-Food Canada experimental plots at Brandon and Portage la Prairie. Spikes of the hard red spring wheat cultivars Biggar and Roblin were obtained from the SeCan plots in various parts of Manitoba (Table 1). Where Biggar was not available in SeCan plots, spikes of AC Taber or AC Minto were collected. Spikes were also collected from nine spring wheat cultivars listed in Table 2 which were planted at the Glenlea station on two dates (21 and 31 May, 1993). Each spike of wheat was dissected under a dissection microscope and numbers of midge damaged kernels and total numbers of kernels were recorded. An attempt was made to collect, and dissect, at least 60 wheat spikes from each cultivar from each location.

Comparisons between data from cultivars and time of seeding were made by analysis of variance on the data transformed to log $(x + 1)$ (Mukerji *et al.* 1988), where x was the number of larvae per spike. Comparisons were made between the data from the two cultivars (Roblin and Biggar) from each of the SeCan plots at each location. Comparisons were also made between data from each cultivar for each date of seeding, and between cultivars planted at Glenlea. The minimum number of samples (N) that would be expected to yield estimated means ($\bar{x}$) and standard deviations (S) within 30% ($D = 0.3$) of the population values with 95% confidence was calculated by the general method $N = ((t_{0.05} * S) / (\bar{x} * D))^2$ (Karandinos 1976; Ruesink 1980; Southwood 1987).

RESULTS AND DISCUSSION

Adult wheat midge, *Sitodiplosis mosellana* (Géhir) were collected from the suction trap (Fig. 1) and were separated from *Clinodiplosis* spp and *Mycodiplosis* sp. which appeared in the trap after 21 July, 1993.

A single adult midge was first obtained from the suction trap during the collection period ending on 23 June. One male midge was found in the collection period ending on 30 June. Spike emergence in the wheat crop in Manitoba began during the week ending on the 7th of July and coincided with the initiation of the first flight of midge. The peak of the midge flight (week ending 21 July) coincided with the emergence of first spikes in nine spring wheat cultivars planted on 21 and 31 May, 1993, at Glenlea, MB (Fig. 1).

The analysis of variance confirmed there was no significant difference in the number of midge-damaged seeds found per spike between the cultivars Roblin and Biggar planted in SeCan plots ($F = 0.027$), but there were significant differences between sites ($F = 10.47$ for $P < 0.01$). The most highly infested samples of the cultivars Biggar and Roblin in SeCan plots came from plots planted on the 19, 20, and 21 of May (Minto, Fannystelle, and Glenlea, all in Manitoba), but the samples from Miniota and Glenboro planted on the 18 and 19 of May, and from Holland planted on 21 May, had low levels of infestation (Table 1). A much higher proportion of kernels were affected at most locations than was reported in the previous survey for orange wheat blossom midge in Manitoba (Barker 1984*a*, Barker 1984*b*). The only sample which showed no damage due to midge in 1993 consisted of 50 spikes of AC Taber from Roland, MB, but at Glenlea, MB, AC Taber was infested at approximately the same level as Biggar (Table 2). Roblin wheat from Roland, MB, suffered an average level of infestation for the cultivar and showed that there were midge at Roland, MB. The samples from Swan River were not unusually highly infested when compared to the infestation levels in the rest of the province, whereas in the previous survey, samples from Swan River were the most highly infested at 5.3% (Barker 1986). Though the 1993 infestation was high for Manitoba, it was far less than that found in Aylsham, Saskatchewan, by Wright and Doane (1987). A higher percentage of kernels were affected in cultivar Roblin than in Biggar with the exception of the samples harvested at Cartwright and Holland (Table 1), but the number of damaged seeds per spike was similar in both cultivars. The cultivar Biggar produced more seeds per spike than did Roblin so that the percentage of seeds damaged was reduced while the numbers of damaged seeds per spike remained approximately the same in both cultivars (Table 2). Asynchrony, therefore, did not account for the difference in the percentage of affected kernels in these two cultivars.

The analysis of variance confirmed that the proportion of midge-affected seeds in several cultivars grown at Glenlea, MB, was significantly ($P < 0.01$) less in the second planting than

in the first planting (F = 34.2) in all the cultivars listed except for Roblin (Table 2). The lower proportion of damaged seeds from most cultivars in the second planting date probably reflects asynchrony between midge oviposition and flowering time of the cultivars. Many of the seeds produced by late seeded cultivars Biggar, Glenlea, and AC Taber were green and shrivelled, partly because they were harvested after the first frost. In contrast, the second planting of the early flowering cultivar Roblin showed an increase in the number of midge affected seeds per spike.

The large number of midge adults caught in the suction trap at Glenlea during the week ending on 21 July gave an early indication that there could be a high level of damage to wheat by midge larvae. This indication was confirmed later by the high proportions of damaged seeds obtained in the samples of wheat spikes from the wheat plots at Glenlea, MB, as well as from the SeCan plots throughout the province. Spike emergence in the cultivars planted at Glenlea, MB, coincided with the first main flight of midge. Biggar appeared to be less heavily infected than Roblin when the percentages of damaged seeds were considered, but there was no meaningful difference between these cultivars when the numbers of damaged seeds per spike were considered. Late planted cultivars were significantly less infested than early planted cultivars at Glenlea, MB, with the exception of Roblin wheat, and confirmed the findings of Wright and Doane (1987) that asynchrony can play a role in helping wheat to escape heavy infestation by midge, but at the risk of suffering frost damage.

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Table 1: Percentages of kernels of wheat cultivars damaged by *Sitodiplosis mosellana* larvae at various locations in Manitoba during the 1993 growing season. Average number of midge damaged seeds per spike in parenthesis.

Location	Date planted	Cultivars		
		Roblin	Biggar	Other
Arborg	23 May	15.0(3.9)	6.9(3.0)	---
Brandon	---	---	---	Glenlea 29.8 (11.4)
Cartwright	22 May	3.2(0.7)	6.4(2.3)	---
Cypress River	----	25.2(6.8)*	---	---
Fannystelle	20 May	34.3(8.0)	24.1(9.2)	---
Fisher Branch	23 May	18.0(4.7)	10.9(5.1)	---
Glenlea	---	---	---	See Table 2
Glenboro	19 May	---	5.6(2.0)	AC Minto 13.2 (2.6)
Holland	21 May	10.8(2.7)	11.4(4.4)	---
Laurier	16 May	6.6(1.6)	2.9(1.0)	---
Melita	---	---	3.7(1.2)*	---
Miniota	18 May	13.0(3.2)	5.5(2.2)	---
Minto	19 May	34.2(7.5)	25.3(9.4)	---
Neepawa	16 May	15.8(4.0)	6.3(2.3)	---
Oak River	18 May	15.6(3.6)	7.5(2.8)	---
Portage la Prairie	---	29.7(7.1)	19.2(6.9)	Glenlea 32.6 (11.6)
Roland	---	17.4(3.8)	---	AC Taber 0.0*
Rossburn	18 May	6.3(1.7)	2.6(0.9)	---
Russell	17 May	23.0(6.0)	17.2(6.8)	---
Swan River	24 May	9.4(2.4)	3.6(1.4)	---
Virden	18 May	6.3(1.5)	----	AC Taber 3.4 (1.0)
Average damaged seeds		16.7(4.1)	9.8(3.8)	
Average No. seeds/spike**		24.58	38.63	

*Samples were obtained from J. Fotheringham, Reston (Melita); D. Garlick, Roland; and G. Young, Cypress River.

**The comparison was made for localities where both Biggar and Roblin were planted.

'able 2: Percent kernel infestation of various wheat cultivars by *Sitodiplosis mosellana* at ;lenlea, MB in 1993 and average number of midge damaged seeds per spike in parenthesis.

	Date of planting		
Cultivar	21 May	31 May	Other dates
Biggar a**	17.4(6.7)	4.7(2.1)GS*	
Biggar b**	17.4(7.5)	2.2(0.9)GS	
Columbus	44.9(11.2)	6.7(1.7)	
Glenlea	33.4(13.4)	12.9(4.2)GS	
Katepwa	33.8(10.2)	13.5(4.1)	
M.C. Minto	45.2(12.5)	11.9(3.5)	
Pasqua	50.1(12.3)	12.8(3.4)	
Red Bobs	45.7(14.1)	29.1(8.7)	34.3(10.6);60.0(21.1)
Roblin	29.7(8.5)	37.4(12.9)	
M.C. Taber	18.9(7.7)GS	3.6(1.4)GS	

;S = green seeds.
'Duplicate planting.

