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**Appendices**

# New Records of Coccinellid Species for the Province of Manitoba

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Museum specimens and recent collections of Coccinellidae included 11 species not previously recorded as present in Manitoba. *Stethorus punctillum* Wiese, *Stethorus punctum punctum* (LeConte), *Scymnus* (*Pullus*) *postpictus* (Casey), *Scymnus rubricaudus* (Casey), *Scymnus tenebrosus* Mulsant, *Hyperaspidius hercules* (Belic k), *Hyperaspidiusmimus* Casey, *Hyperaspidius vittigerus* (LeConte), *Hyperaspis quadrivittata* LeConte, *Coleomegilla maculata lengi* Timberlake, and *Harmonia axyridis* (Pallas) are new species records for the province. *Stethorus* Weise, *Hyperaspidius* Crotch, *Coleomegilla* Timberlake, and *Harmonia* Mulsant are genera recorded in Manitoba for the first time. The multi-coloured Asian lady beetle, *H. axyridis,* the only non-Nearctic species, was first collected in the autumn of 2000, and now seems well-established in south-

ern Manitoba. These new records increase the coccinellid fauna of Manitoba to 65 species in 27 genera. Five of the six subfamilies of Coccinellidae are represented: only the herbivorous Epilachinae have not been recorded.

## INTRODUCTION

Fifty-four coccinellid species, plus two subspecies, in 24 genera have been reported for Manitoba (McNamara 1990). The list includes one Eurasian species, the 7-spotted lady beetle, *Coccinella septempunctata* L., which was introduced into the United States from 1956 to 1973 (Angalet *et al.* 1979) and had reached Manitoba by 1988 (Matheson 1989). Along with *Hippodamia tredecimpunctata tibialis* (Say), this species now dominates the coccinellid fauna of southern Manitoba (Turnock *et al.* accepted). The presence of species previously not reported as occurring in Manitoba is the subject of this report.

## MATERIALS AND METHODS

A study of the impact of *C. septempunctata* on the abundance of native coccinellines in Manitoba from 1988 to 2001 (Turnock *et al.* accepted) was based on sampling aggregations of lady beetles on the beach of Lake Manitoba at the Delta Marsh Field Station (50°11'N, 98°23'W) and on sweep-net samples in agricultural areas. The beach samples included all lady beetles found in a transect, 0.5 m wide, extending at a right angle from the edge of the water to the beach ridge. The sweep-net collections of lady beetles were taken along the edges of fields (cereal crops, canola, flax, alfalfa) and from herbaceous and woody plants mostly located in the Red River Valley. The beetles from the beach and sweep-net collections were brought to the Cereal Research Centre, Winnipeg, counted, and identified to species.

We also examined specimens in the collections of the J.B. Wallis Museum in the Department of Entomology, University of Manitoba and the Cereal Research Centre, Agriculture and Agri-Food Canada, Winnipeg, for taxa that have not been reported as occurring in Manitoba. The identification of these species was confirmed by Dr. Robert Gordon, and voucher specimens are deposited in the J.B. Wallis Museum of Entomology.

## RESULTS

Specimens of 11 species of Coccinellidae not previously been reported from Manitoba were found. *Stethorus punctillum* Weise, *Stethorus punctum punctum* (LeConte), *Scymnus* (Pullus) *postpictus* (Casey), *Scymnus rubricaudus* (Casey), *Scymnus tenebrosus* Mulsant, *Hyperaspidius hercules* (Belic k), *Hyperaspidius mimus* Casey, *Hyperaspidius vittigerus* (LeConte), *Hyperaspis quadrivittata* LeConte, *Coleomegilla*

*maculata lengi* Timberlake, and *Harmonia axyridis* (Pallas) are new provincial records. *Stethorus* Weise, *Hyperaspidius* Crotch, *Coleomegilla* Timberlake, and *Harmonia* Mulsant are new records of genera for the Province of Manitoba.

All specimens of species in which collection information is given below are located in the J. B. Wallis Museum of Entomology, University of Manitoba.

## Stethorinae

*Stethorus punctillum* Weise. MB: Winnipeg, 5-13.v.1991, 21-28.v.1991, 27.v.-3.vi.1991,

R.E. Roughley, University of Manitoba Campus, honey house, suction trap (6 specimens)

*Stethorus punctum punctum* (LeConte). MB: Aweme, 9.ix.1918, N. Criddle (1 specimen); Brandon, 15.viii.1949, A.G. Robinson (1 specimen), 31.viii.1950, T.V. Cole (2 specimens), 31.viii.1950, A.G. Robinson, predatory on spider mites (18 specimens); Winnipeg, 1.ix.1951, A.V. Mitchener (1 specimen), 22.viii.1951, A.V. Mitchener, predatory on Pacific spider mite (3 specimens). This species is not recorded from Manitoba by McNamara (1990). However, Gordon (1985, Map 55) inferred its range to extend across southern Manitoba but had not seen specimens from this area.

*Scymnus* (*Pullus*) *postpictus* (Casey): MB: Aweme, 14-21.v.1992, R.E. Roughley, yellow pan traps (1 specimen); Delta, 16.v.1985, R.E. Roughley and D.A. Pollock, University of Manitoba Field Station, beach drift (1 specimen).

*Scymnus* (*Pullus*) *rubricaudus* (Casey). MB: Aweme, 14-21.v.1992, R.E. Roughley, yellow pan traps (2 specimens).

*Scymnus* (*Pullus*) *tenebrosus* Mulsant. MB: Aweme, 26.v.1913, N. Criddle (1 specimen).

*Hyperaspidius hercules* Belic k. MB: Sandilands Provincial Forest, 3.vii.1989, T.D. Galloway (1 specimen).

*Hyperaspidius mimus* Casey. MB: Aweme, 8 km N. Treesbank, 4-11.vi.1992, R.E. Roughley, yellow pans (1 specimen).

*Hyperaspidius vittigerus* (LeConte): MB: Aweme, 26.vi.1920, N. Criddle (1 specimen).

*Hyperaspis quadrivittata* Le Conte: MB: Aweme, 25.ix.1918, N. Criddle (1 specimen).

## Coccinellinae

*Coleomegilla maculata lengi* Timberlake. (See also records in Batulla and Robinson 1983). MB: Glenlea, 23.v.1988, F.O. Matheson, sweep alfalfa (1 specimen); Delta, 16.v.1995, R.E. Roughley and D.A. Pollock, University of Manitoba Field Station, beach drift (1 specimen).

*Harmonia axyridis* (Pallas). MB: Winnipeg, ix.2000, 14.x.2000, W.J. Turnock (3 specimens), Delta Beach, 7.ix.2001, beach drift, W.J. Turnock (3 specimens), LaSalle, 5.xi.2001, F.O. Matheson (1 specimen).

The multi-coloured Asian lady beetle, *H. axyridis*, was first collected in August, 2000 by W. J. Turnock in a garden in Winnipeg. Three more specimens were collected from an aggregation of lady beetles on the beach of Lake Manitoba at the Delta Marsh Field Station on 14 October, 2000. In 2001, *H. axyridis* comprised only 1.5% (N=1110) of lady beetles collected from vegetation in the Red River Valley and <1% from beach collections on 11 May (N=1991) and on 11 September (N=1292) from Lake Manitoba, but it nevertheless was more abundant than most other coccinellid species. Larvae and adults of *H. axyridis* also were collected in Winnipeg from willow, *Salix* sp., and Manitoba maple, *Acer negundo* Linnaeus in late September, and adults were found in Winnipeg and LaSalle as late as 5 November.

All 31 specimens of *H. axyridis* collected in Manitoba in 2000 and 2001 were of the colour form *succinea* (Komai 1956). Most had dark orange elytra with prominent black spots but a few specimens (13%) had pale orange elytra with a few faint spots or none at all. No specimens of the black morphs (colour forms *conspicua, axyridis, spectabilis*), that predominate in Japan were found in our study. The absence of black morphs in Manitoba is not unexpected since they are rare (1.4%) in *H. axyridis* populations in Oregon (LaMana and Miller 1995) and are unknown in the southeastern United States (Tedders and Schaefer 1994).

## DISCUSSION

These new records increase the number of coccinellids in Manitoba to 65 species among 27 genera. The Manitoba fauna is composed of five subfamilies (Sticholotidinae, Scymninae, Chilochorinae, Coccidulinae, and Coccinellinae) out of a potential six subfamilies (Gordon 1985); only the herbivorous Epilachinae have not been found. Our fauna has two species of Sticholotinae, characterized as small (< 1.5 mm long), dark adults which are primarily predators of scale insects. The Scymninae (27 species in Manitoba) are generally predators of tetranychid mites and scale insects but Batulla and Robinson (1983) found that some Scymninae were also aphid predators. Adults are < 3.0 mm long, principally dark in colour with many species bicoloured. The adults of Chilocorinae (2 species in Manitoba) are 2.75-5.0 m in length and variously coloured, and include black beetles with a distinctive red spot on each elytron. Our one species of Coccidulinae (*Coccidula lepida* LeConte) is 2.75-3.45 mm in length, quite elongate and parallel-sided, with the dorsum yellow with median darker markings. Coccidulinae and Chilocorinae are suspected to be scale predators. The Coccinellinae has 30 species in Manitoba. Members of Coccinellini (29 species in Manitoba) are the well-known lady beetles, >3.0 mm long, usually brightly coloured (red, orange, or yellow and black) and prey on aphids and other small arthropods; our one member of the Psylolloborini, *Psyllobora vigintimaculata* (Say), ranges in length from 1.75-3.0 mm and feeds on fungi. Therefore, our fauna is presently at 65 species or about 41% of the 163 species of

Coccinellidae recorded for Canada. The Manitoba fauna is slightly less rich than areas of similar latitudes in Europe, e.g., 78 species in 37 genera in Poland; 71 species in 28 genera in eastern Germany; 67 species in 33 genera in eastern Ukraine (Hodek and Hon k 1996), but Manitoba has been less thoroughly collected than these areas.

The occurrence of *H. axyridis* in sweep samples in the Red River Valley and from collections on the shore of Lake Manitoba is evidence that this species is already widely distributed in southern Manitoba. This east-Asian species became established in Louisiana in 1988 (Chapin and Brou 1991), and spread very rapidly in the United States. It was first found in Canada at Frelighsburg, Quebec, in 1994 (Coderre *et al.* 1995) and in Ontario and British Columbia soon after. It appears to have arrived in Manitoba very recently for it was not found in field and beach collections from 1983-1999 or in beach collections in May, 2000. The occurrence of adults of *H. axyridis* in aggregations with native species of lady beetles on the shore of Lake Manitoba on 11 May, 2001, and its ability to overwinter in Siberia (Voronine 1965, in Iablokoff-Khnzorian 1982) are evidence that *H. axyridis* can successfully overwinter in Manitoba. The occurrence of larvae in late September may mean that a partial second generation occurred in 2001, although the common lady beetle species in Manitoba have only one generation per year. As happened with *C. septempunctata,* we expect *H. axyridis* will adversely affect the abundance of some native lady beetle species in southern Manitoba in the near future.

## ACKNOWLEDGMENTS

Our thanks to Dr. R. D. Gordon, Willow City, ND, USA for confirming the identification of the species newly reported from Manitoba and to Dr. L. Humble, Canadian Forestry Service, Victoria, BC for giving us samples of *Harmonia axyridis* for comparison with our collections. This is Contribution No. 1831 of the Cereal Research Centre.

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## Scientific Note

# Mortality Resulting from Interactions Between the Red Flour Beetle and the Rusty Grain Beetle

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The rusty grain beetle, *Cryptolestes ferrugineus* (Stephens) (Coleoptera: Laemophloeidae) (Thomas 1999) is a cosmopolitan pest feeding on stored wheat, barley, and other cereals (Rilett 1949) and is also found in the nests of *Vespa* L. (Hymenoptera: Vespidae) (Linsley 1944), or under tree bark (White *et al*. 1995). The red flour beetle, *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae) is a polyphagous, cosmopolitan pest feeding mostly on stored flour and other milled cereal products, broken wheat (Cotton 1963), and farm-stored cereals (Madrid *et al.* 1990). Both *C. ferrugineus* and *T. castaneum* successfully feed on many species of storage fungi (Sinha 1965, 1966). Both are facultatively predaceous and scavengers (Linsley 1944; Rilett 1949). Their native habitat was probably under the bark of trees and shrubs (Linsley 1944). These insects often occur together in stored wheat in western Canada (Madrid *et al.* 1990). *Cryptolestes ferrugineus* larvae and pupae are protected from predation or cannibalism because they develop singly under the seed coat covering the germ of cereal seeds (Rilett 1949; White and Bell 1990). It has

been observed that when *T. castaneum* and *C. ferrugineus* were reared together, the populations of *T. castaneum* were often sharply reduced, relative to controls, within a few months (Lefkovitch 1967; White 1979), perhaps because all life stages of *T. castaneum* were exposed to predation/cannibalism. To determine if interactions between or within the species could affect population growth, the levels of mortality of selected life stages of *C. ferrugineus* and *T. castaneum,* when starved or when feeding on ground wheat, were studied (Table 1).

