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Poanes viator (Edwards) (Lepidoptera: Hesperiidae), a rare skipper found in Whiteshell Provincial Park, Manitoba.

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ABSTRACT

Fifteen specimens of *Poanes viator* (W. H. Edwards, 1865), the broad-winged skipper, were collected in Whiteshell Provincial Park, Manitoba (50.00 N; 95.32 W) near Red Rock Lake in 2003 – 2006. Eight of the broad-winged skippers were female and seven were male. There has been only one other confirmed collection of a female specimen, in 1987, in Manitoba. This is the northern-most distribution of this skipper to date. The broad-winged skipper breeds locally in isolated wet-lands of southeastern Manitoba, flying from late June to early August, but principally in the latter part of July.

INTRODUCTION

Poanes viator (W. H. Edwards, 1865**)**, the broad-winged skipper, is a large, dark brown and orange skipper. It has an inland range from Massachusetts, southern Ontario, Minnesota, and Nebraska, south to Alabama and Texas (Klots 1951). In Canada, it is found throughout southern Ontario, north to Renfrew County, and in southwestern Québec as far as Sorel. Two isolated records are reported outside this range, one from Lake of the Woods, Ontario and one in the Whiteshell Provincial Park, Manitoba. (Layberry *et al*.1998).

Klots (1951) and Brock and Kaufman (2003) identified two populations; an inland freshwater marsh population, which is only found in Canada, and the coastal population, found in salt water marshes from the eastern United States to Texas. In the United States,

this species occurs from south coastal and eastern Texas, through to Florida, mainly close to the gulf, then on the east coast from northern Florida and along the Atlantic coast north to the northeastern coastal states (http://www.nearctica.com/butter/index/htm (May 2006)). The inland population includes Pennsylvania (and Ontario) westward bordering the southern portion of the Great Lakes. In the Midwest, it is recorded in Wisconsin, Michigan, Minnesota, Nebraska North and South and Dakota. The Manitoba population is consistent with descriptions of the inland subspecies. Only the nominate subspecies, Poanes viator viator occurs in Canada (Layberry et al. 1998).

Except for an isolated locality in the Lake of the Woods, Ontario, (Layberry *et al*. 1998), sites in Minnesota and mid-eastern North and South Dakota are the closest indigenous locations in relation to possible breeding sites of *P. viator* in Manitoba. It is usually locally distributed, being found in isolated populations, indicative of strict habitat needs (Klots 1951; McCabe and Post 1978; Pyle 1981).

Layberry *et al.* (1998) remarked that its restriction of habitat to sedge marshes was probably responsible for *P. viator* not being collected in the Ottawa area until 1977, despite intensive collection for over a century. Since then, more than 60 colonies (isolated populations) have been discovered in the Ottawa area alone.

Pyle (1981), and Brock and Kaufman (2003) identified the larval food-plant for the inland populations as hairy sedge (*Carex lacustris* Willd.) and other sedges; the coastal populations feed on common reed (*Phragmites communis* Trin.), wild rice (*Zizania aquatica* Linnaeus) and marsh millet (*Zizaniopsis miliacea* (Michx.) Doell. and Asch.). In Canada, Layberry et al. (1998) reported that P. viator in Ontario is a sedge-area skipper feeding on broad-leafed sedges, C. lacustris and Carex rostrata Stokes.

The dorsal forewing of *P. viator* is brown with orange spots and the hind-wing is orange with a wide brown border. The underwings have similar, but lighter markings appearing less distinctly. There is relatively little, or subtle, sexual dimorphism in the ventral wing-colour patterns (Klassen *et al*. 1989). They also stated that the forewing tips in females are more pointed and the dorsal spots may be more whitish than the male. Identification of sex in the field is also subtle, with the underwing markings paler than above, and "the hindwing traversed from the base to middle of outer margin by a light-coloured longitudinal ray which is not as plain in the female as the male" (Holland 2003). The most distinctive feature of the broad-winged skipper is its comparatively large wingspan at 32 - 44 mm (Klots 1951), while Layberry *et al*. (1998) reported the wingspan in Canada at 27 to 34 mm.