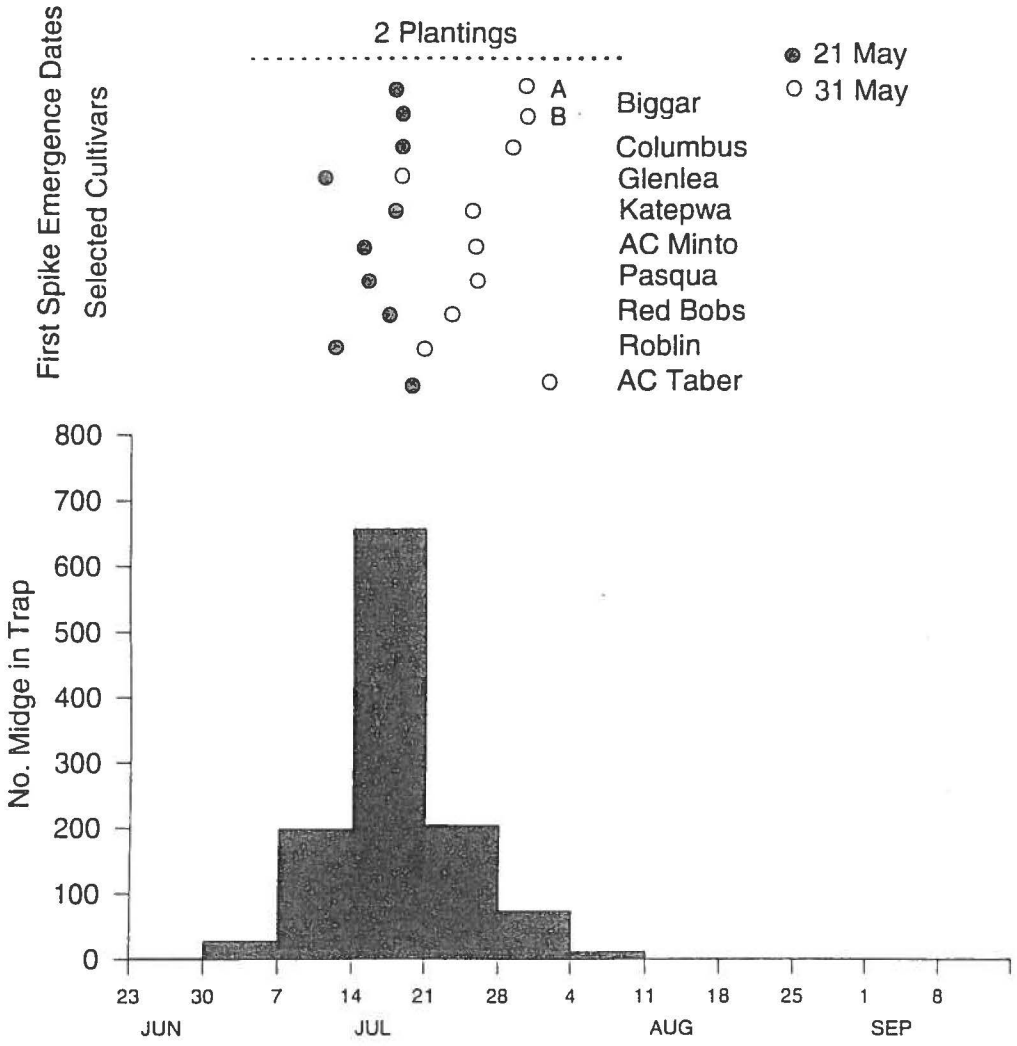

Fig. 1. The timing of first spike emergence of nine wheat cultivars at Glenlea, MB, in relation to the numbers of *Sitodiplosis mosellana* caught in a nearby suction trap. Biggar B was a duplicate planting.

SCIENTIFIC PROGRAM ABSTRACTS FOR THE 1995 ANNUAL MEETING

Keynote Address

GRASSHOPPER COMMUNITIES IN SPACE AND TIME. **William P. Kemp**, Research Leader, United States Department of Agriculture, Agricultural Research Service, Rangeland Insect Laboratory, Bozeman, Montana, U.S.A., 59717-0366.

Grasshoppers represent a very complex collection of herbivores that interact in communities from mountain peaks to desert scrub. In addition to providing a critical link in grassland food webs, grasshoppers occasionally, perhaps 2-3 years per decade, compete with human endeavours to harvest primary production over large landscapes in the Great Plains of North America. Research conducted in the Canadian and northern U.S. Rocky Mountain foothills and prairies suggests that grasshopper communities consist of facultative assemblages of species, though there does appear to be characteristic community associations within vegetation series. That grasshopper communities are sensitive to temporal resource fluctuations as indicated by results of observations maintained at selected rangeland sites since 1986 in Montana, U.S.A. Observations revealed significant post-1988 drought reductions in grasshopper species richness in the eastern and southcentral region of Montana where drought intensity has been increasing during the past 20 years. The northcentral region, which also experienced the 1988 drought but showed no long-term drought trend, did not show a post-drought reduction in overall grasshopper species richness. Thus, the potential impact of a severe drought in a given year, at least in some grassland ecoregions, may depend on the timing of such an event within longer-term climatic cycles. Results from my studies suggest that as regional drought intensity increases temporally, there may be an increased likelihood that a single extreme drought year will not only have a profound impact on abundance, but may also result in a significant long-term reduction in regional-scale grasshopper species richness. Recent findings support the hypothesis that food and heat resources are very important factors contributing to the structure and function of grasshopper communities and that the development of large scale outbreaks represents a relaxation of landscape-scale resource limitations.

Symposium: The Structure of Insect Communities

TUNDRA, BOREAL FOREST, AND PRAIRIE MOSQUITO COMMUNITIES. R.A. Brust.
Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

Mosquito communities in tundra, boreal forest, and prairie ecosystems have different structures, and respond to their environment in substantially different ways. The common resource for mosquito development amongst the three communities, is standing water which is generated from melting snow or rainfall. In the tundra ecosystem, the low level vegetation creates a low demand for moisture so there is an excess of standing water for immature mosquito development. Larval population densities are low, but adult densities around hosts are extremely high for 4-6 weeks each summer. In the boreal forest biome, there is sufficient moisture from melting snow to provide ground pools for immature mosquito development in the spring. Once the trees begin removing ground moisture, there are fewer ground pools, and larvae may become highly concentrated. For a number of reasons, adult densities of any single species around hosts are usually lower in the boreal forest than in tundra biomes. In the prairie ecosystem, mosquito communities are highly dependent on summer weather. A drought may decimate the populations whereas heavy rains over several months can produce abnormally high densities. The reasons for these large swings in mosquito density is a complex interaction amongst such factors as the availability of habitats, availability of blood meals, weather, and multiple generations of some mosquito species.

INVERTEBRATE COMMUNITY ORGANIZATION IN RIVERS. Lynda D. Corkum,
Department of Biological Sciences, University of Windsor, Windsor, Ontario, N9B 3P4.

My field studies were designed to test the biome dependency hypothesis, which predicts that similar assemblages of macro invertebrates occur along rivers both within and among drainage basins if the basins occupy the same biome. I collected benthic macro invertebrates from three drainage basins within each of three biomes in Canada, the eastern deciduous forests (EDF) of southwestern Ontario, the grasslands of southcentral Alberta, and the montane coniferous forests (MCF) of southeastern British Columbia. The 225 benthic samples (3 biomes × 3 rivers/biome × 5 sites/river × 5 samples/site) were collected in spring. The significant interaction effect between biome and a site's location along a river indicated that patterns in total density and taxonomic composition were not spatially consistent among sites along rivers or among biomes. Total macro invertebrate densities were equivalent between the EDF and grassland sites. However, total density was substantially lower at the MCF sites than at sites in the other two

biomes. The greatest differences in taxonomic composition occurred among biomes, although significant differences occurred for other sources of variation examined. On-site hydrological features, riparian vegetation, characteristic climax vegetation of biomes, and land use practices within drainage basins all interacted to account for the distributional patterns of lotic macro invertebrates. My findings suggest that the impact of these features is hierarchical, and that the biome level of organization is the most basic structuring force.

THE ROLE OF COMPETITION IN A CARABID ASSEMBLAGE OF A LACUSTRINE BEACH. **N.J. Holliday**, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

On a stony beach on the west side of Lake Winnipeg, adults of four species dominate the assemblage of carabid beetles. During summer, *Bembidion transversale* Dejean and *B. scopulinum* Kirby occur close to the water's edge; whereas the range of *B. concolor* Kirby and *Chlaenius cordicollis* Kirby includes the water's edge but extends several metres up the beach. Surface temperature and water vapour pressure deficit increase with increasing distance from the water's edge.