Twenty-five individuals of each stage of insect were placed in 9 cm diameter plastic petri dishes with (1.5 g of ground wheat/dish) or without ground wheat and kept at 25 or 30°C at 70% RH for 7 d and observed for mortality (50 insects per dish; larvae were 4$^{th}$ instar). There were four replicates for each treatment and a control of appropriate stages of individual species kept separately at the same rearing conditions. Treatment effects were compared using ANOVA with three-way classification (temperature, predator species, prey species), separately for stages or two-way ANOVA for larvae feeding on pupae (SAS 1999, GLM Procedure). Three-way least square means were compared using pair-wise *t*-tests ($P = 0.05$) with a pooled variance estimate from the ANOVA (PDIFF option in the GLM Procedure, Table 2). Comparisons between prey species mortality were made from the PDIFF Table. Control mortality was always less than 5%. All interactions were used in ANOVA.

In control dishes containing only eggs or pupae of either species or larvae of *C. ferrugineus*, mortality did not occur. In control dishes containing larvae of *T. castaneum*, mean ± SE mortality ranged from 3± 1 to 17 ± 2%, with mortality approximately twice as high when there was no grain or at the higher temperature. Without predators, mortality of all stages was low. With adult beetles of either species present and no grain to serve as an alternative food source, mortality of eggs, larvae and pupae was 100%. Without alternative food, adults of both species were effective predators of the immature stages of either species. Larvae of the two species were equally effective predators of eggs of either species, causing 100% mortality; however, larvae of *T. castaneum* were more effective predators of *T. castaneum* pupae (mortalities of 70 and 96% at 25° and 30°C, respectively) than were *C. ferrugineus* effective predators of *T. castaneum* pupae (mortalities of 14 and 23% at 25° and 30°C, respectively; see Table 1). Nevertheless, without an alternative food source, larvae of both species preyed on eggs and pupae.

Mortality was usually greater at the higher temperature, presumably because of greater insect activity. For all predator stage-prey stage combinations, the main effect of temperature was highly significant ($P < 0.01$) although some individual comparisons were not significant (Table 1). Adults of *T. castaneum* usually preyed on more immatures of both species than did *C. ferrugineus* (Table 1). *Cryptolestes ferrugineus* larvae caused significantly ($P < 0.01$) more mortality of *T. castaneum* eggs than of *C. ferrugineus* eggs at both temperatures. *Tribolium castaneum* larvae caused more mortality of *C. ferrugineus* eggs than of *T. castaneum,* eggs, but only at 30°C. *Tribolium casteneum* larvae caused higher mortality to *T. castaneum* pupae than did *C. ferrugineus* (Table 1). *Tribolium castaneum* adults are more effective predators or cannibals than *C. ferrugineus,* largely because of size, the former weighing about 2.0

mg (wet weight) and the latter about 0.2 mg (White and Sinha 1987; White and Demianyk 1999). However, it is likely that *T. castaneum* can rarely find immature *C. ferrugineus* in a grain bulk, while *C. ferrugineus* adults are effective predators of exposed *T. castaneum* eggs and larvae.

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Table 1. Mean per cent mortality ($n = 4$) of eggs, larvae, and pupae of *Tribolium castaneum* (*Tc*) and *Cryptolestes ferrugineus* (*Cf*) at two temperatures and 70% RH within 7 d of being exposed to adults or 4th instar larvae; 25 individuals of each insect stage in 9 cm diam dishes.

| Predator stage | ANOVA Comparison | Prey stage & species | Ground wheat present | Predator | | | |
|---|---|---|---|---|---|---|---|
| | | | | *Tribolium castaneum* | | *Cryptolestes ferrugineus* | |
| | | | | 25 C | 30 C | 25 C | 30 C |
| Adult | | Eggs | | | | | |
| | | *Tc* | Yes | 35 ± 4 c | 73 ± 4 a | 28 ± 3 c | 47 ± 2 b |
| | | *Cf* | Yes | 42 ± 5 b | 64 ± 4 a | 24 ± 3 c | 27 ± 4 c |
| | | Larvae | | | | | |
| | | *Tc* | Yes | 66 ± 3 a | 75 ± 5 a | 35 ± 3 c | 53 ± 4 b |
| | | *Cf* | Yes | 79 ± 4 b* | 100 a* | 30 ± 3 d | 48 ± 1 c |
| | | Pupae | | | | | |
| | | *Tc* | Yes | 51 ± 3 b | 90 ± 2 a* | 34 ± 3 c* | 55 ± 3 b* |
| | | *Cf* | Yes | 48 ± 3 b | 72 ± 2 a | 7 ± 2 c | 12 ± 1 c |

| Predator stage | ANOVA Comparison | Prey stage & species | Ground wheat present | Predator | | | |
|---|---|---|---|---|---|---|---|
| | | | | *Tribolium castaneum* | | *Cryptolestes ferrugineus* | |
| | | | | 25 C | 30 C | 25 C | 30 C |
| Larvae | | Eggs | | | | | |
| | | *Tc* | Yes | 54 ± 2 b | 73 ± 5 a | 38 ± 4 c* | 64 ± 4 ab* |
| | | *Cf* | Yes | 64 ± 6 b | 85 ± 3 a* | 19 ± 2 d | 34 ± 3 c |
| | | *Tc* | No | 100 | 100 | 100 | 100 |
| | | *Cf* | No | 100 | 100 | 100 | 100 |
| | | Pupae | | | | | |
| | | *Tc* | Yes | 48 ± 3 b | 70 ± 2 a | 5 ± 1 c | 11 ± 1 c |
| | | *Tc* | No | 70 ± 4 b | 96 ± 2 a | 14 ± 1 c | 23 ± 2 c |

Means followed by the same letter in a row are not significantly different ($P < 0.05$) on a comparison-wise basis.
*Indicates significantly higher mortality than the other prey species ($P < 0.05$) for the same prey stage, predator, and temperature.

Table 2. Summary of statistics from ANOVA comparisons presented in Table 1.

| Source | DF | Sum of squares | Mean square | *F* value | *P* > *F* |
|---|---|---|---|---|---|
| Model | 7 | 9294.00 | 1327.71 | 20.96 | <0.0001 |
| Error | 24 | 1520.00 | 63.00 | | |
| Corrected total | 31 | 10814.00 | | | |
| **R-Square** | **Coeff var** | **Root MSE** | **pdead mean** | | |
| 0.859441 | 18.83 | 7.95 | 42.25 | | |
| **Source** | **DF** | **Type III SS** | **Mean square** | ***F* value** | ***P* > *F*** |
| prey | 1 | 288.00 | 288.00 | 4.55 | 0.0434 |
| temp | 1 | 3528.00 | 3528.00 | 55.71 | <0.0001 |
| prey*temp | 1 | 578.00 | 578.00 | 9.13 | 0.0059 |
| pred | 1 | 4050.00 | 4050.00 | 63.95 | <0.0001 |
| prey*pred | 1 | 200.00 | 200.00 | 3.16 | 0.0882 |
| temp*pred | 1 | 648.00 | 648.00 | 10.23 | 0.0039 |
| prey*temp*pred | 1 | 2.00 | 2.00 | 0.03 | 0.8604 |

**dependent variable = prey dead (pdead); pred = ad; prey = egg.**

| Source | DF | Sum of squares | Mean square | *F* value | *P* > *F* |
|---|---|---|---|---|---|
| Model | 7 | 15742.00 | 2248.85 | 43.81 | <0.0001 |
| Error | 24 | 1232.00 | 51.33 | | |
| Corrected total | 31 | 16974.00 | | | |
| **R-Square** | **Coeff var** | **Root MSE** | **pdead mean** | | |
| 0.927418 | 11.79 | 7.16 | 60.75 | | |

| **Source** | **DF** | **Type III SS** | **Mean square** | ***F* value** | ***P* > *F*** |
|---|---|---|---|---|---|
| prey | 1 | 392.00 | 392.00 | 7.64 | 0.0108 |
| temp | 1 | 2178.00 | 2178.00 | 42.43 | <0.0001 |
| prey*temp | 1 | 72.00 | 72.00 | 1.40 | 0.2479N |
| pred | 1 | 11858.00 | 11858.00 | 231.00 | <0.0001 |
| prey*pred | 1 | 1152.00 | 1152.00 | 22.44 | <0.0001 |
| temp*pred | 1 | 18.00 | 18.00 | 0.35 | 0.5593N |
| prey*temp*pred | 1 | 72.00 | 72.00 | 1.40 | 0.2479N |

**pred=ad; prey = larv**

| Source | DF | Sum of squares | Mean square | *F* value | *P* > *F* |
|---|---|---|---|---|---|
| Model | 7 | 22171.50 | 3167.35 | 84.46 | <0.0001 |
| Error | 24 | 900.00 | 37.50 | | |
| Corrected total | 31 | 23071.50 | | | |
| **R-Square** | **Coeff var** | **Root MSE** | **pdead mean** | | |
| 0.960991 | 13.27 | 6.12 | 46.12 | | |

| **Source** | **DF** | **Type III SS** | **Mean square** | ***F* value** | ***P* > *F*** |
|---|---|---|---|---|---|
| prey | 1 | 4140.50 | 4140.50 | 110.41 | <0.0001 |
| temp | 1 | 3960.50 | 3960.50 | 105.61 | <0.0001 |
| prey*temp | 1 | 480.50 | 480.50 | 12.81 | 0.0015 |
| pred | 1 | 11704.50 | 11704.50 | 312.12 | <0.0001 |
| prey*pred | 1 | 1200.50 | 1200.50 | 32.01 | <0.0001 |
| temp*pred | 1 | 684.50 | 684.50 | 18.25 | 0.0003 |
| prey*temp*pred | 1 | 0.50 | 0.50 | 0.01 | 0.9090 |

**pred=ad; prey = pupa**

| Source | DF | Sum of squares | Mean square | *F* value | *P* > *F* |
|---|---|---|---|---|---|
| Model | 7 | 13864.00 | 1980.57 | 25.72 | <0.0001 |
| Error | 24 | 1848.00 | 77.00 | | |
| Corrected total | 31 | 15712.00 | | | |
| **R-Square** | **Coeff var** | **Root MSE** | **pdead mean** | | |
| 0.882383 | 16.24 | 8.77 | 54.00 | | |
| **Source** | **DF** | **Type III SS** | **Mean square** | ***F* value** | ***P* > *F*** |
| prey | 1 | 338.00 | 338.00 | 4.39 | 0.0469 |
| temp | 1 | 3362.00 | 3362.00 | 43.66 | <0.0001 |
| prey*temp | 1 | 32.00 | 32.00 | 0.42 | 0.5253 |
| pred | 1 | 7442.00 | 7442.00 | 96.65 | <0.0001 |
| prey*pred | 1 | 2592.00 | 2592.00 | 33.66 | <0.0001 |
| temp*pred | 1 | 0.00 | 0.00 | 0.00 | 1.0000 |
| prey*temp*pred | 1 | 98.00 | 98.00 | 1.27 | 0.2704 |
| **pred=larv; prey = eggs** | | | | | |

| Source | DF | Sum of squares | Mean square | *F* value | *P* > *F* |
|---|---|---|---|---|---|
| Model | 7 | 11444.00 | 3814.66 | 154.65 | <0.0001 |
| Error | 24 | 296.00 | 24.66 | | |
| Corrected total | 31 | 11740.00 | | | |
| **R-Square** | **Coeff var** | **Root MSE** | **pdead mean** | | |
| 0.974787 | 14.82 | 4.96 | 33.50 | | |
| **Source** | **DF** | **Type III SS** | **Mean square** | ***F* value** | ***P* > *F*** |
| temp | 1 | 784.00 | 784.00 | 31.78 | 0.0001 |
| pred | 1 | 10404.00 | 10404.00 | 421.78 | <0.0001 |
| temp*pred | 1 | 256.00 | 256.00 | 10.38 | 0.0073 |
| **pred=larv; prey = pupa** | | | | | |

# Scientific Program Abstracts for the 2001 Annual Meeting of the Entomological Society of Manitoba

## *Keynote Address*

**INSECT MOVEMENT IN YOUNG FOREST STANDS.** Dan Quiring, Population Ecology Group, Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, NB, E3B 6C2 quiring@unb.ca

Many insect activities, such as mating, oviposition and flight, occur in a particular location at the same time each day. Partitioning of different activities, with respect to space and/or time, may represent adaptations to cyclical patterns of many abiotic and biotic factors, such as insolation, temperature, humidity, food availability, and predation pressure and/or serve to synchronize social behaviour, such as mating.

The daily activity patterns and behaviours, in nature, of many butterflies and several diurnally active moths have been described. However, this is not the case for night-active moths, where almost all field studies have been carried out using traps or in field cages. I will present results from a study describing the diel activity of the major pest of white spruce, the spruce bud moth, *Zeiraphera canadensis* Mutt. & Free., and several studies evaluating proximate and ultimate factors influencing adult activity.