Poanes viator was reported by Klots (1951) to fly mainly in July. Layberry *et al*. (1998) reported it having one generation per year, with adults present from June to mid-August, but commonest in mid-July. McCabe and Post (1978) noted that the flight period for this skipper lasted only a relatively short period of time. Much further south, there may be more than one brood, possibly three in the southern states, with adult flights from April to October (http://www.dallasbutterflies.com/ May, 2006).

Similar species in Manitoba: females of *Poanes hobomok* (Harris, 1862) [Hobomok skipper,] and *Hesperia leonardis* (Harris, 1862) [Leonardis skipper] are the only skippers in Manitoba that remotely resemble *P. viator*. The size of the former, and the distinct spots and dark-brown underwing of the latter readily separate the species. *Poanes*

viator has a deeper brown base to the ventral forewing, which makes the mid-wing orange spots stand out. The dorsal hind-wing of *P. hobomok* has a wider brown border. The ventral surfaces of the hind wings of *P. hobomok* have sharply delineated orange cells with a solid brown border. The ventral side of *P. viator* has deep brown root and base colour on the forewing, and a more diffuse, but similar pattern to the hindwing. The more prominent oblique buff-yellow longitudinal ray on the underside of the male hindwing, as described in field-collected specimen by the editors in Holland (2003), is also discernible on freshly emerged specimens. *Poanes hobomok* also seems to fly a little earlier in the season, in June and *H. leonardis* flies later in Whiteshell Provincial Park, principally in August (Klassen *et al*. 1989; personal records).

McCabe and Post (1977) reported its supposed presence in Manitoba, but until this time only one specimen has been on record for Manitoba, collected by W.H. Christie and J.E. Christie on 28 June, 1987 near Red Rock Lake in Whiteshell Provincial Park (Klassen *et al*. 1989). That specimen is in the collection at Manitoba Museum of Man and Nature (currently, The Manitoba Museum) (Catalogue # DP 78-1; Paris number: 57554, Star# 291406).

MATERIALS AND METHODS

A survey of Lepidoptera, including the Hesperioidea of the Whiteshell Provincial Park area has been ongoing, weather permitting, since 1986. Adult specimens were collected and mounted using standard mounting and drying techniques. Skippers were labeled and identified as *P. viator* when found in our collections. These specimens were measured for wing span and photographed on dorsal and ventral surfaces. Specimens were sexed using a dissecting microscope at 25X, when possible. The distinctive ventral hind-wing ray was also used secondarily to confirm identity of males in the collection.

RESULTS

Fifteen specimens of *P. viator* were collected by the first author during the summer flight periods in 2003 to 2006 in about the same locality. In 2003, five specimens were collected on July 18 (1 male, 2 females) and July 22 (1 male, 1 female). Two specimens of each sex were deposited in the J.B. Wallis Museum of Entomology, University of Manitoba, Winnipeg and the Manitoba Museum. One specimen, (male) was retained for reference in the first author's collection.

Three specimens were collected on 1 August, 2004 (1 female), and 2 August 2004 (1 male; 1 female). It should be noted that the onset of summer foliage was delayed that year (personal records). In 2005, two more specimens were collected on 22 July (2 males). In 2006, two specimens were collected on 3 July (1 male, 1 female). Summer foliage was early by nearly three weeks (personal records). A search further afield in similar habitat was then made and one specimen was collected on 4 July (1 female), but none were seen by the authors in what we considered to be suitable habitat approximately

7 km distant. On 6 July, another specimen was collected at a different site, feeding on thistle near a muskeg- and sedge-filled river (1 female), with other specimens noted in the vicinity. Photographs of up to a dozen specimens feeding on thistle flowers were taken in the original site that date. On 15 July, 2006, one specimen (1 female) in worn condition was collected at the original site.