In a laboratory temperature gradient, *B. transversale* preferred cooler temperatures than other species, and all species avoided temperatures above 30-35°C. On hot sunny days, temperature preference probably caused all beetles to move closer to the water. Species other than *B. transversale* may move away from the water on cool days, and this may contribute to the observed zonation patterns. All species lost water rapidly at smaller vapour pressure deficits than those measured on the beach, and so probably periodically moved to the water's edge to drink. *Bembidion scopulinum* was least tolerant of dehydration and *C. cordicollis* was most tolerant. The hypothesis that beetles exhibit kinetic responses to microclimatic factors was sufficient to explain the observed zonation of all species, although *B. concolor* was sometimes further from the water than expected.

At low densities in artificial beaches, *B. concolor* was close to the water's edge, but was displaced up the beach if densities of *Bembidion* spp. were higher. Similar density-dependent displacement was evident in the field. Kinetic responses of *B. concolor* to encounters with other beetles of similar size would cause individuals of this species to be displaced up the beach. Alternation of episodes of upward displacement with forays to the water's edge to drink would account for the observed distribution of this species on the beach.

It is concluded that position on the shoreline gradient of three of the species was maintained by niche differentiation. The location of *B. concolor* was the result of dominance controlled competitive interaction.

TROPHIC INTERACTIONS AND THE POPULATION DYNAMICS OF FOREST DEFOLIATORS. **Vince Nealis,** Canadian Forest Service - Sault Ste. Marie, P.O. Box 490, Sault Ste. Marie, Ontario, P6A 5M7.

Forest insect communities are organized within a plant community which can have very high species, as well as structural diversity and which range from small, ephemeral communities created by gaps to climax communities persisting over large areas for long periods of time. The potential for the development of complex ecological interactions among plant and insect communities in forests is great. Despite the apparent stability of mature forest ecosystems, there are a few forest insect species whose populations erupt periodically and have a profound influence on their forest home. The dynamics of two such defoliating insects, the spruce and jack pine budworms (*Choristoneura fumiferana* and *C. pinus*), can be interpreted in terms of trophic interactions between the budworm and its plant resource and between the budworms and the rich community of natural enemies that uses the budworms as a resource. The short-term catastrophic nature of these trophic interactions may actually promote long-term maintenance of the rich forest ecosystem.

Presented Papers

INVESTIGATIONS INTO THE DISPERSAL OF NATIVE ELM BARK BEETLES IN MANITOBA. **I.L. Pines and A.R. Westwood**, Forestry Branch, Manitoba Natural Resources, 300-530 Kenaston Boulevard, Winnipeg, Manitoba, R3N 1Z4.

A method of self-marking native elm bark beetles as they emerge from their galleries was tested in a riverbank plot at the Glenlea Experimental Station. A fluorescent yellow powder was applied to the base of healthy elm trees to monitor adult dispersal as they emerged from overwintering sites during the spring of 1994 and 1995. Also for both years, trap logs placed in the vicinity, were colonized during the spring and then powdered in late July to monitor the dispersal of brood adults. Preliminary results are discussed.

PARASITOIDS OF SPRUCE BUDWORM, *CHORISTONEURA FUMIFERANA* (CLEMENS), IN MANITOBA. **D.A. Zebrowski and N.J. Holliday,** Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

Epidemic and endemic spruce budworm populations in eastern Manitoba were sampled biweekly during the spring and summer periods of 1994 and 1995. The collected specimens were reared individually until the emergence of a parasitoid or moth occurred. Parasitoids collected from the 1994 collection period included : *Apanteles fumiferanae* Viereck, *Glypta fumiferanae* (Vier.),

Phaeogenes maculicornis hariolus (Cress.), *Itoplectis conquisitor* (Say), *Trichogramma minutum* Riley, *Mesopolobus tortricis* (Brues), *Ephialtes ontario* (Cress.), *Meteorus trachynotus* (Vier.), *Phryxe pecosensis* (Tnsd.), *Eumea caesar* (Aldr.), *Winthemia fumiferanae* Toth., and *Lypha setifacies* (West). Only two of the above parasitoids, *A. fumiferanae* and *W. fumiferanae*, were collected from the endemic population sampled. All of the above parasitoids were found in the epidemic populations sampled.

AERIAL APPLICATION OF MIMIC FOR SPRUCE BUDWORM IN EASTERN MANITOBA (1994). K.R. Knowles and A.R. Westwood, Forestry Branch, Manitoba Natural Resources, 300-530 Kenaston Boulevard, Winnipeg, Manitoba, R3N 1Z4.

A spruce budworm, (*Choristoneura fumiferana* [Clem.]), infestation has persisted in eastern Manitoba since 1979. In 1994, 200 hectares (ha) of predominantly white spruce (*Picea glauca* [Moench] Voss) forest was treated at Dorothy Lake and at Garner Lake with Mimic® (RH5992, tebufenazide) flowable. At each location 100 ha received one or two applications of 70 g active ingredient (a.i.) per ha per application. Spruce budworm larval samples were taken in both treated and untreated areas prior to and following the applications to determine the efficacy of the treatments. The larval mortality for the double application was 97% at Garner Lake and 92% at Dorothy Lake. The single application had 66% mortality at Garner Lake and 71% at Dorothy Lake. Larval mortality in the untreated blocks was 51% and 57% at Garner and Dorothy Lakes, respectively. Egg mass surveys to predict 1995 defoliation were conducted in the treated and untreated blocks. Egg mass densities averaged 455 per 10 m^2 of foliage in the untreated blocks and 224 or less in the treated blocks. Larval counts were done in each block in 1995. The number of larvae per branch averaged 37 and 40 in the two untreated blocks, resulting in severe defoliation. In the treatment blocks larval numbers were much lower averaging three to 13 per branch. One year of treatment, in particular the double application, was successful in reducing defoliation to low levels for two years. This facilitated the recovery of white spruce which had experienced considerable twig dieback.

DEVELOPMENT OF FOREST HEALTH SURVEYS IN MANITOBA'S RENEWED FOREST STANDS. Y.B. Beaubien and A.R. Westwood, Forestry Branch, Manitoba Natural Resources, 300-530 Kenaston Boulevard, Winnipeg, Manitoba, R3N 1Z4.

Over the past 8 years Forest Landscape Management has been actively investigating all types of forest stand renewal throughout the province. A ground survey was carried out in 300 stands covering over 8500 hectares in the Western, Northeast, Northwest and Eastern Regions including both Pine Falls Paper Company and Repap Paper Company Forest Management License Areas. The survey has delineated areas of pest occurrence causing significant losses by tree species and by geographical location. Follow-up stand treatments including refilling, thinning and/or pest

control was recommended in 114 of the surveyed stands. The survey indicates that some form of stand tending is often required on reforested sites. Modification of existing forest resource surveys is presently underway to collect baseline information for the top 10 most damaging pests. A preventative approach to minimize losses will be initiated through recommending modification of operational forest practices.

INITIATION OF SEX PHEROMONE BIOSYNTHESIS IN THE FEMALE YELLOW MEALWORM, *TENEBRIO MOLITOR* (COLEOPTERA: TENEBRIONIDAE). N. Islam and D. Vanderwel, Department of Chemistry, University of Winnipeg, 515 Portage Avenue, Winnipeg, Manitoba, R3B 2E9.

The female yellow mealworm beetle, *Tenebrio molitor*, produces the sex pheromone 4-methylnonanol. Other investigators have shown that the pheromone is only produced by mature females. The initiation of pheromone production is apparently mediated by Juvenile Hormone (JH). The objective of this study was to determine the biosynthetic pathway of the pheromone, and to determine the biosynthetic step(s) that are regulated by JH. The biosynthetic pathway of the pheromone was determined by stable isotope-labelling studies. Mature female beetles were fed defatted bran coated with ^{2}H- or ^{13}C-labelled precursors of interest. Incorporation of the ^{2}H- or ^{13}C-labels into the pheromone was determined by gas chromatography/mass spectroscopy. The pathway was deduced to be a modification of normal fatty acid metabolism. The last step involved the reduction of 3-methylnonanoic acid to the pheromone. In order to determine if this step was regulated by JH, female beetles were injected with radio-labelled 4-methylnonanoic acid and extracted after three hours. [^{3}H]4-Methylnonanoic acid and [^{3}H]4-methylnonanol were separated by chromatography and quantified by scintillation counting. The reduction of the precursor to pheromone was blocked in control immature females, but was allowed in mature and immature females that had been pre-treated with methoprene (a JH analogue). Thus the reduction of methylnonanoic acid to 4-methylnonanol is apparently regulated by JH.