Although they move much shorter distances than flying adults, many juvenile insects also disperse, presumably to increase survival, development rate and/or size. I will examine the influence of variations within the crowns of young conifers on larval movement by the spruce bud moth on white spruce, the yellow-headed spruce sawfly (*Pikonema alaskensis* (Roh.)) on black spruce, and the balsam fir sawfly (*Neodiprion abietis* (Harr.)) on balsam fir. As for adults, larval movement will be examined from a proximate and ultimate perspective and implications for pest management discussed.

## *Symposium: Insect Movement*

**MOVEMENT OF PESTS AND BENEFICIAL INSECTS: DO WE KNOW WHO IS IN?** M. Schöller, Biological Consulting, Hosemannstrasse 8, 10409 Berlin, Germany, mschoeller@tricho.b.shuttle.de

The documentation of movement of pests and beneficial insects is crucial for plant protection and quarantine. Biogeographical studies and systematics provide basic information to identify the specimens and the geographical range of species. Examples from the orders Coleoptera (Chrysomelidae) and Hymenoptera (Pteromalidae, Braconidae) are given where the specific identity and the geographical range are not clear due to the occurrence of sibling-species. The methods to identify these species and the biological meaning of the characters used for species discrimination are discussed, as well as the impact for plant protection and biological control of pest species.

**TEMPORAL AND GEOGRAPHICAL MOVEMENTS OF CABBAGE SEEDPOD WEEVIL, *CEUTORHYNCHUS OBSTRICTUS*, IN CANOLA.** L.M. Dosdall, Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, T6G 2P5, R. Weiss, O. Olfert, Agriculture and Agri-Food Canada, Saskatoon Research Centre, Saskatoon, SK, S7N 0X2 and H. Cárcamo, Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB, T1J 4B1.

The cabbage seedpod weevil, *Ceutorhynchus obstrictus* (Marsham), was discovered infesting canola in southern Alberta in 1995, and by 1999 its populations had reached outbreak densities. Both adults and larvae are destructive to canola and other Brassicaceae, and this species poses a grave threat to Canada's canola industry. The weevil has dispersed rapidly through cropland in the southern prairies, prompting a study to assess its potential for establishment in Canada's primary regions of canola production in central Alberta, Saskatchewan, and Manitoba. In spring, adults move from overwintering sites to feed on brassicaceous host plants when air temperatures reach about 12°C. Feeding occurs on several native and introduced species, and adults migrate to canola crops in the bud and early flowering stages. Adults remain restricted primarily to the inflorescence rather than on stems and leaves regardless of time of day. Surveys conducted in commercial canola fields from 1997 to 2000 recorded rapid dispersal of the species to the north and east from the region of southern Alberta where it was initially found. Dispersal has occurred at a rate of approximately 55 km per year, and in 2000, *C. obstrictus* populations were found in Saskatchewan for the first time. Distribution data from surveys were combined with meteorological data and published information on the biology of *C. obstrictus* to develop a model of its potential distribution using CLIMEX™ software. Based on model predictions, this pest may become established throughout virtually the entire region of canola production in western Canada.

**INSECT MOVEMENT DURING HOST-FINDING: CONTRIBUTIONS OF PLANT STIMULI, INTERNAL STATE AND MOTOR PROGRAMS.** M.O. Harris, Department of Entomology, North Dakota State University, Fargo, North Dakota, USA, 58105.

While progress has been made toward defining some of the plant stimuli that mediate insect-plant relationships, we still have only a poor understanding of how insects

adjust their movement in response to these plant stimuli. Morris and Kareiva (1991) characterized the movement of herbivorous insects as being either random or non-random relative to host plants. Random movement occurs when the "frequency, rate and orientation of movement are unrelated to the suitability of plants within the perceptual range of the insect". Movement that shows some relationship to the location of host plants is then considered to be non-random and can take one of several forms. In its simplest form, the rate and direction of movement are random (relative to plants) but the insect, upon contacting a plant, adjusts its movement so that it either settles on the plant (non-random settlement) or moves away. A slightly more complex form of non-random movement occurs when an insect contacts a plant and then, based on information gained, adjusts its movement so that, after it leaves the plant, it stays longer in the area surrounding that plant (area-restricted search). The most sophisticated adjustment of movement in relation to plants consists of an oriented response to plant stimuli spatially separated from the responding insect. In my talk I will discuss how random and non-random movement are manifested in two very different systems: 1) Hessian fly females foraging for oviposition sites; and 2) tortricid larvae responding to food that contains Cry1Ac, an endotoxin produced by *Bacillus thuringiensis.*

**NEW INTERNATIONAL TRADING PATTERNS EQUALS NEW INSECTS AND PESTS.** Jon Bell, Biosurveys Specialist, Canadian Food Inspection Agency, 202-620 Royal Avenue, New Westminster, BC, V3M 1J2.

Exotic insect pests have exploded in numbers and variety, challenging our traditional methods of quarantine enforcement. In the last quarter century, containerization has changed the way the world does business. Now infested containers from a distant country are opened anywhere in Canada. Some recent exotics are the Brown Spruce Longhorn Beetle in Halifax; Cereal Leaf Beetle in Creston, BC, and the Asian Gypsy Moth in BC. The Canadian Food Inspection Agency (CFIA) has the legislation but it really is everybody's responsibility to prevent introductions. Detection programs are geared to insects that have "quarantine" status and for which detection techniques exist.

When an exotic insect pest is detected: the pest must be officially identified; a "Pest Risk Assessment" commences and incorporates all relevant information; stakeholder and other governments are consulted; CFIA notifies our international trading partners; actions may range from eradication, quarantines to no action.

What will arrive in the future? We do not know, but based on emerging trading patterns and the natural spread of some exotics already established in North America, the list will continue to grow. Cereal leaf beetle is established in the Western US and has moved north into the Creston Valley of BC. It is only a matter of time before the insect naturally spreads or is moved in hay to the Canadian Prairies. Will the European Brassica pod midge cause significant damage when this Diptera arrives in the New World? Science will be playing a continuous game of catch up, finding new parasites, isolating pheromones and developing advanced detection techniques to keep up will the steady influx of exotics.

## *Submitted Papers*

**THE BLACKLEGGED TICK, *IXODES SCAPULARIS*, ON THE MOVE INTO MANITOBA: THE RESULTS OF A TICK SURVEILLANCE PROGRAMME, 1996 TO 2000.** Terry D. Galloway, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2, L. Robbin Lindsay, Antonia Dibernardo, and Harvey Artsob, Zoonotic Diseases and Special Pathogens, Canadian Science Centre for Human and Animal Health, Health Canada, Winnipeg, MB, R3E 3R2.

The vector of the pathogen which causes Lyme Borreliosis was first recorded in Manitoba, Canada in 1989, and it became important to determine the abundance and distribution of *Ixodes scapularis* and the prevalence of *Borrelia burgdorferi* infection in these ticks in the province. It was also critical to determine whether or not *I. scapularis* was established as reproducing populations, or whether ticks were dispersing into the province on migrating vertebrates. Results from a field survey in 1990-1991 did not justify the cost and effort, so a passive surveillance programme was initiated in 1996. The assistance of public health officials, physicians, veterinarians, natural resources personnel, and the general public was solicited using posters and media ads. Ticks submitted were identified and all live specimens of *I. scapularis* in 1996 and 1997 were initially examined for infection with *B. burgdorferi* by dark-field microscopy, IFA and laboratory culture. Subsequently, PCR (1st stage, nested) was used to test all specimens of *I. scapularis* for *B. burgdorferi*. Total submissions of ticks from Manitoba have increased from 110 in 1996 to 373 in 2000, in which at least 12 species of ticks have been included. The majority of submissions (n=2676; 87.2%) were the American dog tick, *Dermacentor variabilis*. However, 201 (6.6%) specimens of *I. scapularis* have been submitted, of which 190 were tested and 23 were positive for *B. burgdorferi* infection. Veterinarians (50.7%) and the general public (43.8%) submitted nearly all of the blacklegged ticks during the passive surveillance programme. These ticks were most often collected on dogs (136 of 201 specimens) and cats (29 specimens). Thirty-one specimens were found on humans. Manitoba is still considered to be a non-endemic area of the blacklegged tick, which is apparently introduced over widely scattered areas of the province each year. There is still no conclusive evidence that *I. scapularis* is reproducing in Manitoba.

**MOLECULAR CHARACTERIZATION OF 35 SPECIES OF HORSE FLIES AND DEER FLIES (DIPTERA: TABANIDAE) OF MANITOBA USING PCR-RFLP.** M. Iranpour, Department of Entomology, A. Schurko, G. Klassen, Department of Microbiology, and T.D. Galloway, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

Horse flies and deer flies, with 144 species in Canada, are well known blood-feeding insects throughout the country. They are considered as major pests of wild and domestic animals in North America. Systematics of adult tabanids is well studied by different investigators. However, because of difficulties in lab rearing of the immature stages, systematics of larval and pupal stages are incomplete and there are few descriptions of egg masses in the literature. In this study, Polymerase Chain Reac-

tion and Restriction Fragment Length Polymorphism (PCR-RFLP) were used to associate immature stages of Tabanidae to their respective adults. Using Manitoba Horse Fly Traps, approximately 60,000 adult tabanids were collected from different locations in Manitoba during the summers of 1997-2000. Collections yielded 35 species in 5 genera, *Hybomitra*, *Tabanus*, *Chrysops*, *Haematopota*, and *Atylotus*. After DNA isolation from 1 to 10 individuals of each species, the IGS (Inter Genic Spacer) was amplified via PCR. IGS of selected individuals was digested by four endonuclease enzymes, *Hinf* I, *Mbo* I, *Rsa* I, and *Taq* I. Inter- and intra-specific variations were studied and diagnostic bands were determined for each species. Using these diagnostic bands, 60 unknown tabanid egg masses have been associated with their adult species.

**POPULATION STRUCTURE IN *CULEX TARSALIS* (DIPTERA: CULICIDAE) INFERRED USING PCR-RFLP AND MITOCHONDRIAL SEQUENCE DATA.** M. Iranpour, Department of Entomology, N. Lovejoy, Department of Zoology, R.E. Roughley, and T.D. Galloway, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

*Culex tarsalis* is a known vector of western equine encephalitis (WEE) and St. Louis encephalitis (SLE) in North America. It is also a suspected vector of West Nile virus (WN) in the USA. Some strains of *Cx. tarsalis* are known to be highly resistant to WEE virus infection and also some populations transmit SLE virus better than the others. To find appropriate molecular tools to study *Cx. tarsalis* at the population level, three populations of this species collected from Winnipeg and California were studied. The Inter Genic Spacer (IGS) and Internal Transcribed Spacer (ITS) were amplified and digested with *Hinf* I, *Taq* I, *Alu* I, *Cfo* I, *Mbo* I, and *Rsa* I. Diagnostic differences among these examined populations were observed. A 620-bp fragment of ND5 gene was also amplified and sequenced for two individuals of *Cx. tarsalis* collected from Winnipeg and California, along with one individual of *Cx. restuans*, *Aedes vexans*, and *Culiseta inornata* from Manitoba. Sequence data of ND5 revealed 0.5%, 5%, and 15% nucleotide differences between individuals of the same species, species of the same genus, and species of different genera, respectively.

***VARROA DESTRUCTOR* AS A PROMOTER OF THE HONEY BEE (*APIS MELLIFERA*) PATHOGENS, NOSEMA (*NOSEMA APIS*) AND CHALKBROOD (*ASCOSPHAERA APIS*).** David Ostermann and Rob Currie, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

Many parasites attack the honey bee (*Apis mellifera* L.). The fungus *Ascosphaera apis* (Maassen ex Claussen) Olive & Spiltoir, protozoan *Nosema apis* Zander, and ectoparasitic mite *Varroa destructor* Anderson & Trueman are parasites that infect the honey bee around the world. All three parasites have detrimental effects on honey bee colonies, however, varroa is considered the greatest threat to world beekeeping.

Damage to colonies caused by simultaneous infections with *V. destructor* and other

parasitic diseases, such as *A. apis* and *N. apis* or both, appear to be greater than the sum of individual parasite damage. The complex activity and social structure of a honey bee colony, which is also subject to genetic and environmental factors, makes it very difficult to link the damage to any specific parasite in a hive infected with many parasites. Knowledge of interactions between parasites is important in considering economic thresholds.

Despite being discovered recently in the US (1987) and Canada (1990) there is much literature dedicated to *V. destructor* (formerly *Varroa jacobsoni* Oudemans) describing its devastating effects on colonies of *A. mellifera*. Interactions between *V. destructor* and *A. apis* and *N. apis* are not well understood or documented. The literature suggests that *V. destructor* is able to transport spores of *A. apis* and *N. apis* (Liu 1996), while feeding by the mite may increase chalkbrood (Glinski 1988) and nosema disease. Further research is needed to evaluate the relationships between these three parasites.