A mean wingspan of all sixteen Manitoba specimens collected was 34.4 mm (range 28.8 to 38.0 mm). The smallest specimen, a male, was collected on 2 August, 2004. The largest female specimen was 38.0 mm, collected on 4 July, 2006. There were nine female and seven male specimens collected.

Vegetation found in the collecting area included the following plants: trees - alder, birch, dwarf birch, jack pine and tamarack; shrubs - heather sp., bog laurel, bog rosemary; understory - fern sp., broad leaf sedges, Canada thistle and *Carex* spp.

DISCUSSION

Whiteshell Provincial Park is quite far north of the reported range for *P. viator*, at 50.00 N; 095.32 W. The Park is situated in the Canadian Shield and does have numerous areas of acid bogs and sedge marsh, which seem to be preferred habitats for the caterpillar.

The larvae of *P. viator* are apparently undescribed, (Layberry *et al*. 1998). These fresh-water marshes are found throughout Whiteshell Provincial Park as water entrapment ponds by beaver-dam action and in the small creeks and are certainly prime sites to search for additional populations and for the larvae. These wet-land sites are not the usual collection areas for butterflies and skippers, but have been productive for observing feeding adult skippers when flowering plants were found nearby.

Poanes viator was observed flying with other commonly found skippers (male and female least skippers, *Ancyloxypha numitor* (Fabricius, 1793) in 2004 and 2005, and a dun skipper, *Euphyes ruricola* (Boisduval, 1852) in 2004. Other broad-winged skippers were observed feeding on common thistles and purple vetch near a sedge-filled beaver-dam swamp. Harvesters (*Feniseca tarquinius* (Fabricius, 1793)) were also collected in the same area, with the second brood flying at about the same time-period as *P. viator*. Their larvae were possibly feeding on wooly aphids found in the nearby alder thicket.

The occurrence of skippers in Whiteshell Provincial Park, as in much of the rest of Canada, is not well recorded. Ross (1873) included only one page on the family Hesperiidae and mentioned skippers briefly in the description of butterflies and moths of Canada. In Manitoba, early lists of butterflies are by Wallis (1921) and Brodie (1929). Brooks (1942) published a revised checklist of butterflies in Manitoba, based upon the earlier lists, but identified Seven Sisters Falls (to the northwest), the Sandilands Provincial Park (to the west) and McMunn (to the southwest) as the closest collecting localities. The revised checklist includes only 27 skippers in all of Manitoba, with records from Victoria Beach or Fort Alexander, northwest of Whiteshell Provincial Park.

Masters (1972) published a checklist of butterflies of Whiteshell Provincial Park and the

Northwest Angle Forest Reserve, but does not include in that list, the numerous skipper specimens reported to be found there. Bird (1956) published a list of Rhopalocera from Whiteshell Forest Reserve taken over the previous two summers, all specimens coming from within ten miles (16 km) of Red Rock Lake. Bird was working at the Federal Forestry Research Station, Larch Sawfly Programme, which had its headquarters on Red Rock Lake. He noted that this locale is an interface for eastern and western, as well as many northern and southern faunal components. This is the identical collecting area in this report. *Poanes viator* was not included in his list of seven skippers. A comprehensive list and the range of butterflies and skippers of Manitoba by Klassen (1984) and Klassen *et al*. (1989) does include a number of those 19 species of skippers collected in the Whiteshell. A more detailed description of early lepidopterists in Manitoba can also be found in their text.

Hooper (1973), when describing the butterflies of Saskatchewan, included a hypothetical list of species for the province and postulated that *P. viator* may at some time be found in the south-eastern Saskatchewan bogs adjacent to North Dakota.