EFFECT OF MATING ON SEX PHEROMONE TITRES IN THE FEMALE YELLOW MEALWORM, *TENEBRIO MOLITOR* (COLEOPTERA: TENEBRIONIDAE). R. Vakili and D. Vanderwel, Department of Chemistry, University of Winnipeg, 515 Portage Avenue, Winnipeg, Manitoba, R3B 2E9.

The sex pheromone of the female yellow mealworm, *Tenebrio molitor*, is 4-methylnonanol. The presence of 4-methylnonanol in pentane extracts of the female beetle both attracts the male and elicits a copulatory response. Our objective was to determine the effect of mating on 4-methylnonanol production by mature females. Pentane extracts of the females were prepared at various times after mating. The activity of the extracts was determined by bioassay. Mating

caused both a significant decrease in the number of males that responded, and an increase in the length of time that the responding males took to respond to the extracts. This effect peaked about 6 hours after mating, but was transient. Our next step was to attempt to confirm that the decrease in the activity of the activity of the female extracts was caused by a decrease in the levels of 4-methylnonanol. We quantified 4-methylnonanol by Gas Chromatography (GC) and GC-Mass Spectroscopy (MS) using 1-octanol as an internal standard. Virgin females contained 10.0 $\pm$ 0.2 ng of extractable 4-methylnonanol. The level of 4-methylnonanol dropped below our level of detection in extracts prepared 6 hours after mating. Thus both bioassay and GC-MS results indicated that mating induces a transient decrease in 4-methylnonanol content in the female yellow mealworm.

INSECTS ASSOCIATED WITH *LYTHRUM SALICARIA* L. AT SEVERAL SITES IN SOUTHERN MANITOBA. **Jason K. Diehl**, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

During the summer of 1994 insects were collected at Delta Beach and Libau Manitoba, where purple loosestrife, *Lythrum salicaria* is dominant. A number of collecting techniques, such as sweep netting, vacuum sampling, and hand collecting were used. All insect material was identified, where possible, to genus and species. A total of 43 families of insects were obtained and grouped into four feeding guilds: herbivores, predators, omnivores, and fungivores. Herbivores that fed on *L. salicaria*, as well as possible predators of the biological control agents, *Galerucella* spp. will be emphasized.

THE EFFECT OF POLLEN DIET ON HONEY BEE (*APIS MILLIFERA* L.) WORKER FITNESS. **Stephen F. Pernal and R.W. Currie**, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

Cohorts of 150 newly-emerged adult honey bees were placed in queenless cages and fed one of eight single pollen diets for a period of 14 days, in a replicated experiment. To determine any associated changes in worker fitness, 25 bees were removed from each cage at 0, 3, 8, and 14 days and the extent of ovarian development was visually assessed. Hypopharyngeal glands from 10 of these individuals were also removed and analyzed for total protein using a modification of the Bradford microassay. Diet consumption and worker survival was also measured during the same time intervals. Total protein content of each diet was determined by elemental analysis. Preliminary results suggest significant variations in total protein content of individual diets and associated changes worker ovary and gland development. The relationship between the nutritional suitability of these pollen sources for honey bees versus their relative attractiveness to pollen foragers is an area for continued investigation.

COMPENSATION OF *BRASSICA NAPUS* AND *SINAPIS ALBA* FOR DEFOLIATION BY THREE SPECIES OF INSECTS. **John Gavloski**, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

Field and lab studies were performed to determine whether canola (*Brassica napus* L. 'Excel') and mustard (*Sinapis alba* L. 'Ochre') compensate differently for equal amounts of feeding by three different defoliating insects. Seedings were damaged by either bertha armyworm (*Mamestra configurata* Walker) larvae, diamondback moth (*Plutella xylostella* L.) larvae, or crucifer flea beetles (*Phyllotreta cruciferae* Goeze), and insects were removed when sufficient damage was achieved. Plant growth was measured weekly. Insect damage to canola and mustard seedings resulted in yield losses, with the degree of yield loss depending on the defoliating insect.

DISTRIBUTION OF CEREAL APHIDS WITHIN THEIR HOST PLANTS. **S.M. Migui and P.A. MacKay**, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

Studies of aphid distribution on barley under laboratory and field conditions indicated a stratified sub-division of the host plant. Each aphid species appeared to prefer a specific feeding location where reproduction also occurred. Regions of highest abundance for each species were, the central unopened leaf of immature plants for *Rhopalosiphum maidis*, the lower leaf sheaths for *R. padi*, the underside of the proximal end of lower leaves for *Schizaphis graminum*, and the distal end of middle and upper leaves of immature plants and on the head of filling grain for *Sitobion avenae*. Dispersing adults searched and settled on their specific locations and appeared to be more sensitive to feeding location than juveniles. The morph of reproducing adults did not influence their distribution within the host plant. The pattern of distribution within the field varied between the four aphid species. *Sitobion avenae* had the highest abundance and was distributed widely within the field. The population of the other four species was low and among these, *R. padi* was the most widespread while *R. maidis* and *S. graminum* had an aggregated distribution.

TEMPERATURE MODULATION OF PHOTOPERIODISM AND THE TIMING OF DIAPAUSE IN AN APHID, *ACYRTHOSIPHON PISUM* (HARRIS). **M.A.H. Smith and P.A. MacKay**, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2.

Photoperiodic and temperature cues have been shown to be used in a latitudinally adaptive way to initiate diapause in many Temperate Zone insects. Most of our understanding of these mechanisms come from laboratory studies, extrapolated to natural populations. Our objective

was to investigate the role of these cues in nature and their importance in natural selection and adaptation of insects to local habitats. From 1989-93 natural populations and caged clones of pea aphids were sampled throughout late summer from fields at Glenlea, MB, and tested in the laboratory to determine the types of progeny they produced. Even though there was considerable intra- and inter-clonal variation in responses to photoperiodic and temperature cues, the timing of diapause was adaptively related to August temperature. The sexual phase, which lays the diapausing eggs, was produced earlier in cool years than in warm years. Early autumn temperatures play a strong selective role in determining which clones succeed in laying eggs in time. These findings are discussed in relation to the migratory nature of the pea aphid.

RESPONSE OF CORN GAS EXCHANGE PARAMETERS TO WESTERN CORN ROOTWORM INJURY. Xin Hou, L.J. Meinke, T. Arkenbauer, and L. Higley, Department of Entomology, University of Nebraska, Lincoln, Nebraska, U.S.A.

This study was conducted to characterize how larval feeding on corn roots affects corn leaf gas exchange parameters, ie. photosynthetic rate, stomatal conductance, and intercellular CO_2 concentration, and to determine how soil moisture level interacts with larval injury on corn gas exchange parameters. To characterize how larval feeding on the corn root system affects corn leaf gas exchange parameters, the parameters of corn plants infested and not infested with larval western corn rootworms were compared within short time intervals during the larval period. Larval feeding had significant and transient effects on corn leaf photosynthetic rate and stomatal conductance. When the rootworm population was predominantly second instars, leaf photosynthetic rate and stomatal conductance in the infested corn were significantly lower than those in the noninfested corn. Shortly thereafter, an apparent compensation/overcompensation plant response occurred. Corn leaf intercellular CO_2 concentration was not significantly affected by larval feeding.

Soil moisture level interacts with larval injury to significantly affect leaf photosynthetic rate and stomatal conductance. When rootworm damaged and nondamaged plants were irrigated, photosynthetic rates of the nondamaged plants greatly increased with rates of rootworm damaged plants remained at preirrigation levels. This interactive effect lasted several days. Eventually, within irrigated plants, photosynthetic rates and stomatal conductance of the rootworm injured plants equilibrated with those of the noninjured plants. Nonirrigated plants maintained low photosynthetic rates and stomatal conductance.

The results of this study suggest that water uptake reduction because of root physical damage may not be the only factor that is involved in the injury-plant response process and that irrigation of the infested corn may not immediately reduce the stress on corn caused by larval injury. More direct research needs to be conducted to test the hypothesis of the corn root hormone involvement.

SPECIFIC IMPACTS OF APHIDS ON SEEDLING PLANTS. **Robert J. Lamb,** Agriculture & Agri-Food Canada, 195 Dafoe Road, Winnipeg, Manitoba, R3T 2M9.