**SUSCEPTIBILITY OF WHEATS IN THE GENUS *TRITICUM* TO THREE APHID SPECIES: IDENTIFYING POTENTIAL SOURCES OF ADULT PLANT RESISTANCE.** S.M. Migui, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2, and R.J. Lamb, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg, MB, R3T 2M9.

A collection of 41 accessions (genotypes) of wild and cultivated wheats belonging to 19 species were studied to determine their host relationships with three species of aphids (*Rhopalosiphum padi*, *Schizaphis graminum*, and *Sitobion avenae*) with special reference to host plant resistance. Biomass relationships between the aphids and the wheats were quantified to estimate antibiosis and tolerance components of crop resistance. Antibiosis was estimated as the biomass of aphids accumulated over a three week period on heading plants in the field and tolerance was estimated as the plant biomass lost due to infestation by the aphids. All three species of aphids survived and reproduced on all wheats. The wheat genotypes showed a variable level of antibiosis and tolerance to the aphid species, with a greater level of resistance to *R. padi* and *Si. avenae*, and to a lesser extent to *Sc. graminum*. Aphid feeding on mature plants resulted in a reduction in foliage biomass and head biomass compared to uninfested controls. Plant heads suffered heavier loses than the foliage. Overall, antibiosis and tolerance to aphids appeared to be associated with domestication, with the least domesticated diploid wheats showing the highest frequency of resistant lines and the most domesticated hexaploid wheats showing the lowest frequency of resistant lines. However, individual genotypes with high levels of resistance to aphids occurred at all levels within the evolutionary tree of wheat. Potential use the wild wheats in directed screening and plant breeding programs for resistance in wheat to aphids is discussed.

**REPRODUCTIVE ECOLOGY OF WHEAT MIDGE IN RELATION TO THE EVOLUTION OF VIRULENT GENOTYPES ON RESISTANT WHEAT.** M.A.H. Smith, R.J. Lamb, and I.L. Wise, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg, MB, R3T 2M9.

The rate virulence evolves in wheat midge, *Sitodiplosis mosellana* (Géhin), to overcome host resistance will depend on its mating, dispersal and oviposition behaviors. Sex ratios of wheat midge at emergence, during and after dispersal indicate that mating occurs where larvae develop, and that only females disperse. Females deposit small batches of eggs repeatedly throughout their short lives, which spreads their offspring among plants. Female dispersal and oviposition behaviour increase the likelihood of random mating and gene exchange among genotypes. Thus, virulence management appears to be a viable option for this pest when resistant crops become available.

**FEMALE PREFERENCE AND OFFSPRING PERFORMANCE: IMPLICATIONS FOR PYRAMIDING RESISTANCE GENES FOR WHEAT MIDGE ON WHEAT.** R.J. Lamb and P. Sridhar, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg, MB, R3T 2M9.

Some wheats exhibit antibiotic resistance to wheat midge larvae and also deter oviposition. Pyramiding these two types of resistance might help prevent the evolution of virulent wheat midge, particularly if these resistance mechanisms are independent. We ask whether females have evolved a mechanism for avoiding antibiotic wheat, or wheat has evolved a mechanism for deterring oviposition. The preferences of females for ovipositing on three genotypes of wheat at different growth stages are determined, and related to the performance of larvae. Female preferences at different growth stages match larval performance on one wheat genotype. However, the preference-performance relationship breaks down for the other two wheat genotypes. Based on similarities of female preference for genotypes that differ in their antibiotic resistance, it is concluded that oviposition deterrence is a plant defense independent of antibiosis.

**SAMPLING ADULTS OF THE WHEAT MIDGE, *SITODIPLOSIS MOSELLANA* (GÉHIN), IN SPRING WHEAT WITH STICKY TRAPS TO MAKE CONTROL DECISIONS.** I.L. Wise, R.J. Lamb, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg, MB, R3T 2M9, J. Gavloski, Manitoba Agriculture, Soils and Crop Branch, Box 1149, Carman, MB R0G 0J0, L.A. Kaminski, and O.O. Olfert, Agriculture and Agri-Food Canada, 107 Science Crescent, Saskatoon, SK, S7N 0X2.

A method to predict larval densities in wheat heads was tested by counting the number of adults of the wheat midge *Sitodiplosis mosellana* (Géhin) caught on yellow sticky traps (75 mm × 125 mm cards). Ten traps were located at 10-15 m intervals in a row about 10 m from the field edge in nearly 200 commercial wheat fields in 1998-99 and 2001 in Manitoba, Saskatchewan and Alberta. The traps were placed at the height of the wheat heads when the heads were emerging from the boot. After 3 nights the traps were removed and the number of adult midges on the traps were counted. Larval densities in the heads were estimated from 20 or more wheat heads collected two to three weeks later from near the trap sites. The relationship between adult counts and larval densities were determined by correlation. Fields were divided into larval densities according to whether they were below (<3/head), equal to (3 to <5/head),

or above (>5/head) threshold levels that had been developed from earlier studies. Using these densities as a guide, a correct decision from the trap counts on whether to spray was made for most of the fields surveyed. The accuracy of the sticky trap method for making control decisions at different adult density levels was evaluated.

**PARASITOID GUILD OF CABBAGE MAGGOT, *DELIA RADICUM* (L.), IN CANOLA IN THE PRAIRIE PROVINCES OF CANADA.** K.S. Hemachandra and N.J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

The parasitoid guilds of *Delia radicum* in Canadian and European canola fields are being investigated to determine the potential for biological control by introducing European parasitoids. In 2000, >13,000 immature *D. radicum* were collected as weekly samples, and mass collection of pupae in autumn in Manitoba, Saskatchewan, and Alberta, for rearing in the laboratory in University of Manitoba. All parasitoids that emerged were larval-pupal or pupal parasitoids of which the most prevalent were staphylinids, *Aleochara bilineata* and *A. verna*, the eucoilid, *Trybliographa rapae*, and an ichneumonid, *Phygadeuon* sp.

**EUROPEAN *PERISTENUS* SPECIES (HYMENOPTERA: BRACONIDAE): THEIR POTENTIAL AS BIOLOGICAL CONTROL AGENTS FOR SPECIES OF PEST *LYGUS* HAHN AND *ADELPHOCORIS LINEOLATUS* (GOEZE) IN NORTH AMERICA.** Heather D. White, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

Several European species of *Peristenus* will attack and kill species of North American pest *Lygus*, and the introduced species *Adelphocoris lineolatus*. Various Europan *Peristenus* species were released in Canada and the United States as biological control agents for these pests during the 1980's and 1990's. Field studies were made in Germany and Switzerland from 1998-2000 to provide new information on the ecology of European *Peristenus* species which are candidates for biological control programs in Canada. Information on levels of host abundance and parasitism found in various crops, the spatial distribution of hosts and parasitoids in crop environments, and the ecological host range of candidate species will be presented.

**RESPONSE OF NATURAL ENEMIES ASSOCIATED WITH ALFALFA FIELDS TO THE PEA APHID SEX PHEROMONE.** M.J. Uddin, N.J. Holliday, P.A. MacKay, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2, W. Powell, J.A. Pickett, and S. Graves, AFRC - Institute of Arable Crops Research, Rothamsted Experimental Station, Harpenden, Herts, AL5 2JQ, UK.

The sex pheromone of pea aphids is important to their sexual reproduction. In the fall, female pea aphids release pheromones to attract mates. The hypothesis that natural enemies use this pheromone as a cue to locate their aphid hosts was examined in fields in the Interlake region of Manitoba and in the laboratory during the summers of 2000 and 2001. Two seed fields of alfalfa, each adjacent to a hay field of

alfalfa, were used. Pheromone lures were placed in assigned plots of the seed fields and then the adjacent hay fields were mown. Following this treatment, natural enemies in seed fields were sampled weekly. The natural enemy abundance in the pheromone treated plots was compared with that in the control plots. In 2001, an additional late season trial was conducted in a seed field using four different pheromones in a 5 × 5 Latin Square design. In the field trial, the males of lacewings, *Chrysopa oculata*, were found to be highly attracted to the pheromone. The number of aphid parasitoids was higher in the pheromone treated plots than that in the control plots. The pheromone was equally effective over a three-week period. The pheromone treated plots had a lower number of aphids and a higher number of lacewing larvae. In the late season trial, different components attracted different aphid species. Identification of the aphid species will allow their corresponding sex pheromone to be determined. Of the four different pheromones tested in the late season, neomatabiol was found to attract the adults of a lady beetle, *Hippodamia tredecimpuncta,* however, this was not noticed in the laboratory. Lacewings and parasitoids responded similarly to the pheromone in the laboratory experiment.

**THE IMPACT OF BURDOCK (*ARCTIUM* SPP.) ON NATIVE BIRDS, BATS, AND INSECTS.** Robyn M. Underwood, Department of Entomology and Todd J. Underwood, Department of Zoology, University of Manitoba, Winnipeg, MB, R3T 2N2.

Four species of burdock (*Arctium* spp.) were introduced into North America from Eurasia as much as three centuries ago. The two most common of these species are now found throughout southern Canada and the United States. In order to reproduce, these plants produce seed-filled burs that are dispersed by becoming entangled in the fur/feathers of large animals that come into contact with them. For small animals, this entanglement can sometimes be deadly. In this observational study, we document the entanglement of birds, bats, and insects on the burs of burdock plants. In addition, we examine several hypotheses to explain this phenomenon.

**ABUNDANCE AND SPECIES RICHNESS OF DYTISCIDAE (COLEOPTERA) IN PRAIRIE PONDS OF SOUTHERN MANITOBA.** Michael Alperyn and Robert E. Roughley, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

Predacious water beetles (Dytiscidae) are a utilitarian group for aquatic ecological investigations. However, many fundamental questions concerning the factors that influence species richness and abundance are yet unanswered. The purpose of my study is to examine dytiscid community structure in relation to water chemistry, aquatic macrophyte diversity, predator density, and permanence. Thirty-two ponds were selected along a latitudinal transect across southern Manitoba. Ponds were sampled each month (May through to September). It is hypothesized that: (1) predation will be the best predictor of dytiscid species richness and abundance; and (2) a transition of dytiscid species assemblages will correspond to a transition in from more boreal to more prairie habitats.

**PRELIMINARY STUDIES IN THE CLASSIFICATION OF NEARCTIC *BRYCHIUS* THOMSON (COLEOPTERA: HALIPLIDAE).** Tonya Mousseau and Robert E. Roughley, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

The crawling water beetle (Coleoptera: Haliplidae: *Brychius*) occurs in discrete, disjunct populations in North America. A revision of the genus will determine species status for all populations and clarify the existing classification. Taxonomic and phylogenetic investigation of these species will involve a traditional study of adult structure of all available specimens. The emphasis will be placed on the form and variation of the aedegus of male specimens, which is a standard indicator of species status in the Haliplidae. Life history information for the entire family is scant, particularly for species of *Brychius*. To address this lack of knowledge, specimens of selected species of *Brychius* will be observed in the natural habitat and laboratory. A population of an unknown *Brychius* species near Duck Mountain Provincial Forest, Manitoba provides a working model for study of other populations. Future investigations will include characterization of the larvae and molecular analysis to confirm a hypothesis about species status.

**THE EFFECT OF FIRE SEASON (SPRING, SUMMER, FALL) ON THE SPIDER (ARANEAE) DIVERSITY OF A TALLGRASS PRAIRIE IN SOUTHERN MANITOBA.**

David Wade, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

The management of tallgrass prairie commonly uses controlled burns. The timing of these burns are referred to as the fire season with spring, summer, and fall being frequently used. To date, most studies have only looked at spring burns with the plant and insect diversity receiving the most attention. Studies involving spider diversity have all focused on the effect of spring burns. To address this issue, a study was conducted from 1997 to 2000 on the St. Charles Rifle Range, examining the effect of spring, summer, and fall burns on plant, ground beetle, and spider diversity. The burns were conducted in 1997 and sampling occurred during the snow-free periods of each year. Sampling techniques primarily consisted of pitfall traps. This paper will present the responses of the two most abundant spider species on the St. Charles Rifle Range, *Pardosa moesta* Banks and *Pardosa distincta* (Blackwall) (Araneae, Lycosidae), to fire season. *Pardosa moesta* showed a decrease in abundance immediately following the burns in 1997 while *P. distincta* was not affected. Abundance levels increased in the spring burns for both species in 1998. *Pardosa moesta* showed a negative response to summer and fall burns in 1998 while *P. distincta* showed a positive response. *Pardosa distincta* continued to show a positive response for all fire seasons for the remainder of the study whereas *P. moesta* abundance returned to preburn levels. These different responses affected which species was dominant in a given treatment over the course of the study.

**FUNGI ASSOCIATED WITH NITIDULID BEETLES IN CORN AND APPLE IN NORTHEASTERN OHIO.** A.M. Mostafa, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2 and R.N. Williams, Department of Entomology, OARDC, Ohio State University, Wooster, OH, 44696.