The authors identified three additional populations of *P. viator* within 5 km of Red Rock Lake in 2006. Further collection in mid-July should be made in similar habitat from the Northeast Angle to other areas in Whiteshell Provincial Park, and in wetlands with suitable host plants elsewhere in the Province to establish the northern and westernmost limits of this species. Throughout most of its range elsewhere, the broad-winged skipper cannot be considered endangered. It may be considered secure globally, though in some parts of its range it is considered rare. Its occurrence in Manitoba may be considered on the periphery of its range. Therefore, further collection and study for the distribution of *P. viator* in sedge marsh habitat in Manitoba could help decide if population management is required.

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Rearing Lacewings, *Chrysoperla carnea* and *Chrysopa oculata* (Neuroptera: Chrysopidae), on prepupae of Alfalfa Leafcutting Bee, *Megachile rotundata* (Hymenoptera: Megachilidae)

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ABSTRACT

Lacewings are an important group of insect biological control agents. Protocols for rearing lacewings often require rearing of an additional insect species to be used as a diet, and this can be costly. Prepupae of alfalfa leafcutting bee, *Megachile rotundata* (F.), which are commercially available, inexpensive and can be stored, were evaluated as a larval diet of the lacewings, *Chrysoperla carnea* (Stephens) and *Chrysopa oculata* Say. Leafcutting bee prepupae were suitable for rearing lacewings: 90% of *Chrysoperla carnea* eggs hatched and the larvae grew to reach adulthood. For *Chrysopa oculata* eggs, survival to adulthood was 66%, but this increased to 91% when pupating larvae had access to empty cocoons of leafcutting bee prepupae. The diet allowed us to establish colonies of the lacewings in the laboratory.

INTRODUCTION

The green lacewings (Neuroptera: Chrysopidae) are an important group of insect predators (Dean and Satasook 1983). Natural populations of chrysopids can be augmented by inoculative or inundative releases (Ridgway and Jones 1969, Nordlund *et al*. 2001). While small numbers are often useful for laboratory studies and inoculative releases, large numbers of cultured chrysopids are required for inundative releases (Nordlund

et al. 2001). Protocols for culturing of chrysopids using natural, subnatural-artificial and artificial diets are available (Finney, 1948; 1950; Ridgway *et al*. 1970; Morrison *et al*. 1975; Morrison 1985; Nordlund *et al*. 2001; Yazlovetsky 2001).

Suitable larval diets include eggs of the lepidopterans, *Phthorimaea operculella* (Zeller) (Finney 1948, 1950) and *Sitotroga cerealella* (Olivier) (Ridgway *et al*. 1970, Morrison *et al*. 1975, Morrison 1977, 1985) (Gelechiidae), and *Anagasta kuehniella* (Zeller) (Pyralidae) (Zheng *et al*. 1993a, 1993b), larvae of *P. operculella* (Finney 1948, 1950) and honey bees (Ferran *et al*. 1981, cited in Yazlovetsky 2001; Matsuka and Niijima 1985), aphids (Tauber and Tauber 1974) and artificial diets (Hagen and Tassan 1965, 1966, Vanderzant 1969). Finney (1948; 1950) reared *Chrysoperla* larvae on paper sheets covered with *P. operculella* (Zeller) eggs and honey. Ridgway *et al*. (1970) used *S. cerealella* eggs to feed larvae in Hexcel® (Hexcel Products Inc., Dublin CA), which has honey-comb like chambers that separate individual larva, whereas, Morrison *et al*. (1975) dispensed the eggs in sheets of ornamental Masonite® separated by organdy cloth. Masonite consisted of 0.64 cm^2 cells removed from solid material in a regular pattern leaving a 0.32 cm^2 border between cells. When Masonite was discontinued, Morrison (1977) suggested Verticel® (Hexacomb, University Park IL), which contains triangular cells. Several other materials including plastic light diffusing grids and shredded paper have also been suggested.