Measures of the impact of insect herbivores on their host plants are useful in assessing crop damage for integrated pest management and the tolerance of plants to insects in crop resistance research. Herbivory consists of the removal of plant tissue by the insect, conversion of the plant tissue to insect tissue, and compensatory growth by the plant. It can be broken down into two parts: specific impact and numerical impact. Specific impact represents the basic unit of conversion on a biomass basis; numerical impact represents the density effects when numerous insects feed on a single plant. In an attempt to establish generally applicable measures of the impact of insect herbivores on plants, the specific impacts of nine aphid species were determined on four seedling crops. The specific impacts were stable for most aphids, with about 3 mg of plant biomass lost for each mg of biomass gained by an aphid. However, virulent aphids exist with higher specific impacts. Some ecological and agricultural implications of specific and numerical impacts are discussed.

Minutes of the 51st Annual Business meeting of the Entomological Society of Manitoba

14:00 h, November 4, 1995

Travelodge Astoria
Winnipeg, Manitoba

The President, R. Currie presided. A quorum being present, the meeting was called to order. Mr. Brent Elliott, Newsletter co-editor, took the minutes due to the absence of the secretary.

ATTENDANCE

Executive:	R. Currie, President	
	M. Smith, Treasurer	
	N. Holliday, Regional Director to the ESC	
	R. Westwood, Editor of the Proceedings	
	J. Buth, Endowment Fund Board	
Members:	J. Gavloski	R. Ellis
	N. White	D. Vanderwel
	P. MacKay	D. Dixon
	B. Preston	B.Elliott
	R. Lamb	J. Gosselin
	R. Brust	S. Pernal
	R. Lafreniere	A. Wiens

1. Agenda (Appendix A). **Motion:** MacKay / Lamb. That proposed agenda be adopted. **CARRIED.**

2. **Minutes of the 50th Annual Meeting. Motion:** Buth / Smith. That the minutes of the 50th Annual Business Meeting of the Entomological Society of Manitoba, held 4 November, 1995 and published in Volume 50 of the Proceedings of the ESM, be accepted. **CARRIED.**

3. **Business Arising from Previous Minutes:** R. Currie states that a committee has been struck for organizing the joint ESM - Department of Entomology meeting. The committee members are T. Galloway, R. Currie, N. White and R. Westwood.

4. **Executive Reports:**

Motion: Holliday / MacKay. That the committee reports be received. **CARRIED.**

a. President (Appendix B). R.Currie asks present members to observe a moment of silence in the memory of B. Fingler. R. Currie offers a general thanks to the membership for their excellent contributions.

b. Treasurer/Auditor's Report (Appendix C).

c. Regional Director to the Entomological Society of Canada (Appendix D).

d. Editor of the Proceedings of the ESM (Appendix E).

e. Endowment Fund Board (Appendix F).

5. **Committee Reports:**

a. Finance (Appendix G).

b. Newsletter (Appendix H).

c. Social (Appendix I). S. Pernal reported that he will be retiring from the Social directors position. P. MacKay offers a general thanks from the membership for doing an excellent job in his tenure.

d. Education and Youth Encouragement (Appendix J). J. Gavloski reported that he will be retiring from the Education Directors position. A letter is read on behalf of T. Galloway congratulating J. Gavloski for doing an excellent job in his tenure.

e. ESC Common Names (No report).

f. Archivist (No report).

g. Scrutineers Report (No report).

h. Honourary Members (Appendix K). R. Currie asks for nominations to chair this committee.

i. Student Awards (Appendix L).

j. ESC Scholarship (Appendix M).

k. ESM Scholarship (Appendix N).

l. Scientific Program (Appendix O).

m. ESM Membership (Appendix P).

n. Fund Raising Committee (Appendix Q).

6. **Election Results:**

D. Dixon reports that 109 ballots were sent out and 0 ballots were spoiled.

President Elect: T. Galloway
Member-at-large: S. Pernal

Motion: Holliday/Smith. That the ballots from the elections be destroyed. **CARRIED.**

7. **Transfer of Office:**

R. Currie remains as President and R. Gadawski remains as past president until R. Roughley returns from sabbatical.

8. **Other Business:**

i. **Motion:** Pernal/Buth. That the book award prize be raised from $100.00 to $150.00. **CARRIED.**

ii. **Motion:** Holliday/Buth. That the current auditor be retained. **CARRIED.**

iii. **Motion:** That the recipient of the ESM Award be an ESM member. N. Holliday stated that there is no need for any more constraints. R. Brust stated that this would hurt the image of the society. **MOTION DEFEATED.**

iv. **Motion:** Holliday/Brust. That all committee chairs of the society be restricted to members of the society. **Amendment:** Dixon/White. That this requirement maybe altered or changed by the executive of the society on a case by case basis. **CARRIED.**

9. **Adjournment:** Dixon/Brust. 16:00 h.

APPENDIX A

ENTOMOLOGICAL SOCIETY OF MANITOBA
51ST ANNUAL BUSINESS MEETING

November 4, 1995

Agenda

1. Acceptance of Agenda

2. Acceptance of minutes of last Annual Meeting (Nov 17, 1994)

3. Business arising from the last minutes.

4. Reports - Executive

President	R. Currie
Treasurer	M. Smith
Regional Director to the ESC	N. Holliday
Editor of the Proceedings	R. Westwood
Endowment Fund Board	J. Buth

5. Reports - Committees

Finance	J. Buth
Publicity / Newsletter	R. Lafreniere
Social	S. Pernal
Education / Youth Encouragement	J. Gavloski
ESC Common names, Archivist	R. Roughley
Student Awards	B. Gallaway
ESM Scholarship	J. Conroy
Scientific Program	R. Lamb
ESM Membership	T. Galloway
Fund Raising	J. Gosselin

6. Election Results — D. Dixon

7. Transfer of Office — R. Currie

8. Other Business

APPENDIX B

PRESIDENT'S REPORT

This has been a trying year for the Executive of the Entomological Society of Manitoba. Our President, Barry Fingler, was diagnosed with cancer and after a brief illness passed away on 23 May 1995. Barry was a dedicated entomologist and faithful servant to the Society. His contributions to the entomological community will be sorely missed.

In accordance with the bylaws of the society I assumed the duties of the President. During my brief term as Acting-President I have learned much about the functions of the Society. Fortunately, due to the diligence and hard work of the various committee chairs, the social educational, financial and administrative functions of the society have carried on for the most part without interruption.

The coming year promises to be an exciting one for the Society. In addition to the usual activities of the Society, plans are being initiated for a joint E.S.M. - Dept. of Entomology 75th Anniversary Celebration. the Celebration will be in conjunction with the Society's Annual General Meeting and a "Joint E.S.M. - Department of Entomology Meeting" Committee has been established that is being chaired be Dr. T. D. Galloway.

I would like to extend my thanks to all of the Committee chairs and to the Executive for their guidance and assistance during this period.

R.W. Currie
Acting President

APPENDIX C

AUDITOR'S REPORT

To the Directors of the
Entomological Society of Manitoba Inc.

I have examined the balance sheet of the Entomological Society of Manitoba Inc. As at August 31, 1995 and the statement of income and expenses for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I consider necessary in the circumstances.

In common with many non-profit organizations, the organization derives some cash revenue, the completeness of which is not susceptible to conclusive audit verification. Accordingly, my verification of these revenues was limited to the amounts recorded in the records of the organization and I was not able to determine whether any adjustments for unrecorded receipts from these sources might be necessary to income or surplus balances.

In my opinion, except for the effect of any adjustments, if any, which I might have determined to be necessary had I been able to satisfy myself concerning the completeness of the cash revenues referred to above, these financial statements present fairly the financial position of the society as at August 31, 1995 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles.

Winnipeg, Canada
October 12, 1995

Original signed by Doug Nicholson
Certified General Accountant

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
BALANCE SHEET
AUGUST 31, 1995

ASSETS

	1995	1994
Cash Advances (note 2)	$ 50	$ 50
Cash in bank	7,203	1,672
Investments	27,997	30,004
	$35,250	$31,926

LIABILITIES

Liabilities	nil	nil

SURPLUS

Surplus	$35,250	$31,926

APPROVED BY THE BOARD

_____ Director

_____ Director

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
STATEMENT OF INCOME AND EXPENSES
YEAR ENDED AUGUST 31, 1995

	1995	1994
REVENUE		
Joint Annual Meeting	$2,661	-
Donations	-	$ 550
Fundraising committee	721	296
Interest income	2,678	2,794
Members fees	1,255	1,458
Miscellaneous	149	241
Other committees	-	169
Proceedings	402	2,359
Student awards	-	100
Social committee	-	39
Youth encouragement/ and public education	200	200
	8,066	9,926
EXPENSES		
Awards and scholarships	$1,500	$1,287
General	1,057	921
Meetings	100	2,388
Newsletter	76	269
Other committees	-	169
Proceedings	402	2,359
Social committee	253	457
Youth encouragement/ and public education	70	112
	$4,742	$8,283
EXCESS (DEFICIT) OF INCOME OVER EXPENSES	$3,324	$1,643
Surplus, beginning of year	$31,926	$30,283
Surplus, end of year	$35,250	$31,926