Nitidulid beetles are known to have a role in transmitting microorganisms, especially fungi, to many important crops and fruits. Also, fungi are preferred nutritional sources for many species of these beetles. We investigated the fungi associated, externally and internally, with nitidulids in corn and apple during the fruiting season of 2000. Nitidulid beetles were collected from a cornfield and an apple orchard using sterilized forceps. To propagate any externally associated fungi, each individual insect was washed in distilled water and the wash water was then smeared on Potato Dextrose Agar (PDA) and on Tryptic Soy Agar (TSA) media. The exterior of the insect body was then sterilized by washing in distilled water, alcohol and then water again. Following surface sterilization, the head and the last two segments of the abdomen were removed and the remainder of the body was put on the same two kinds of media to propagate any internally associated fungi. Propagated fungi were re-isolated for purification and then identified.

Two fungi, *Fusarium semitectum* (externally) and *Geotrichum* sp. (externally and internally), were associated with *Carpophilus lugubris* in the cornfield. *Penicillium* spp., *Aspergillus niger*, and *Geotrichum* spp. were associated externally and internally with the same insect in the apple orchard. Fungi associated with *Carpophilus hemipterus* were *F. graminearum* (externally), *F. semitectum* (externally), and *Aspergillus niger* (externally and internally). *Fusarium* spp. are responsible for producing mycotoxins. *Fusarium graminearum* is the pathogen of head blight disease in cereal crops. *Penicillium* and *Aspergillus* may cause the ear rot disease.

**HOST INSTAR SELECTION BY A SOLITARY LARVAL ENDOPARASITOID, *MICROPLITIS MEDIATOR* (HYMENOPTERA: BRACONIDAE).** N. Lauro and N.J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

In Switzerland, the larval endoparasitoid *Microplitis mediator* Haliday (Hymenoptera: Braconidae) has been reported to attack the first three larval instars of *Mamestra brassicae* L. (Lepidoptera: Noctuidae). Results will be presented from choice and no-choice laboratory studies the oviposition behaviour of *M. mediator* females and the suitability of *M. brassicae* instars for parasitoid development were examined. Female parasitoids did not discriminate between first, second, or third instar hosts for attacks, regardless of whether these were presented with or without choice. However, survival of parasitoids in third instar hosts was low.

**ESTABLISHMENT OF THE MULTI-COLOURED ASIAN LADY BEETLE, *HARMONIA AXYRIDIS* IN MANITOBA.** I.L. Wise and W.J. Turnock, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg, MB, R3T 2M9

The multi-coloured Asian lady beetle or southern lady beetle was imported and released into the United States as early as 1916, but populations did not become established until 1988 in Louisiana. Since then, the beetle has spread to nearly every state from multiple release sites and was identified in Canada for the first time at Guelph, Ontario in 1994. It has now become one of the most abundant lady beetle species in southern Ontario. The first beetle in Manitoba to be identified as an Asian lady beetle was collected in Winnipeg by W.J. Turnock in 2000. It subsequently has been collected from the beaches of Lake Manitoba at the Delta Marsh and from annual and perennial herbaceous plants in the Red River Valley. Its relative abundance on these plants now exceeds 1% of all lady beetles. The ability of *H. axyridis* to overwinter successfully in Manitoba has yet to be confirmed. The potential impact of this species on the abundance of indigenous lady beetle species is discussed.

**SOME SURPRISING INSECT PESTS OF CROPS IN MANITOBA IN 2001.**
John Gavloski, Manitoba Agriculture and Food, Soils and Crops Branch, Box 1149, Carman, MB, ROG OJO, jgavloski@gov.mb.ca.

The following are examples of situations that occurred in Manitoba, Canada during the 2001 cropping season where insects not normally considered pests caused concern in crops, or insects damaged crops at stages where they normally do little damage.

Some canola fields were being sprayed for diamondback moth (*Plutella xylostella*) as early as late May, while plants were still seedlings. At least two fields had to be reseeded because of severe diamondback moth damage to canola seedlings. Alfalfa looper (*Autographa californica*) fed on the pods and seeds of canola. Several canola fields were sprayed for alfalfa looper in the area near Portage la Prairie, and canola fields were also sprayed for alfalfa looper near St. Jean, Gretna, and Plum Coulee. The second flush of armyworms (*Pseudaletia unipuncta*) were feeding on canola pods and had to be controlled in some canola fields in late August.

Larvae of the variegated fritillary butterfly (*Euptoieta claudia*) were clipping the bolls from plants in some flax fields, and at least seven or eight fields in the central region of the province were sprayed to control the damage.

A couple of fields of sunflowers in the southwest area of the province and some sunflower fields in the region south of Morden and Winkler were sprayed to control larvae of the painted lady butterfly (*Vanessa cardui*). Banded sunflower moth (*Cochylis hospes*) larvae were found in the seeds from numerous sunflower fields in Manitoba again this year.

Larvae of the alfalfa weevil (*Hypera postica*) caused heavy damage to alfalfa in the Killarney area, and damage was also noted in the Brandon area.

## *Poster Presentations*

**PEA PROTEIN COMBINED WITH PARASITOIDS TO CONTROL STORED-PRODUCT INSECTS.** Xingwei Hou, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2, Paul Fields, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg, MB, R3T 2M9, Paul Flinn, Joel Perez-Mendoza, and Jim Baker, US Grain Marketing Research Laboratory, USDA-ARS, 1515 College Avenue, Manhattan, KS, 66502-2736.

Pea protein is toxic and repellent to rice weevil, *Sitophilus oryzae* and rusty grain beetle, *Cryptolestes ferrugineus*. However, laboratory tests showed that pea protein is not toxic to parasitoids *Anisopteromalus calandrae* (Hymenoptera: Pteromalidae), a parasitoid of rice weevil, and *Cephalonomia waterstoni* (Gahan) (Hymenoptera: Bethylidae), a parasitoid of rusty grain beetle. The combination effect of pea protein flour with parasitoids was examined in 300 kg wheat bulks set up at two locations. Wheat was treated with 0, 0.04, or 0.1% pea protein. Three insect species (*S. oryzae, Tribolum castaneum*, and *C. ferrugineus*) and two parasitoids were released at 2 insects per kg of wheat. Wheat was sampled from top, middle and bottom in each wheat bulk. Preliminary data showed that the populations of three insect pests were reduced at 0.1% pea protein treatment. Parasitoids alone reduced population of *C. ferrugineus*. The effect of combining pea protein and parasitoids was not clear at 9 weeks.

**ECONOMICALLY IMPORTANT NITIDULIDS OF NORTHERN EGYPT WITH EMPHASIS ON THEIR PHEROMONES.** A.M. Mostafa, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

Nitidulid beetles occupy a wide range of habitats throughout the world. Some species are cosmopolitan, while others are well known as pests of ripening and dried fruits, grains, and many stored products. In Northern Egypt there are four primary species that attack citrus, date palm, guava and many of other fresh and dried or stored fruits. These species are, *Carpophilus hemipterus, C. dimidiatus, C. humeralis* and *Epuraea luteolus*. Also the small hive beetle, *Aethina tunida* was observed for the first time in Egypt last summer. We have known for some time that these beetles are attracted to various volatiles produced by fermentation of overripe fruits as well as bread dough. In the past few years, aggregation pheromones of many nitidulid species were discovered and synthesized.

Our nitidulid work focused on studying the combination effects of pheromones with whole wheat bread dough (WWBD). The following combinations were applied by using the PVC trap in both citrus and date palm orchards in Rosetta in Northern Egypt (1998-2000): 1) WWBD only; 2) *C. hemipterus* pheromone only; 3) *C. dimidiatus* pheromone only; 4) *C. hemipterus* pheromone + WWBD; and 5) *C. dimidiatus* pheromone + WWBD.

Date palm was more attractive to the four species of nitidulids than citrus. A combination of dough and pheromone of *C. dimidiatus* was the most attractive lure for these insects, followed by a combination of dough and pheromone of *C. hemipterus*. Less attractive was dough by itself and least attractive were individual pheromones by themselves.

**STUDIES OF THE SEASONAL ABUNDANCE, DISTRIBUTION AND PARASITISM OF THE EUROPEAN CABBAGE MOTH, *MAMESTRA BRASSICAE* L. (LEPIDOPTERA: NOCTUIDAE), IN ORGANIC VEGETABLE FIELD PLOTS IN SWITZERLAND, WITH SPECIAL REFERENCE TO THE LARVAL PARASITOID, *MICROPLITIS MEDIATOR* (HYMENOPTERA: BRACONIDAE).** N. Lauro and N.J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, MB, R3T 2N2.

*Mamestra brassicae* is a common pest of mustard crops in Central Europe. We present results from field studies conducted in 1998 and 1999 that characterize the abundance, distribution and parasitism of *M. brassicae* and the spatial patterns and host specificity of *Microplitis mediator* (Haliday) in Switzerland. In a life history consisting of two annual generations, *M. brassicae* reaches peak abundance in the second. Egg masses were randomly distributed in field plots and averaged 25 ± 1.2 eggs per mass. Consequently, eggs and young larvae were aggregated and distributions gradually shifted to random with increasing larval instar. Six primary parasitoids were reared from *M. brassicae* and the two egg parasitoids, *Trichogramma buesi* Vogele (Hymenoptera: Trichogrammatidae) and *Telenomus* sp., and the larval parasitoid, *M. mediator*, were important. *Microplitis mediator* was dominant in each generation of *M. brassicae* and responded to hosts on two spatial scales. Four other species of Lepidoptera were collected and *M. mediator* was reared only from three larvae of *Autographa gamma* Linnaeus (Noctuidae).

# *The Entomological Society of Manitoba gratefully acknowledges the following organizations, which provided financial support to the 57th Annual Meeting*

Aventis CropScience Canada

Canadian Grain Commission

Canadian Forest Service, Natural Resources Canada

Canola Council of Canada

City of Winnipeg – Insect Control Branch

Dow Agro Sciences Canada, Inc.–Ag Research

Dow Agro Sciences Canada, Inc.–Turf, Ornamentals & Horticulture

Gustafson

Louisiana Pacific, Ltd.

Manitoba Conservation

Metro Pest Control

Monsanto Canada, Inc.

North/South Consultants

Poulin's Pest Control Services

Swat Team Pest Services, Inc.

Syngenta Crop Protection Canada, Inc.

Tembec Paper Group – Pine Falls Operations

# Minutes of the 57th Annual Meeting of the Entomological Society of Manitoba

3 November, 2001
Freshwater Institute
Winnipeg, Manitoba

The President, Ian Wise presided.
With a quorum present, the President called the meeting to order at 2:00 PM.

**Attendance**

Executive:

Ian Wise, President
Pat MacKay, Past President
Robert J. Lamb, Regional Director to ESC

Executive Staff:

Noel White, Secretary
Bill Preston, Treasurer
Désirée Vanderwel, Proceedings Editor

Members:

| | |
|---|---|
| Michael Alperyn | Ayman Mostafa |
| Christie Borkowsky | Tonya Mousseau |
| Terry Galloway | Rob Roughley |
| John Gavloski | Marjorie Smith |
| Neil Holliday | Blaine Timlick |
| Nicole Lauro | Robyn Underwood |
| David Wade | Richard Westwood |
| Joel Gosselin | |

Executive member absent was Paul Fields, President-elect

1. **Acceptance of Agenda (Appendix A)**

   ***Motion***: T. Galloway/B. Lamb CARRIED

2. **Acceptance of the Minutes of the Last Annual General Meeting of October 21, 2000**

   ***Motion***: J. Gosselin/R. Roughley to accept previous AGM minutes CARRIED

3. **Business Arising From the Previous Minutes**

A standing rule dealing with tie votes for Executive members was passed in 2000,

"In Executive Committee elections where both candidates receive the same number of votes, each candidate will serve for one term, with the order of appointment being determined alphabetically by surname."

To make this a permanent standing rule the motion must be passed at two consecutive AGMs.

***Motion***: B. Lamb/R. Roughley that the standing rule on tie votes initially passed at the 2000 AGM be accepted as permanent. CARRIED

4. **Executive Reports**

***Motion***: N. Holliday/T. Galloway to receive the reports of the Executive and Committees. CARRIED

Appendix B – President's Report (I. Wise)

Appendix C -- Treasurer's Report (B. Preston) - Audited Statement

Appendix D – Regional Director to the ESC (Bob Lamb) (and 2002 ESM/ESC Joint Meeting Report)

Appendix E – Editor of the Proceedings (D. Vanderwel) (the new editor for 2002 will be T. Galloway)

Appendix F – Endowment Fund Board (B. Timlick)

**5. Committee Reports**

Appendix G – Finance (B. Timlick)

Appendix H – Newsletter (J. Diehl)

Appendix I – Social Committee (M. Alperyn)

Appendix J – Youth Encouragement (C. Borkowsky)

Archives – (R. Roughley [oral]) - Newsletters are going in archives. New material is being accepted.