Finney (1948) processed *P. operculella* larvae with sodium hypochloride, hot water and paraffin, and fed them to the chrysopid larvae being reared. Ferran *et al*. (1981, cited in Yazlovetsky 2001) used a mixture of larval worker honey bee powder and honey, whereas Matsuka and Niijima (1985) used larval honey bee drone powder and water. However, due to its hygroscopic nature, diet made from larval honey bee powder turns into a syrup, and develops mould rapidly. Similarly, several other natural insect materials including powdered *S. cerealella* moths, aphids, and crickets have been used, though these diets failed to give any advantage (Yazlovetsky 2001).

To reduce costs, searches for artificial larval diets have been made. Hagen and Tassan (1965, 1966, 1970), and Vanderzant (1969) developed liquid diets made primarily from enzymatic hydrolysate of yeast and casein, sugar, vitamins and water, but they were not satisfactory: an artificial diet for *Chrysoperla carnea* (Stephens) which contained wax-coated yeast hydrolysate droplets required costly preparation and also resulted in high mortality (Hagen and Tassan 1965; Vanderzant 1969). However, Vanderzant (1969) had better success by adding vitamins and minerals. Today, several diets improved from Vanderzant's are available, though not all larvae reared on them reach adulthood (Yazlovetsky 2001). Cohen and Smith (1998) developed a semi-solid larval diet containing protein, lipid, carbohydrate, cholesterol, and water. This diet resembles the inside of insect prey in both texture and composition. Combinations of honey, chicken eggs, dried cow's milk, beef liver, bacto-agar, pig fat and butter have improved performance of artificial diets further (Yazlovetsky 2001). Although, progress has been made with artificial larval diets, chemically defined diets are often more expensive, and to make them more economical, further improvements are required (Nordlund *et al*. 2001).

Most protocols are suitable for culturing chrysopid larvae on a large scale operation. These protocols can often be inconvenient for small-scale operations. Natural diets require rearing of one insect, which is usually complex and expensive, to feed another

(Finney 1950; Morrison 1985). Artificial diets are even less satisfactory. For example, an artificial diet of wax-coated yeast hydrolysate requires costly preparation, it may cause high mortality of lacewings (Hagen and Tassan 1965, Vanderzant 1969), its required ingredients may be expensive (Nordlund *et al*. 2001) and are often difficult to obtain locally. Hence, it is desirable to have alternative protocols that do not require additional rearing of insects and that rely on materials available locally.

We describe here rearing techniques and bionomics of *Chrysoperla carnea* and *Chrysopa oculata* Say fed as larvae on prepupae of the alfalfa leafcutting bee, *Megachile rotundata* (F.) (Hymenoptera: Megachilidae).

MATERIALS AND METHODS

Specimen collection

Using a sweep net, five to eight adult females of *C. carnea* and *C. oculata* were collected from alfalfa fields in Manitoba in early August of 2001. Each female was placed individually in a 118 ml screw-cap specimen container with a small piece of alfalfa shoot and transferred to the laboratory in a picnic cooler. In the laboratory, females were held in the specimen containers overnight at 20 ±2°C and 12:12 (L:D) h. The next day, eggs laid in the containers were carefully harvested using forceps and breaking the stalk beneath the egg and transferring it to containers with leafcutting bee prepupae. A colony of each species was established from these eggs using alfalfa leafcutting bee prepupae, and yeast plus sucrose paste as larval and adult diets, respectively. Eggs obtained from these colonies were used in the present study.

Diets

Alfalfa leafcutting bee prepupae were used as the larval diet. The prepupal cocoons, which were in the second year of storage at 5°C, were transferred into a 15–18° C room one or two days before use. Cocoons were cut open at one end with a scalpel and the prepupae were pulled out of cocoons with forceps. Care was taken to avoid injury to prepupae.

Adult lacewings were fed on a paste of yeast flakes (52% protein) and sucrose prepared following Morrison (1985). The food was prepared once a week and was kept frozen until use.