JOINT ANNUAL MEETING
TWENTY MONTHS ENDED AUGUST 31, 1995

REVENUE	
Entomological Society of Canada	$ 4,000
Entomological Society of Manitoba	500
Registration	22,549
Fund Raising	9,117
Interest	71
	$36,237
EXPENSES	
Audio Visual	$ 1,365
Bank Charges	22
Banquet	10,687
Coffee	1,605
Entertainment	375
ESC Expense	2,772
Mailing	735
Miscellaneous	709
Printing	2,053
Rooms	6,999
Speakers	1,484
Student Awards	300
Wine and Cheese	2,242
	$31,348
Profit	$4,889
DISTRIBUTION OF PROFITS	
Payout to Entomological Society of Canada	$2,228
Payout to Entomological Society of Manitoba	$2,661
	$4,889

NOTES TO THE FINANCIAL STATEMENT
AUGUST 31, 1995

1. SIGNIFICANT ACCOUNTING POLICIES:

Income and expenses are recorded on the cash basis of accounting. There are no accruals of receivables or payables at the year end. Fixed assets are written off when acquired and therefore, there are no annual depreciation allowances.

2. STANDING ADVANCES

Treasurer	M. Smith	$ 25
Editor	R. Westwood	$ 25
		$ 50

3. INVESTMENT CERTIFICATES:

Cert. No.	Amount ($)
7053937	2,000.00
7053706	3,024.00
8421072	1,775.60
7058513	2,003.96
7058436	3,000.00
7053805	2,000.00
7053871	9,200.00
14577420	1,993.52
18105406	3,000.00
TOTAL	$27,997.48

E.S.M. Financial Committee Meeting - 25 October, 1995
Treasurer's Supplement to the Auditors Report

REVENUES:

Joint Annual Meeting:

The joint AGM income/expense statement is given separately. The amount of $2660.88 was the final payout to the ESM on closing the Joint Annual Meeting account.

Interest Income:

G.I.C. interest was $2659.43. Interest from the bank account was $18.48.

Miscellaneous:

The amount of $149.06 was the GST rebate.

EXPENSES:

Awards and Scholarships:

This includes a donation of $500.00 which was made to the A.G. Robinson Scholarship Fund.

General Expenses:

Auditor	$615.25
Secretary, Treasurer, Postage and Photocopying	111.73
Bank Service Charges	33.25
2000 ESM logo envelopes	181.11
Corporation Fee	15.00
Labelmaster software and registration	61.57
Other office supplies	26.10

The amount of $100.00 is the reimbursement of the Joint Agm registration fee for Bill Preston, recipient of the Criddle Award.

Note Regarding Surplus:

There is a larger than usual surplus because an amount budgeted for Distinguished Lecturer, and amounts for Newsletter and Youth Encouragement and Public Education, were not spent. At the last executive meeting approval was given to increase the 1995 Annual General meeting budget to allow for more out-of-town speakers. There should, therefore, be an offsetting deficit for the year ending 31 August, 1996.

APPENDIX D

REPORT OF THE ESC REGIONAL DIRECTOR TO THE ENTOMOLOGICAL SOCIETY OF CANADA

In 1995, The Entomological Society of Canada's annual meeting was in Victoria, BC and about 300 people attended. At the meeting, ESM member, Dr. R.A. Brust received the ESC Gold medal. Future annual meetings are scheduled for Fredericton, NB (5-9 October 1996) and Edmonton AB, ($-8 October 1997). A joint annual meeting with the Entomological Society of America is planned for 2000 and the venue is likely to be Montreal, Toronto or Vancouver.

The sales of the book, *Diseases and pests of vegetable crops in Canada*, has continued this year, but have not yet covered the costs incurred by ESC. ESC is currently negotiating with its co-publisher, the Canadian Phytopathological Society, on an equitable distribution of costs and revenues of the book. The hard cover English edition is in short supply, but there adequate supplies of the soft cover English edition and the French edition.

A change design of the cover of the *Canadian Entomologist* will appear in the future. A change design has also been finalized for the *Memoirs*, but changes in the publication policies of the Biosystematic Research Institute have resulted in a dearth of submitted manuscripts for the *Memoirs*. No *Memoirs* will be published in 1995, and there seems little prospect of a return to frequent issues of former years. ESC is considering how to deal with subscribers who pay for the *Memoirs* when no *Memoirs* are issued.

The 1995-6 president of the ESC is Dr. Guy Boivin. The societies secretary is now Dr. Peggy Dixon. The new Bulletin Editor is Dr. Hugh Barclay. In January 1996, Dr. Gary Cummings will take over as Treasurer of ESC.

The ESC is reviewing all its operations and activities in the light of declining membership. The committee that is working on this task will be examining many aspects of the

Society, including relationships with regional societies. A report from the committee is to be discussed in depth at next year's annual board meetings in Fredericton.

The ESC has vacancies for Honourary Members and is also seeking nominations for its Gold Medal and C. Gordon Hewitt Award. I recommend that the Society executive give thought to putting forth nominations for these honours and awards.

The published membership list of the ESC is now quite dated, and a new list will be published in the near future. It had been hoped to publish a version on diskette, but equipment problems have delayed this venture. Available right now from the ESC office is a diskette containing the ESC list of common names of insects. Cost is $15 plus shipping and handling. ESC and the Entomological Society of America have begun negotiating on a "common" Common names list. It is intended to have this list published at the time of the joint meeting of the two societies.

N.J. Holliday
Regional Director

APPENDIX E

REPORT OF THE PROCEEDINGS EDITOR

Volume 50 (1994) of the Proceedings of the Entomological Society of Manitoba was completed on August 31, 1995 and mailed to our Society members, subscribers and as gifts or exchange to selected institutions in October and November of 1995. A total 225 copies of Volume 50 were printed. The format was reduced from the current 8.5" X 11", to 6.5" X 8.5" to reduce mailing costs and save costs on printing. As the cost savings were substantial, the price charged to subscribers for Volume 50 of the Proceedings was $8.00 Canadian, the same as previous years. The cost to produce Volume 50 was approximately $7.23 per volume ($1.23 per volume less than Volume 49). The society had indicated that an increase in the subscriber fee to $10.00 per volume would be appropriate. When the cost for a downsized format for Volume 50 and reduced mailing costs were factored in with the cost of having to design and produce new invoices (if the subscription price was increased), the Editor decided that a fee increase for the 1994/95 fiscal year was not necessary.

Approximately 125 copies were mailed to society members, 40 to subscribing institutions and 50 were mailed to institutions that exchange their journal with ours or receive the Proceedings as a gift. Volume 50 was 97 pages in length.

Volume 50 contained 2 referred scientific papers which made up 15 of the 97 pages.

Publishing authors paid only for reprints, as the Society does not charge page costs for papers printed in the Proceedings. The funds that the Society sets aside to help authors unable to fund their own papers was not utilized in 1994/5. The peer review process worked well and I am indebted to the reviewers for their time and expertise to ensure the scientific content of the Proceedings is of the highest quality. Three papers were submitted for Volume 50, two being accepted and one found not suitable. I continue to seek new ideas and methods to improve the quality of our publication and any Society member who wishes to comment on the content or format of the current publication should do so in writing, attention to myself.

Proceedings Editor
November 1, 1995.
Richard Westwood

APPENDIX F

ANNUAL REPORT OF THE ENDOWMENT FUND BOARD

The endowment fund continues to be a major source of revenue for the Society. It provides a basis for funding the Student Scholarship ($1,000.00) and, the publication of the Proceedings ($1,500.00). Also, the fund contributes approximately $500.00 toward the costs associated with the Annual General Meeting of the Society. Therefore, the endowment fund is committed to about $3000.00 annually

In the 1994-95 fiscal year, $2678.00 of investment income was generated from a principle amount of $30,000.00. Income from the Endowment Fund continues to decline, as G.I.C.'s at 10-11% are being renewed at 7-8% Interest rates are not expected to rise to previous levels of 10-11%.

Membership fees are now expected to cover a greater part of the society's expenses.

In keeping with the auditors recommendations last year, we combining our smaller G.I.C.'s into several larger ones. The auditor mentioned that we should try to combine our G.I.C.'s so that they are over $5,000.00 each, as most financial institutions offer higher interest rates on larger G.I.C.'s.

In the past year $2,000.00 (matured 11 Oct., 94) was combined with $7,200.00 (matured 14 Nov., 1994) into one G.I.C. for $9,200.00, reinvested over 5 years at 8.00%.