Appendix K – Scholarship and Awards (R. Westwood)

***Motion***: R. Westwood/N. Holliday. That the ESM Student Achievement Award be $200 (from $150) to be equivalent to the SWAT Award. CARRIED

Appendix L – Scientific Program

Appendix M – Membership (T. Mayert)

Appendix N – Fundraising (J. Gosselin)

Appendix O – ESM Internet Site (P. Fields [not present])

## 6. Update on 2002 ESM/ESC joint meeting - Don Dixon

## INSECTS AND HUMANS: CONFRONTATION AND COEXISTENCE

On behalf of the Entomological Societies of Manitoba and Canada, we are pleased to extend an invitation to join us at the 2002 Joint Annual Meeting which will be held at the Delta Hotel in Winnipeg, Manitoba. The theme for the 2002 ESC/ESM Meeting will be "Insects and Humans: Confrontation and Coexistence". We are confident that this theme will provide the basis for an interesting and informative series of plenary sessions, symposia and workshops. Please refer to the tentative agenda.

The Delta Hotel, the largest hotel in Winnipeg, is connected through a series of walkways to a variety of shopping, entertainment and restaurant options in downtown Winnipeg. In addition, the hotel is within walking distance of the historic Forks area at the junction of the Assiniboine and Red Rivers. The meeting is scheduled to coincide with the spectacular bird migration along the Red River Valley, the pleasant autumn weather we experience in early October, and the possibility of late season insect collecting.

The ESC/ESM 2002 organizing committee has decided to make some important changes to the meeting format. We believe these changes will provide a more efficient use of time and will enhance enjoyment of the meeting by participants. Specifically, the opening ceremonies and plenary session will commence after lunch on Sunday, October 6, rather than on Monday morning. Please ensure that you adjust your travel plans accordingly.

In addition to the JAM, there are several additional meetings scheduled to enable entomologists to get the best bang for their travel dollar. The Organizing Committee welcomes suggestions for additional program items or participants in symposia and workshops. Please visit our webpage at http://home.cc.umanitoba.ca/esm/meet-esc.html.

**For further information**

Don Dixon
Manitoba Agriculture and Food
545 University Crescent
Winnipeg, Manitoba, R3T 5S6
204-945-3861 e-mail: ddixon@gov.mb.ca

**Associated Meetings**

| | |
|---|---|
| Wednesday, October 2 | Canadian Forum for Biocontrol |
| Thursday, October 3 | Agriculture and Agri-food Canada Working Group on Biocontrol |
| Friday, October 4 | Western Committee on Crop Pests and Western Committee on Plant Diseases |
| Saturday, October 5 | Western Forum Board Meeting, and ESC Board Meeting |
| Sunday, October 6 | Joint Meeting of the Entomological Societies of Manitoba and Canada begins |

# Joint Meeting of The Entomological Societies of Manitoba and Canada

**Delta Winnipeg Hotel, Winnipeg, Manitoba**

**5-9 October, 2002**

**TENTATIVE PROGRAM**

**Sunday, October 6**

| | |
|---|---|
| 1300-1415 | Opening Ceremonies, ESC Awards, Gold Medal Address |
| 1445-1645 | Plenary Session: "Insects and Humans: Confrontation and Coexistence"? Professor David Schindler, University of Alberta<br>Expert in: Environmental Significance of Global Movements, Sequestration and Re-release of Pesticides<br>Professor Mark Rausher, Duke University<br>Expert in: Management of Evolutionary Change in Pest Insects |
| 1930-2030 | Students Meet the Board followed by Reception |
| 2030-2230 | Mixer (included) |

**Monday, October 7**

| | |
|---|---|
| 0830-1200 | Symposium: Forest Age Structures: Consequences for Insects - Richard Westwood (University of Winnipeg) |
| 0830-1200 | Symposium: Crops as New Habitats for Insects - John Gavloski (Manitoba Agriculture and Food) |
| 1330-1600 | Symposium: Biological Control and the Native Fauna and Flora - Neil Holliday (University of Manitoba) |
| 1330-1600 | President's Prize Papers |
| 1600-1730 | Poster Session |

**Tuesday, October 8**

| | |
|---|---|
| 0830-1200 | Symposium: Managing Insects with Pheromones - Désirée Vanderwel (University of Winnipeg) |
| 0830-1200 | Symposium: Measuring the Interaction between Insects and Plants - Rosemarie DeClerck-Floate (AAFC Lethbridge) |
| 1330-1600 | Symposium: Ecology and Diversity of Grassland Arthropods - Terry Wheeler (McGill University) |
| 1330-1600 | Contributed Papers |
| 1800-2300 | Banquet |

**Wednesday, October 9**

| | |
|---|---|
| 0830-1200 | Hands-On Workshop: North American Dragonflies - Terry Galloway (University of Manitoba) |
| 0830-1200 | Contributed Papers |

Ces renseignements sont disponibles en français sur le site Web de la société entomologique du Manitoba: http://home.cc.umanitoba.ca/esm/reunion.html.

7. **Election Results - scrutineer**
   Member-at-Large – R. Underwood
   Regional Representative to ESC – P. MacKay
President-Elect (N. Holliday as decided by tie ballot with P. Fields)

8. **New Business**

   Should the Insect Pest Management Review produced by the province be placed in the Proceedings as a scientific report?

   It was decided it should be submitted by the Manitoba Agriculture and Food author to the editor of the Proceedings.

9. **Transfer of Office** – New President – P. Fields

   ***Motion***: N. Holliday/P. MacKay to destroy ballots CARRIED

10. **Reappointment of Auditor**

***Motion***: M. Smith/R. Roughley. That Doug Nicholson and Co. be reappointed as our auditors. CARRIED

11. **Other Business**

    Steve Payne has donated a plastic banner with the ESM name and logo to the Society (made by his graphics class).

    ***Action***: P. Fields - write to thank him for the banner.

12. **Adjournment**.

    Motion: B. Lamb. That the meeting be adjourned. CARRIED

# Appendices

## Appendix A:
## Agenda of the Entomological Society of Manitoba, 57th Annual Business Meeting, 3 November, 2001

1. Acceptance of Agenda.

2. Acceptance of the minutes of the last Annual Meeting (21 October, 2000).

3. Business arising from the minutes.

4. Reports - Executive:

| | |
|---|---|
| President | I. Wise |
| Treasurer | W. Preston |
| Regional Director to the ESC | R. Lamb |
| Editor of the Proceedings | D. Vanderwel |
| Endowment Fund Board | B. Timlick |

5. Reports - Committees:

| | |
|---|---|
| Finance | B. Timlick |
| Publicity / Newsletter | J. Diehl |
| Social | M. Alperyn |
| Youth Encouragement / Public Ed. | L. Baspaly |
| Archives | R. Roughley |
| Scholarship & Awards | R. Westwood |
| Scientific Program | J. Gavloski |
| Membership | T. Mayert |
| Fund-raising | J. Gosselin |
| Web Page | P. Fields |

6. Update on 2002 ESM/ESC joint meeting. D. Dixon

7. Election results - scrutineer. C. Demianyk

8. New business.

9. Transfer of office.

10. Reappointment of Auditor

11. Other business.

12. Adjournment.

**Appendix B: Report of the President**

The recent upswing in the fortunes of the Entomological Society of Manitoba, as noted in recent presidential reports by Pat MacKay and Marjorie Smith, continued unabated this past year. Membership in the Society continues to rise, particularly in the number of new upcoming entomologists, and its financial position remains very positive despite continued low returns in our Endowment Funds caused by low interest rates. The Society continues to receive terrific backing from its members. I was particularly gratified, although not necessarily surprised, to get almost universal willingness when I approached members to serve as a chair of a committee or asked members for their assistance to enable the Society to meet its wide assortment of ongoing functions or new goals. This spirit continues to be the true measure of the strength of the Society. I would like to acknowledge the contribution of some of our members and also briefly review some of the activities of the Society this past year.

The Executive had its usual change of elected officers, but not necessarily in the usual manner. As mentioned at last year's meeting, Paul Fields became the first President-Elect to assume his position by the new Standing Rule, which decides the outcome of elections that end in a tie, and Neil Holliday graciously assumed the position of President-Elect. The second change in our elected members will be a successor for Bob Lamb, who completed the last of his three year term as Regional Director. However, the Society did not allow Bob' talents to go to waste and corralled him to be the Scientific Committee Program chair for the 2002 Joint Annual Meeting. For the Executive Staff, Désirée Vanderwel decided to step down as Proceedings Editor and Terry Galloway has agreed to take over. Désirée established an effective program for publishing the Proceedings at the University of Winnipeg; a system that should smooth the transition to the new Editor. I wish to express my thanks and for the Society to show its gratitude to Bob and Désirée for their excellent work in fulfilling the needs of these demanding positions. Noel White as Secretary, Blaine Timlick in Finance, and Bill Preston as Treasurer continued to provide excellent service to the Society and should be equally commended.

A number of noteworthy changes and accomplishments were made among the Committee Chairs. John Gavloski agreed to head up the Scientific Program Committee, and, as members are now aware, did a terrific job in arranging the scientific and social components of the meeting. Mike Alperyn took on the responsibility of the Social Chair and Tannis Mayert tackled the newly organized Membership Committee. Because of the hard work of Tannis this committee has now become a great asset for the Treasurer and other committee chairs who require an up-to-date mailing or e-mail list, and contributes to cost savings by hastening the transition of the Society's correspondence to mostly an electronic format. For members who have not notified Tannis of recent e-mail or address changes, please do so as soon as possible.

The electronic medium remained a focal point of the ESM this year. While Jason Diehl and his many contributors have utilized the electronic media to provide members with the Newsletter in very cost effective way, our web site (http://home.cc.umanitoba.ca/esm) now provides members with the latest edition of the Newsletter and the Proceedings, information on upcoming meetings, executive reports, committee duties, and much more, including links to many other web sites.

Much of the information on the web was often unavailable or slow in reaching many of our members, especially our new ones. The web site will now enable all members to be better informed about the Society, and make the workings of the Society, in particular the Executive, a lot more transparent. I encourage all members to also use the web site as a means of contacting members of the Executive whenever you wish to voice a concern or a suggestion. The web site has been a product of the tremendous efforts of our webmaster Paul Fields. His diligence has allowed the Society to take a mighty step forward into the 21st century. Paul is to be highly commended for his efforts. For members with computer skills who would like to help out with the web page, Paul can readily add you to the Web Site Committee.

The Society supported two worthy endeavours this past year. The second and final installment of $500 was sent to the J. B. Wallis Museum for its expansion and renovation. The Society also showed a debt of gratitude to the tireless work shown by the University of Manitoba graduate students by contributing $300 towards the purchase of a poster display acquired from funds received by the Department of Entomology Graduate Student's Association from a grant from Manitoba Heritage. Heather White, Robyn Underwood, and all other members of the DEGSA who took the initiative and prepared a successful application are to be congratulated. The students innumerable visits to schools is often an overlooked contribution to the Society because its direct benefits to the Society take many years to come to fruition. I am sure the display will stir the entomological interest of many future members of the Society.

As all members are probably aware and I alluded to earlier, the Society will be holding a Joint Annual Meeting with the Entomological Society of Canada in 2002. Don Dixon and his organizing committee members are in the midst of planning an exciting get-together. A picturesque brochure of the Forks, outlining our program, was included as an insert at the meetings in Niagara Falls. As for all meetings of this size, Don will be seeking the assistance of a number of volunteers to help cover all the details. I ask all members to consider ways in which, no matter how small, they can help in making this meeting an unqualified success.

The Society made initial contact with people at the Assiniboine Park Conservatory. They are planning to construct a butterfly house at the Conservatory, and the objective of our inquiries was to determine the best way the Society could provide help. Once construction is given the go ahead, I encourage all members to provide suggestions to the Executive on ways you would like to see the Society liaise with the Conservatory. I wish to thank Paul Fields for taking the initiative on this matter.

Two long time members of the ESM were in the news. Dr. Sam Loschiavo, who had a distinguished career as a stored grain entomologist at Agriculture Canada in Winnipeg and was one of the founding fathers of Folklorama, was awarded the Order of Canada. I was honoured to present a commemorative plaque to Sam on behalf of the Society, recognizing his great achievement. On a sad note, the Society lost a devoted member with the passing of Walter Askew. Wally, as he was best known, served as Treasurer of the Society from 1976–1987, and was awarded by the Society for his devoted service upon his retirement. He had an unbridled enthusiasm for insects, and many of his cohorts can spin stories of his ceaseless pursuance of this interest whenever the opportunity arose. May we all take a moment of silence to pay tribute to

Walter Askew and show our respects to his family.

I wish to thank the Society for the honour of serving as your President. I look forward continued involvement with the ESM and once again thank the many members who provided support this past year.

Ian Wise, President

**Appendix C: Report of the Treasurer**

**Entomological Society Of Manitoba, Inc. Financial Statements**
**August 31, 2001**

# DOUG NICHOLSON* & CO.,

## Certified General Accountant

## AUDITOR'S REPORT

To the Members of the

Entomological Society of Manitoba Inc.