Rearing methods

F2 and F3 generation eggs were collected from each colony. Sixty to 78 eggs of each species were placed in conspecific batches of 8–10 eggs per larval rearing unit made of a 60 x 15 mm covered Petri dish. Two leafcutting bee prepupae were added to each unit which was labeled and placed at 25 ± 2°C, 18:6 (L:D) h and 70 ± 5% relative humidity, the conditions at which all rearing took place. Eggs were checked daily for hatching.

On the day of hatching, newly emerged lacewing larvae were transferred to fresh units, in batches of 5–10 larvae per unit. Two or three alfalfa leafcutting bee prepupae were provided in each unit. Fresh food was provided every second day during the first six days. Little cannibalism occurred during this period, while the larvae were small in comparison to the size of the food items. After six days, the number of lacewing larvae was reduced to one per unit to avoid cannibalism, and from then until pupation fresh food was provided every day. The lacewing pupae were left undisturbed.

Newly emerged adult males and females, were transferred in conspecific batches of 8–10 into a pre-oviposition unit made of a transparent 1 liter plastic container 14 cm high, 11 and 8.5 cm diameter at the top and bottom, respectively. The lid of the container had a 1 mm hole drilled near the edge for aeration. A small piece of distilled-water-saturated cotton wad in a 35 x 10 mm Petri dish was placed on the floor of the container. Food was presented by placing 2–3 drops of the yeast and sucrose paste on a 10.5 x 4 cm strip of brown cardboard, which was placed on the upper rim of the container so that the food faced down. The food and cardboard were changed every day and every third day, respectively, to avoid mold development. On the day eggs were first seen, females were separated and individual females were placed in oviposition units, which were similar to pre-oviposition units. Eggs laid inside oviposition units were collected and reared for colony development.

Performance of culture

The time needed for egg hatching, the number of eggs hatched, the number of larvae and pupae, the duration of larval and pupal periods, the number and sex of emerged adults and the pre-oviposition period were recorded. To develop a fecundity schedule, 15 females of *C. carnea* and 10 of *C. oculata* were followed for 30 days from initial oviposition in oviposition units.

We also examined whether the provision of empty leafcutting bee cocoons for pupating *C. oculata* larvae improved survival. Two treatments, no cocoon (control) and with cocoon, were compared. In the latter treatment, an empty leafcutting bee cocoon was provided in each larval rearing unit on the ninth or 10th day after hatch. All other operations remained as described above. Chi-square tests were used to conduct the statistical analysis (Sokal and Rohlf 1995).

RESULTS AND DISCUSSION

Alfalfa leafcutting bee prepupae permitted rearing of *C. carnea* and *C. oculata* larvae (Table 1). About 2–3% of eggs failed to hatch because they were eaten or damaged by the larvae that hatched earlier. The total time required from oviposition to adult emergence of *C. carnea* averaged 24.7 (23–29) d. The type and amount of food fed to their larvae is one of the factors influencing the growth and development of *C. carnea* (Zheng *et al*. 1993b, Obrycki *et al*. 1989). The time required from oviposition to adult emergence in the present study is similar to previous reports of developmental duration

(Hagen and Tassan 1965, Zheng *et al*. 1993a). The leafcutting bee prepupae allowed 90% of *C. carnea* eggs to hatch and the larvae to grow to adulthood, and this rate is higher than those obtained on natural or artificial diets in previous studies (Hagen and Tassan 1965, Ridgway *et al*. 1970, Morrison *et al*. 1975, Obrycki *et al*. 1989). Zheng *et al*. (1993*a*) obtained 75–100% and 65–73% survival from egg to adult on high and intermediate amounts of larval food, respectively. In this study about 52% of emerged adults were females. Zheng *et al*. (1993*a*) obtained a similar sex ratio on low to intermediate food quantities, and 67% females on a high amount of larval diet.