A G.I.C. for $2,006.48 (matured 28 Aug., 95) will be combined with $1.993.52 (matures 19 Dec., 95) and reinvested for one year. This will then be combined with $2,000.00

(matures 2 Oct., 96), to make one G.I.C. for $6,000.00 reinvested for five years.

A description of the Endowment Fund investments is provided below.

Guaranteed Investment Certificates with Royal Trust

Cert. No.	Amount ($)	Interest Rate (%)	Maturity Date	Annual Int.($)
7053937	2,000.00	9.75	Oct. 2, 1996	195.00
7053706	3,024.33	8.00	Dec. 15, 1997	241.95
8421072	1,775.67	7.50	Jan. 26, 1998	133.18
7058513	2,003.96	6.375	Sept. 16, 1998	127.75
7058436	3,000.00	5.25	Dec. 11, 1998	157.50
7053805	2,000.00	7.25	Apr. 5, 1999	145.00
7053871	9,200.00	8.00	Nov. 14, 1999	736.00
7053893	2,006.48	11.50	Aug. 28, 1995	230.75
14577420	1,993.52	10.75	Dec. 19, 1995	214.30
18105406	3,000.00	7.50	Oct. 31, 1997	225.00
TOTAL	30,003.96	Avg. 8.16		2,406.43

Marjorie Smith
JoAnne Buth

APPENDIX G

ANNUAL REPORT OF THE FINANCE COMMITTEE

The finance committee met on Oct. 25, 1995 to review the Society's financial status.

In 1994-95, revenue exceeded expenses by $3,324.00. In general, committee expenses were less than projected, especially the Proceedings and Newsletter. In addition, there was no guest lecturer in 1994-95.

The accumulated surplus is currently $5,200.00. This will be reduced over the next two years with anticipated net losses of $2,413.72 in 1995-96 and $450.00 in 1996-97. Future surpluses will be used for the guest lecturer.

The finance committee reviewed each of the committee budgets and prepared an overall budget for the Society. An accounting of the revenue and expenses for 1994-95 and projections for the next two fiscal years is attached.

In 1993 the Society committed in principle $1,000.00 donation for the A.G. Robinson memorial scholarship. A $500.00 donation was given in 1994-95 and the final $500.00 is budgeted for in 1995-96.

Marjorie Smith
Richard Westwood
JoAnne Buth

Entomological Society of Manitoba

BUDGET ITEMS	1994-95 ACTUAL	1995-96 ACTUAL & PROJECTED	1996-97 PROJECTED
Endowment Fund	$30,000.00	$30,000.00	$30,000.00
REVENUE			
Membership dues	1,255.00	1,950.00	1,950.00
Proceedings	402.00	600.00	600.00
Social Committee	0.00	0.00	0.00
Youth/Education Committee	200.00	200.00	200.00
Donations	0.00	500.00	500.00
Fund Raising Committee	721.00	500.00	500.00
Student Awards and Scholarship	0.00	100.00	100.00
Meetings: ESM AGM	0.00	1,530.00	1,700.00
ESC-ESM (94-95)	2,661.00	0.00	-
Investment Income	2,678.00	2,200.00	2,100.00
Miscellaneous: GST Rebate	149.00	866.28[1]	150.00
TOTALS	$8,006.00	$8,446.28	$7,800.00
EXPENSES			
General Society Expenses	$1,057.00	$1,200.00[2]	$1,000.00
Proceedings	1,686.00	1,800.00	1,800.00
Newsletter	76.00	500.00	500.00
Social Committee	253.00	500.00	500.00
Youth/Education Committee	70.00	330.00[3]	200.00
Fund Raising Committee	0.00	50.00	50.00
Student Awards and Scholarships	1,000.00	1,300.00	1,300.00
Meetings: ESM AGM	0.00	3,280.00	2,500.00
ESC-ESM (94-95)	100.00	-	-
Other Committees: Membership	0.00	50.00	50.00
Guest Lecture	0.00	1,000.00	0.00
Representation at ESC	0.00	350.00	350.00
A. Grant Robinson Scholarship Fund	500.00	500.00	-
TOTALS	$4,742.00	$10,860.00	$8,250.00
Net Gain (Loss) for Year Ending August 31st	$3,324.00	$(2,413.00)	$450.00

[1] Includes GST rebate from ESC-ESM JAM 1994-1995
[2] Includes audit for ESC-ESM JAM 1994-1995
[3] Includes unexpended balance from 1994-1995

APPENDIX H

NEWSLETTER AND PUBLICITY COMMITTEE

In the absence of an editor, three issues, (winter spring, and summer) of the 1995 "Entomological Society of Manitoba Newsletter" were cancelled. The fall issue was published and distributed with the 1995 membership list. The cost of the publication, which includes the cost of printing, postage and envelopes was $91.38

Rhéal Lafrenière

APPENDIX I

ANNUAL REPORT OF THE SOCIAL COMMITTEE

The Entomological Society of Manitoba met for three luncheons during the 1994-95, held at the Travelodge Hotel Astoria. On Nov. 17, 1994 Spencer Sealy from the Department of Zoology, University of Manitoba, spoke about "Exploring Sociality Among Cloud-Forest Birds in Costa Rica" to 34 members. On March 2, 1995, 25 members listened to John Gavloski talk on "Exploring the Natural Wonders of Costa Rica". Finally on September 26, 1995, Don Dixon revealed his many "Images of Asia" to the 21 members in attendance.

The new members social was held at the Valour Road Curling Club on March 18, 1995. Twenty-nine people were in attendance, including five of the Society's seven new members: Xin Hou, Osamu Kuroda, Jennifer Omani, James Tucker and Heather White. All Participants took part in a novice curing bonspiel dubbed "Entomospiel '95", and enjoyed the many door prizes given away.

The banquet for the Annual General Meeting was held on November 3, 1995 at the Oceana Restaurant in Winnipeg. Following the banquet, Hhinode Taiko performed a loud and lively exhibition of Japanese drumming to the 41 people in attendance. In conjunction with the Scientific Program Committee for the Annual General Meeting, the Social Committee arranged for Pat MacKay and Bob Lamb to host the Meet the Speakers Mixer on November 4, 1995, at their home. Approximately 30 people attended the mixer, and had the pleasure of meeting William Kemp, the meeting's keynote speaker as well as the symposium speakers, Lynda Corkum and Vince Nealis.

S. F. Pernal
Social Committee

APPENDIX J

ESM YOUTH ENCOURAGEMENT AND PUBLIC AWARENESS COMMITTEE

Presentations and Displays

Approximately 20 talks / displays were given by either myself or volunteers so far in 1995. The majority of these were to grade school, although talks were also presented to scout groups and day cares. Most talks included a slide show, and displays of live and preserved insects. Talks during the summer months often included some small collecting trips as well. Most of these talks were local, although I have presented to schools in Bird's Hill and Selkirk in the past year.

Presentations were made at several fairs during 1995. In March, I gave a series of talks during Ecole Robert Browning school's science and technology week, and in June Dr. Terry Galloway set up an entomology display at Sun Valley schools science fair. In October Don Henne set up a display at the Manitoba Museum of Man and Nature during Natural Science and Technology Week, and I presented on how to use insects in the classroom at the Science Alive conference put on by the science teachers association of Manitoba. I have also helped people obtain information on entomology for school projects over the past year.

Expenses

Slides from ESA's Ries memorial slide collection ($60) - About 30 slides were purchased. Several of the slides purchased focus on the theme of insect life cycles, although slides dealing with tropical insects, predation, and different ways insects house themselves were also acquired.

Proposed Expenses

More funds may be used towards enhancing the ESM slide collection. Slides may be again be purchased from the Ries memorial collection. Some funding may also be used to buy display cases for insects in the ESM collection.

Note: The ESM slides, insect posters, a "Discover Entomology" video, preserved insects, and other material can be used to teach about entomology. This material can be borrowed by any ESM member by contacting 474-9257. Anyone interested in giving talks on entomology or helping with displays is also encouraged to contacting the Youth Encouragement Chairperson.

John Gavloski

APPENDIX K

REPORT OF THE ESC HONOURARY MEMBERS COMMITTEE

No one was nominated for honourary member this year. ESM members who would like to nominate some one for this honour should forward names to the Executive or to the chairperson appointed by the committee.

R. Currie

APPENDIX L

REPORT OF THE ESM STUDENT AWARDS

The committee has reviewed the nominations received for the Student Achievement Award and the Swat Student Award. This year the Student Achievement Award will be shared between Don Henne and Michael Lewis. Heather White was selected for the Swat Student Award.