I have examined the balance sheet of the **Entomological Society of Manitoba Inc.** as at **August 31, 2001** and the statement of income, expenses and surplus 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 the above, these financial statements present fairly the financial position of the society as at August 31, 2001 and the results of it's operations and the changes in it's financial position for the year then ended in accordance with generally accepted accounting principles.

*original signed by Doug Nicholson & Co.*

Winnipeg, Canada
October 24, 2001

Doug Nicholson & Co.,
Certified General Accountant

**PROFESSIONAL CORPORATION*

**ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.**
**BALANCE SHEET**
**AS AT AUGUST 31, 2001**

**ASSETS**

| **CURRENT** | **2001** | **2000** |
|---|---|---|
| Cash in bank | $ 3,144 | $ 4,215 |
| Cash advances | – | 200 |
| GST receivable | 121 | – |
| Canadian T-Bill fund (note 2) | 3,593 | 3,444 |
| Investments (note 3) | 35,552 | 35,000 |
| | $42,410 | $42,859 |

**LIABILITIES**

| | | |
|---|---|---|
| **LIABILITIES** | nil | nil |

**SURPLUS**

| | | |
|---|---|---|
| **SURPLUS** | 42,410 | $43,182 |
| | $42,410 | $43,182 |

**APPROVED BY THE BOARD:**

*original signed by*
_____ President _____ Treasurer

**The accompanying notes form an integral part of these financial statements**

## ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.
## STATEMENT OF INCOME, EXPENSES AND SURPLUS
## YEAR ENDED AUGUST 31, 2001

| REVENUE | 2001 | 2000 |
|---|---|---|
| Annual meeting | $1,674 | $1,469 |
| Donations | 1,230 | 1,205 |
| Fund-raising committee | 1,598 | 372 |
| Interest income | 2,017 | 2,187 |
| Members fees | 1,137 | 1,688 |
| Miscellaneous | 141 | 106 |
| Proceedings | 21 | 433 |
| Youth encouragement & public education | – | 200 |
| | $7,818 | $7,660 |
| **EXPENSES** | | |
| Awards and scholarships | 1,450 | $1,500 |
| Donations | 800 | |
| Fund-raising | 1,240 | 1,012 |
| General | 968 | 973 |
| Meetings | 3,254 | 3,011 |
| Newsletter | 442 | 161 |
| Proceedings | – | 891 |
| Social Committee | 25 | 68 |
| Youth encouragement & public education | 88 | 367 |
| | $8,267 | $7,983 |
| **EXCESS (DEFICIT) OF INCOME OVER EXPENSES** | **$(449)** | **$(323)** |
| Add: Surplus, beginning of year | 42,859 | 43,182 |
| **SURPLUS, END OF YEAR** | **$42,410** | **$42,859** |

**ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.**
**NOTES TO THE FINANCIAL STATEMENTS**
**AUGUST 31, 2001**

## 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. Inventory is expensed when it is purchased. Interest from investment certificates is paid out annually and no interest is accrued. Capital assets are written off when acquired and, therefore, there are no annual depreciation allowances.

## 2. INVESTMENT – T-BILL FUND

The Canadian T-Bill fund was opened February 28, 1997 with a principal balance of $3,000. The T-Bill is shown at market value at year-end.

## 3. INVESTMENT CERTIFICATES

| Certificate Number | Interest Rate | Maturity Date | | Par Value |
|---|---|---|---|---|
| 25703249 | 5.250 | Feb 26, 2002 | $ | 3,000 |
| 960006276-1 | 4.500 | Oct 31, 2002 | $ | 3,000 |
| 960006276-2 | 5.300 | Feb 10, 2003 | $ | 10,800 |
| 960006276-3 | 5.150 | Sep 16, 2003 | $ | 4,000 |
| 960006276-4 | 4.800 | Dec 11, 2003 | $ | 3,000 |
| 25723170 | 4.800 | Apr 5, 2004 | $ | 2,000 |
| 55611-0004 | 6.000 | Nov 12, 2004 | $ | 9,752 |
| | | | $ | 35,552 |

**Appendix D: Report of the Regional Director, Entomological Society of Canada**

The Entomological Society of Canada Annual General Meeting was held with the Entomological Society of Ontario in Niagara Falls, October 21-24, 2001. I attended the Governing Board meeting and Annual General Meeting on your behalf. Bernie Roitberg, Simon Fraser University, took over as President from Bob Foottit, AAFC, ECORC. Also in attendance at the Joint Meeting were Don Dixon, Chair of the Organizing Committee for the 2002 Joint Meeting with ESM, and Marj Smith, the Registrar, and both observed how the 2001 meeting was organized and made contacts that will be useful in organizing our meeting. I submitted Don Dixon's report on meeting preparations to the Governing Board. Don Dixon arranged for the distribution of an invitation to ESC members and our tentative program as part of the registration package for the 2001 meeting. Other ESC initiatives relevant to ESM are as follows: The Canadian Entomologist is developing plans to publish electronically while retaining a paper version. The new Editor of the ESC Bulletin, Dan Johnson, AAFC Lethbridge, would like to feature more items from the Regional Newsletters in the ESC Bulletin, and requests that Regional Directors provide electronic versions of the newsletters. The ESC has established a policy of donating any profits from Annual Meetings provided by the Regional Societies to the ESC Scholarship Fund of the Regional Society's choice. ESC has adopted long-term planning for meeting venues so that Regional Societies will know five years in advance where Annual Meetings will be held. The Governing Board expressed appreciation at our willingness to establish differential fees for members and non-members at the 2002 Annual Meeting, and welcomed our proposal for a $25 differential fee. The Board hopes that this initiative will serve as an example for future joint meetings. The 57$^{th}$ Annual Meeting of ESM completes my term as Regional Director, and so this is my final report in this position.

Bob Lamb, Regional Director

**Appendix E: Report of the Proceedings Editor**

Two-hundred twenty-five copies of Volume 55 (1999) of the *Proceedings* will be printed and mailed in October, 2000. Volume 55 is 67 pages long and contains three refereed scientific papers. Copies will be mailed to both Society members and to about 90 outside institutions (those that subscribe, exchange their journal with ours, or receive the *Proceedings* as a gift).

Volume 56 (2000) of the *Proceedings* is in the final stages of preparation. It will be about 44 pages long.

I would like to thank everyone involved with Volume 55 and 56 for their efforts, particularly the authors and the anonymous reviewers.

D. Vanderwel

*Proceedings* Editor

**Appendix F: Report of the Endowment Fund**

The Endowment Fund continues to provide the resources necessary to enable the Entomological Society function. Costs associated with the Student Scholarship, the Proceedings and costs associated with the Annual General Meeting are all supported in part, by the Earnings of the Endowment Fund. In the past this support is in the range of $2000 annually.

Currently the Endowment Fund is $35,500 and the cap is currently $40,000. The fund along with bank account and T-Bill interest generated over $2000 in 1999-2000. The Fund currently has certificates generating between 4.8% and 6.0%. While the returns are considerably less than the Society has experienced in the past, they will remain stable over the next year as the next maturing dates are 2002. The current return rate for the certificates is approximately $1900.00.

**Endowment Fund Guaranteed Investment Certificates**

| Certificate No. | Principle | Interest Rate (%) | Maturity Date | Annual Interest |
|---|---|---|---|---|
| 25703249 | $3000.00 | 5.25 | Feb 26, 2002 | $157.50 |
| 960006276-1 | $3000.00 | 4.50 | Oct 31, 2002 | $135.00 |
| 960006276-2 | $10800.00 | 5.30 | Feb 10, 2003 | $572.40 |
| 960006276-3 | $4000.00 | 5.15 | Sept 16, 2003 | $206.00 |
| 960006276-4 | $3000.00 | 4.80 | Dec 11, 2003 | $144.00 |
| 25723170 | $2000.00 | 4.80 | Apr 5, 2004 | $96.00 |
| 55611-0004 | $9752.00 | 6.00 | Nov 12, 2004 | $585.20 |
| **Total** | $35,552.00 | | | $1896.10 |

Blaine Timlick, Chair

Bill Preston, Treasurer

**Appendix G: Report of the Finance Committee**

The Chair of the Finance Committee and the Treasurer met in October 2001 to exchange information, review the annual budget, and assess the potential revenues and expenditures.

In the 2000-01 fiscal year expenses exceeded revenue by $449. The deficit in 1999-2000 was $323. It is anticipated that expenditures will also be greater than revenue in the following year.

Past budgets have been conservative and our expenditures have usually been less than expected. In the 2001-2002 financial year, it is anticipated that losses will exceed $1,000. This is primarily due to the cost of 2 years of the Proceedings being

published, revenue from the Proceedings declining, reduced membership, and lower rates of return from the endowment fund.

The Finance Committee urges other Committee Chairs to attempt to stay within the allocated budget if possible. The funds associated with the Society can support small deficit positions for a few years, but the Society should attempt to balance expenditures with revenues.

The Committee also urges members who have potential contacts for donations to provide those contact names to the Fund Raising Committee.

**Entomological Society of Manitoba Inc. – Budget 2001-02**

| Budget Item | 2000-01 Actual | 2001-02 Actual & Proposed | 2002-03 Projected |
|---|---|---|---|
| **Endowment Fund** | $35,000 | $35,500 | $35,500 |
| **REVENUE** | | | |
| Membership Dues | 1,137 | 1,200 | 1,200 |
| Proceedings | 21 | 100 | 100 |
| Social Committee | 0 | 0 | 0 |
| Youth/Education Committee | 0 | 200 | 200 |
| Donations | 1,230 | 1,500 | 1,200 |
| Fund Raising Committee | 1,598 | 1,500 | 400 |
| Meeting ESM/AGM | 1,674 | 0 | 1,500 |
| ESC – ESM JAM | 0 | 2,000 | 0 |
| Miscellaneous | 141 | 100 | 100 |
| Investment Income | 2,017 | 2,000 | 2,000 |
| **Totals** | $7,818 | $8,600 | $6,700 |
| **EXPENSES** | | | |
| General Society Expenses | 968 | 1,000 | 1,000 |
| Proceedings | 0 | 1,800 | 900 |
| Newsletter | 442 | 250 | 250 |
| Social Committee | 25 | 100 | 100 |
| Youth/Education Committee | 88 | 200 | 300 |
| Fund Raising | 1,240 | 1,000 | 500 |
| Student Awards/Scholarship | 1,450 | 1,500 | 1,500 |
| Meeting ESM/AGM | 3,254 | 0 | 3,000 |
| ESC – ESM JAM | 0 | 3,000 | 0 |
| Donations | 800 | 500 | 0 |
| Other Committees | 0 | 50 | 50 |
| Representation at ESC | 0 | 350 | 350 |
| **Totals** | 8,267 | 9,750 | 7,950 |
| **Year End Aug, 2000** | (449) | (1,150) | (1,250) |

Blaine Timlick, Chair
Bill Preston, Treasurer

**Appendix H: Report of the Newsletter Committee**

Three newsletters were mailed out in 2001. Spring, summer and fall issues. Germaine took care of mail out costs for the spring and summer issues and notified me that receipts were mailed to the treasurer of the ESM. I do know that mail out costs for the summer issue was $33.37. Total costs for 2001 were:

| | | | | |
|---|---|---|---|---|
| Spring issue: | Photo. | $39.34 | Mail out | $33.37 (approx.) |
| Summer issue: | Photo. | $39.34 | Mail out | $33.37 |
| Fall issue: | Photo. | $42.48 | Mail out | $36.59 |
| TOTAL | | $121.16 | TOTAL | $103.33 |

Costs associated with the newsletter in 2001 are $224.49 (approx.). This number might change based on the exact mail out value of the spring issue. I would like to take this opportunity to thank the members of the ESM for all submissions to the newsletter and encourage them to keep it up. As I stated in my last issue I am stepping down as editor but will stay on to help whomever the new person is.

Jason Diehl

**Appendix I: Report of the Social Committee**

The New Member's Social was a two-part event, including a potluck and glow bowling held on April 12th. The potluck was held at Entomology Department, University of Manitoba and glow bowling was at Uptown Bowling Lanes. Heather White's stuffed grape leaf rolls and Nicole's cornbread chili were just a few of the interesting and yummy dishes served. The bowling event was enjoyed by all who attended and the event provided evidence that entomologists can in fact bowl. Players that demonstrated considerable skill at the game included David Wade and Dr. Terry Galloway. The new members that attended the event included: Tonya Mousseau, David Wade, Diana Saunders, and Christie Borkowsky.

The ESM banquet was a successful event with a turn out of over fifty people. The banquet was held on November 2nd, at the Canad Inns. The dinner included a variety of appetizing buffet items including roast turkey as the main dish. Local harpist, Olivia Ritchie playing a lovely array of classical melodies, provided entertainment. During the awards ceremony, Heather White received both the Student Paper Award and also the Graduate scholarship. The ESM Student achievement award was given to Marla Reikman and Nancy Dewar received the Swat Team Student Award. Sam Loschiavo, Order of Canada recipient, was honored by the ESM for his lifetime contributions to entomology.