J. Conroy
S. Pernal
W. Preston
W. Gallaway

APPENDIX M

ENTOMOLOGICAL SOCIETY OF CANADA SCHOLARSHIP COMMITTEE

The Entomological Society of Canada Scholarship Committee met and discussed 14 applications for the ESC postgraduate awards.

The ESC Scholarship Committee recommended that the ESC postgraduate awards be made to Mr. David Biron and Ms. Alida Janmaat.

Mr. Biron is from the Université du Québec and is supervised by Dr. Alain Maire.

Ms. Janmaat is from Simon Fraser University. Her supervisor is Dr. M. Winston.

The ESC scholarship committee noted the major increase in applicants which was from

six in 1994. There were no candidates nominated.

J. Conroy

APPENDIX N

REPORT OF THE ESM SCHOLARSHIP COMMITTEE

The Entomological Society of Manitoba Scholarship Committee and discussed three applications for the ESM postgraduate award.

The ESM Scholarship committee unanimously recommends that the ESM postgraduate award be made to Mr. John Gavloski, Department of Entomology, University of Manitoba.

Mr. Gavloski is currently working on his Ph.D degree under the supervision of Dr. Bob Lamb, Agriculture Canada. His thesis looks at "the effects of insect herbivory on canola (Brassica napus) as well as on mustard (Sinapis alba)".

R. Woods
M. Hardy
J. Conroy

APPENDIX O

REPORT OF THE SCIENTIFIC PROGRAM COMMITTEE

The 51st Annual Meeting of the Entomological Society of Manitoba was held on 3 and 4 November 1995 at the Freshwater Institute. There were a total of 32 full registrants and 12 student registrants.

On the morning of Friday 3 November, Dr. Bill Kemp, USDA, Rangeland Insect Lab, Bozeman, MT, gave the keynote address "Grasshopper Communities in Space and Time". Dr. Kemp's talk was attended by 45 people.

The submitted paper session beginning in the morning and continuing through the afternoon of Friday 3 November, was chaired by Drs. Richard Westwood and Neil Holliday and consisted of 13 papers, six of which were entered in the student paper competition. The judges of the student paper competition were Dr. Noel White, Dr. Bill Preston, and Mr. Brent Elliott. The paper competition winner was Mr. Steve Pernal.

A symposium "The Structure of Insect Communities" was held on the morning of Saturday 4 November, moderated by Dr. David Rosenberg. The four speakers were Dr. Reinhart Brust, Dept of Entomology, University of Manitoba; Dr. Lynda Corkum, Dept of Biological Sciences, University of Windsor; Dr. Vince Nealis, Canadian Forest Service, Sault Ste. Marie; Dr. Neil Holliday, Dept of Entomology, University of Manitoba. The Symposium was attended by 32 people.

The annual banquet was organized by Steve Pernal (Local Arrangements Chair) and took place at the Banquet Room of Oceana Restaurant on Friday night. Entertainment was provided by Hinode Taiko, players of traditional Japanese drums. A total of 41 attended, including the three out-of-town guest speakers. An informal mixer was held in the evening of 4 November at the home of Bob Lamb and Pat MacKay. All the guest speakers were present and the total attendance was about 35 people.

The committee wishes to thank all the speakers for their excellent contributions to the meeting. Special thanks go to Dave Rosenberg and Al Wiens for arrangements at the Freshwater Institute, to those who staffed the registration desk, and to those who operated the projection equipment.

The change to a Friday-Saturday meeting was an experiment this year. The advantages of this schedule were that the three out-of-town guests could more conveniently stay over Saturday night and obtain inexpensive airline tickets, and that some members had fewer clashes with their university responsibilities. The committee was concerned that attendance might be affected by holding part of the meeting on Saturday. Attendance overall was lower than in 1993, the last regular meeting, but it is likely that the reduced attendance was a result of the reduced membership in the society, the weather, and the labour dispute on campus. The attendance on Saturday morning was similar to that on Friday afternoon and attendance at the banquet and mixer were similar to that in previous years. The Saturday sessions probably did not reduce attendance.

Robert J. Lamb
Chair, Scientific Programme Committee

APPENDIX P

REPORT OF THE MEMBERSHIP COMMITTEE

Membership application forms were distributed to potential new members and most previous members were contacted to encourage their renewed support for the Society. Special attention was given to new students entering graduate and undergraduate programs in

Entomology. Despite these efforts, our membership is considerably below the level of five years ago. As of 24 September, there were 79 Regular members, 20 Student members, 4 Lifetime members, and 6 Honourary, for a total of 109 members.

I would like to express my appreciation th M. smith, ESM Treasurer, for her assistance in providing current lists of members in good standing, and for her preparation of the membership application form.

T. Galloway

APPENDIX Q

REPORT OF THE ESM FUNDRAISING COMMITTEE

The sale pins, sweatshirts and t-shirts during the Joint ESC - ESM Meeting generated revenues of $471.00.

A donation of $250.00 for the sale of 50 insect drawers was received. Total revenues for the fiscal year are $721.00

J. Gosselin

NOTICE TO CONTRIBUTORS

Research papers in the *Proceedings of the Entomological Society of Manitoba* are fully refereed. The *Proceedings* are published once a year and manuscripts are welcome any time. The research papers section of the *Proceedings* is primarily intended to highlight entomological research of local (Manitoba) or regional (prairie provinces) interest. The following guidelines should be followed in writing and preparation of manuscripts. Guidelines are adapted from *The Proceeding of the Entomological Society of Ontario*, Volume 117, 1986.

General. Articles are normally in English and should not be offered for prior or simultaneous publication elsewhere. The Editor should be informed if manuscripts have been refused elsewhere. Authors need not be members of the Entomology Society of Manitoba to submit articles.

Text. Articles should be typed, double spaced and on one side of the paper. Margins should be 25 mm on all sides. One original and two copies of text should be submitted to the Editor. Spelling should conform to usage recommended in either the Oxford or Webster's New International dictionary. Except in tables, figures, or quotations, dates should be written in the form of 15 July, 1992, etc. Reference to illustrations should be in the form 'Figure 2' or 'Fig. 2', and references to tables should be in the form 'Table 2', etc. Citation references in the text should be in the form 'Wilson (1992) stated', '(Smith 1990)', '(Brown 1985, 1990a,b)' or '(Wilson and Brown 1984; Smith 1990)' in chronological order for multiple citations within one set of parentheses. Footnotes should be kept to a minimum and typed at the bottom of the page to which they apply. Abbreviations should be kept to a minimum and only those that are generally recognized, or defined within the text for the sake of brevity should be used. Units of measurement should be metric and abbreviated according to the Canadian national standards.

Manuscript Submission and Review. Typed manuscripts must be submitted for review purposes. After final acceptance all manuscripts should be submitted in both typed form and on floppy disk. The name(s) of the file(s) on the disk, name of the word processing language, and the type of computer used must also be included. All manuscripts are reviewed by at least two reviewers. The Editor selects those reviewers and does not disclose their names. The Editor decides to accept, reject or return for revision, manuscripts after reviewer evaluation.

Abstract. Articles greater than two typewritten pages, except scientific notes, must be preceded by a brief but informative abstract.

Acknowledgements. Acknowledgements should be short and placed in a paragraph at the end of the text.

References. All references should be listed alphabetical order of authors at the end of the article. References not directly consulted by the author should be preceded by an asterisk. The full title for each reference must be given, plus complete pagination for all items, including books. The names of serials and periodicals should be written out in full.

Layout. The general layout of articles should follow the format for those appearing in this Volume (e.g. use of italics, use of bolding and capitals for wording etc.). Tables and figures should also follow the format for those articles appearing in this Volume. Two copies of each illustration for each reviewer should be submitted. Captions should be numbered consecutively and must be attached to each illustration.

Publication. There are no page charges for publication of articles in the *Proceedings of the Entomological Society of Manitoba*. Charges are applicable to article reprints on a cost recovery basis.

ACKNOWLEDGEMENTS

The editor wishes to acknowledge the efforts of the anonymous reviewers asked to review the research papers appearing in this Volume.

ENTOMOLOGICAL SOCIETY OF MANITOBA

The *Entomological Society of Manitoba* was formed in 1945 "to foster the advancement, exchange and dissemination of Entomological knowledge". This is a professional society that invites any person interested in entomology to become a member by application in writing to the secretary. The society produces a quarterly newsletter, the *Proceedings*, and has a variety of meetings, seminars and social activities. Persons interested in joining the society should contact:

The Secretary
Entomological Society of Manitoba
c/o Agriculture Canada
Research Station
195 Dafoe Road
Winnipeg, Manitoba, R3T 2M9