Michael Alperyn and
Heather White

**Appendix J: Report of the Youth Encouragement and Public Awareness Committee**

In the past year, over 560 students received either an in-class presentation or a tour of the department. Of the 23 groups we worked with, the Youth Encouragement program received donations from the following:

| | |
|---|---|
| Robert H. Smith School | $25.00 |
| Grosvenor Elementary School | $30.00 |
| Camp Kildona-Earth Science Program | $80.00 |
| YMCA Daycare | $25.00 |
| Wolseley School | $35.00 |

Additionally, the Museum of Man and Nature-Summer Camp Program covered the cost of the $5.00 parking fee. The following have given or assisted with presentations: Michael Alperyn, Lisa Babey, Lisa Baspaly, John Gavloski, Xingwei Hou, Nicole Lauro, Tonya Mousseau, David Ostermann, Katherine Peech, Diana Saunders, Stacie Steige, Jashim Uddin, Robyn Underwood, David Wade, and Heather White.

On 27 April, I assisted Robyn Underwood with an Agriculture in the Classroom workshop during the Manitoba Schools Science Symposium, held at the University of Winnipeg. In a short 2-hour period we seen nearly 120 students and dazzled them with the Giant Brazilian Cockroaches and beetle larva. This of course was a brief preview of the 3-day Amazing Grains program held at the Red River Exhibition Park, 11-13 September 2001. The response to this Agriculture in the Classroom program is unbelievable with 1,263 students from 24 schools participating. A waiting list of an additional 820 students was recorded this year and the program be expanded to 4 days in 2002. The Amazing Insect area was divided into 5 stations featuring general information, insects and crops, biocontrol, apiculture and the fun filled "metamorphosis relay". My thanks to Lisa Baspaly, Tonya Mousseau, Robyn Underwood and Heather White for attending the numerous organizational meetings for this event. The Amazing Insect stations could not have been managed without the efforts of the following: Michael Alperyn, Lisa Baspaly, Jodi Lynn Blazenko, Colin Demianyk, Dan Eilers, Paul Fields, Amy Hawkins-Bowman, Xingwei Hou, Rheal Lafreniere, Nicole Lauro, Tannis Mayert, Tonya Mousseau, David Ostermann, Diana Saunders, Jashim Uddin, Robyn Underwood, David Wade, Heather White, and Noel White.

I would like to thank everyone who has assisted with presentations at schools, daycares, summer camps, department tours, and the Amazing Insects stations during the Amazing Grains program. Overall, more than 1,950 students had the opportunity to learn about insects, overcome initial fears, and hold live insects.

Christie Borkowsky,
Chair

**Appendix K: Report of the ESM Student Awards and ESM Scholarship Committee**

The Committee reviewed four applications for the ESM post-graduate award. A fifth submission did not meet the application criteria. The ESM Scholarship Committee recommends that the ESM Post-graduate Scholarship Award be made to Ms. Heather White of the Department. of Entomology, University of Manitoba. Ms. White is currently working on her M.Sc. degree.

The Committee reviewed the nominations for the Student Achievement Award and SWAT Team Pest Services Student Award. Ms. Marla Riekman, currently registered at the University of Manitoba, was selected as the recipient of the Student Achievement Award. The Committee selected Ms. Nancy Dewar, currently registered at the University of Winnipeg, as the recipient of the SWAT Student Award.

The Committee further recommends that the value of the ESM Student Achievement Award be made equivalent to the current value of the SWAT Team Pest Services Student Award.

Deirdre Zebrowski
Désirée Vanderwel
Rob Anderson
Joel Gosselin
Richard Westwood (Chair)

**Appendix L: Report of the Scientific Program Committee**

The 57th Annual meeting of the Entomological Society of Manitoba was held on November 2 and 3, 2001 at the Freshwater Institute in Winnipeg, Manitoba. The theme of the meeting was "Insects on the move". Sixty-one people registered for the meeting. In total there were 27 presentations at the 2001 Entomological Society of Manitoba meetings.

Dr. Dan Quiring, from the University of New Brunswick, gave the keynote address titled "Insect movement in young forest stands" on the morning of November 2. This was followed by the submitted papers session. There were 19 submitted papers for the 2001 meetings. The submitted paper session began at 10:30 a.m. and continued through the afternoon of Friday November 2 and was chaired by Brent Elliott from Manitoba Agriculture and Food in Carman. Because of the high number of submitted papers, 2 were also held on the morning of November 3rd. Ten of the papers were entered in the student paper competition. The judges of the student oral presentation competition were Mr. Sam Migui, graduate student, University of Manitoba, Marj Smith, Agriculture and Agri-Food Canada, and Rheal Lafrenière, from Manitoba Agriculture and Food. Heather White was this year's winner of the student paper competition. There were also three poster presentations in this year's meetings.

On the morning of November 3, a symposium was held on insect movement. Invited speakers and their topics in the symposium were:

- "Movement of pests and beneficials: do we know who is in?" by Dr. Matthias Schöller**,** Biologische Beratung, Berlin, Germany,
- "Temporal and geographical movements of cabbage seedpod weevil, *Ceutorhynchus obstrictus* in canola" by Dr. Lloyd Dosdall,.Department of Agricultural, Food and Nutritional Science, University of Alberta,
- "Insect movement during host-finding: contributions of plant stimuli, internal state, and motor programs" by Dr. Marion Harris, North Dakota State University, and
- "Quarantine practices, and monitoring for potential new insect pests in Canada" by Jon Bell, Canadian Food Inspection Agency. Jon Bell could not make the meetings. In his absence, Jon's presentation was given by Brain Rex of the Canadian Food Inspection Agency in Winnipeg.

The annual banquet was organized by Heather White and Michael Alperyn and took place at the Canad Inns Fort Garry. Cocktails were from 6:00 p.m. until 7:00 p.m. followed by a buffet meal. An awards ceremony was held after the meal. The following awards were presented: the Student Paper Award to Heather White, the ESM Student Achievement Award to Marla Riekman, the SWAT Team Student Award to Nancy Dewar, and the ESM Graduate Scholarship to Heather White. Ian Wise, president of the Entomological Society of Manitoba, presented a special honouring of Sam Loschiavo for receiving the Order of Canada. Entertainment was provided by a local Harpist. An informal mixer was held on the evening of November 3rd at the home of Bob Lamb and Pat MacKay.

The committee wishes to thank all the speakers for their excellent contributions to the meeting. Special thanks are extended to the many students who assisted with the logistics of the meeting from helping out at the registration desk to operating audio-visual equipment and everything in-between.

In addition to myself, John Gavloski, the Scientific Program Committee consisted of the following individuals: Robbin Lindsay, Paul Fields, Brent Elliott, Joel Gosselin (Chair, Fund Raising Committee), Michael Alperyn (Chair, Social Committee), and Heather White (Social Committee). All members made significant contributions to the overall success of the meeting by providing intellectual input (i.e., helping to decide on meeting format, invited speakers, etc.) and invaluable assistance during the many tasks to run these meetings. As in previous years, David Rosenberg coordinated the building arrangements for the meeting, and Joel Gosselin single-handedly solicited funds to allow the meeting to take place. Heather White and Michael Alperyn did an excellent job organizing the banquet. Congratulations are due to these individuals for a job well done.

John Gavloski, Chair,
Scientific Program Committee

**Appendix M: Report of the ESM Membership Committee**

For the 2000-2001 year, 13 new members have joined the ESM with a total membership of 133 members.

T. Mayert

**Appendix N: Report of the Fund-raising Committee**

The Fund-raising Committee received donations of $850.00 for the Annual General Meeting. Volunteers sold pins, t-shirts, hats and toques for an additional net revenue of $327.30 for a total revenue of $1,177.30 .The Committee wishes to thank all who provided additional names we could solicit, volunteers who sold and promoted ESM items and those who provided ideas for projects.

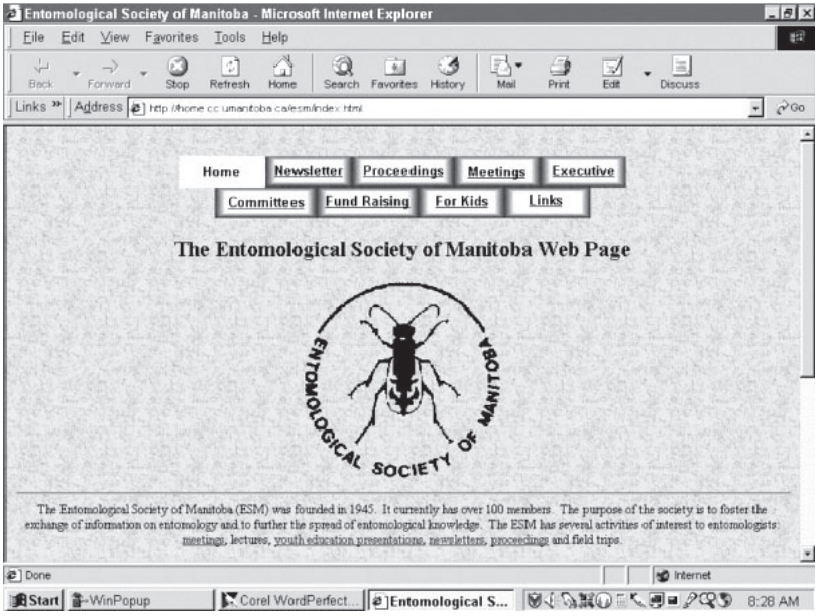
Joel Gosselin ,Chair

**Appendix O: Report of the ESM Internet Site Committee**

The web page of the ESM has been updated to include the meeting information of the ESM-ESC meeting and in the near future the proceedings should also be available.

The address of the web page is http://home.cc.umanitoba.ca/esm/index.html

Paul Fields,
Chair of the Internet Site Committee



**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) interest. The following guidelines should be followed in writing and preparation of manuscripts. Guidelines are adapted from *The Proceedings 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 Entomological Society of Manitoba to submit articles.

**Text.** Articles should be typed, double spaced 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 the Oxford Dictionary. Except in tables, figures, or quotations, dates should be written in the form of 15 July, 2001, 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 2000)", "(Brown 1985, 1990a, b)" or "(Wilson and Brown 1984; Smith 1990)" in chronological order for multiple citations within the 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 measure 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 diskette. The name(s) of the file(s) on the disk, and the name of the software used should be included. All manuscripts are reviewed by at least two reviewers. 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 in alphabetical order of authors at the end of the article. References not directly consulted by the author(s) should be preceded by an asterisk. The full title for each reference must be given, plus 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 recent volumes (e.g. use of italics, use of bold text and capitals for wording, etc.). Tables and figures should also follow the format of those articles appearing in recent volumes. Two copies of each illustration should be submitted. Captions should be numbered consecutively, and must be attached to each illustration.

**Publication.** There are no page charges for publication in the *Proceedings of the Entomological Society of Manitoba*.

# Titles Currently Received by the Entomological Society of Manitoba

Held in the University of Manitoba Library for Science and Technology

Acta Entomologica Musei Nationalis Pragae
Acta Entomologica Serbica
Acta Zoologica Cracoviensia
American Museium Novitates
American Museum of Natural History, Bulletin
Beitrage zur Entomologie
Boletin do Museu Nacional, N.S. Zoologica. Museu Nacional. Rio
Bollettino del Laboratoria Di Entomologica Agraria
Bollettino di Zoologiz Agraria e di Bachicoltura
Bologna, Universita Instituto di Entomologia Bollettino
Cab International Institute of Biological Control, Annual Report
CISTI News
Entomologica Fennica Notulae Entomologicae
Entomological Society of British Columbia, Journal
Entomological Society of Manitoba, Newsletter
Entomological Society of Manitoba, Proceedings
Entomological Society of Ontario, Proceedings
Entomologische Berichten
Ethology, Ecology and Evolution
Foli Biologica
International Milling Flour & Feed
Iowa Academy of Sciences, Journal
Japanese Journal of Genetics
Monografie Fauny Polski, Warsaw
Nutur und Museum
Polska Akademia Nauk. Instytut Zoologiczny, Annales Zoologici
Polska Akademia Nauk. Instytut Zoologiczny, Fragmenta Faunistica
Polskie Pismo Entomologiczne
Redia: Giornale di Zoologia
Smithsonian Contributions to Zoology
Studi Sassaresi, Sezione III Agraria
Swedish Journal of Agricultural Research
Tropical Zoology, Firenze
University of California Publications in Entomology
Wings
Zastita Bilja (Plant Protection)


# Acknowledgements

The editor wishes to acknowledge the efforts of the anonymous reviewers asked to review the research paper appearing in this Volume. Special thanks to Warren Schuetz of The University of Winnipeg Printing Services for the graphic design of this journal.


# 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 and Agri-Food Canada
Cereal Research Station
195 Dafoe Road
Winnipeg, Manitoba,
CANADA. R3T 2M9.

# Acknowledgements

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