The total time required from oviposition to adult emergence of *C. oculata* averaged 34.7 (31–38) d, which is comparable to the time required on natural diets (Obrycki *et al*. 1989). Twelve per cent of larvae failed to pupate, and 66% of eggs survived to adulthood. Provision of empty leafcutting bee cocoons significantly increased the survival through the pupal stage ($\chi^2 = 4.02$; df = 1; $P < 0.05$), probably by providing a better site for anchoring cocoon-webs (Table 2). Egg to adult survival increased to 91% in the presence of leafcutting bee cocoons for pupation. Sixty five percent of emerged adults in this study were females. Obrycki *et al*. (1989) reared up to 81% of larvae to adults on various natural diets, and less than 57% of those adults were females.

The lacewing species differed in pupation sites. *Chrysoperla carnea* pupated at both the floor-sidewall and lid-sidewall junctions. Cues leading to this site selection are unclear as little is known about pupation of *C. carnea* (Canard and Volkovich 2001). *Chrysopa oculata* usually pupated on the floor-sidewall junctions perhaps because this species pupates in the ground (Burke and Martin 1956).

Four individuals of each species had problems in mating or oviposition and were dropped from the fecundity analysis to avoid bias (Hagen and Tassan 1970). The fecundity schedule of the lacewing species differed (Fig. 1). Females of *C. carnea* laid on an average a total of 679 eggs in 30 d, and oviposition was high until 16 d then declined gradually. Females of *C. oculata* oviposited more or less uniformly and females laid an average of 424 eggs during the period (Fig. 1). Longevity of adult lacewings depends on climatic conditions and resources (Canard and Volkovich 2001). McEwen and Kidd (1995) found *C. carnea* females fed sugar solution survived about 33 d, but the oviposition was non-existent. Unfortunately they did not indicate how long the females would survive and oviposit, but it is clearly indicated that they could potentially survive for over 34 days.

The intrinsic rate of natural increase (r_m) of *C. carnea*, calculated following Southwood (1978), in this study was 0.646 per wk. From Zheng *et al*. (1993*a*) we calculated r_m = 0.665 per wk in 1984, and r_m = 0.781 per wk in their 1986 trial. The higher value in the 1986 trial was thought to be due to the higher survival of fresh field-collected eggs used that year and the higher fecundity of the first generation adults (Zheng *et al*. 1993*a*). In this study, the r_m of *C. oculata* was 0.463 per wk and 0.505 per wk in the absence and presence of leafcutting bee cocoons, respectively. Population increase is influenced by insect fecundity, which depends on the protein concentration of adult diets (Morrison 1985). The protein concentration in adult diet (< 52%) used in this study was less than the recommended level of 65% (Morrison 1985), which may have reduced the r_m value.

We found that *C. carnea* is more fecund and develops faster than *C. oculata*, and as a

result the rate of increase is higher for *C. carnea*. Therefore, populations of *C. carnea* are expected to be greater than those of *C. oculata* in field crops. This is indeed the case in alfalfa fields of Manitoba. Chrysopid populations were studied in alfalfa fields of Manitoba, where it was found that *C. carnea* predominated over *C. oculata* (Uddin 2005).

Diets in this study allowed satisfactory rearing of lacewings. Alfalfa leafcutting bee prepupae can be used as a larval diet for *C. carnea* and *C. oculata*. The bee prepupae are commercially available, cheap (the food required for rearing a larva cost less than 1.3 and 1.95 Canadian cents for *C. carnea* and *C. oculata*, respectively) and can be kept alive for at least a year at 5°C. The method described allows small-scale production and maintenance of lacewing colonies at reasonable cost. The possibility of rearing multiple larvae per unit with the same amount of the diet needs to be studied, as it could reduce per capita diet requirement and costs.

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Table 1. Development of two lacewing species reared at 25°C and fed alfalfa leafcutting bee prepupae as a larval diet.

Species	*Chrysoperla carnea*	*Chrysopa oculata*
Duration (d) (Mean ± SE)		
Egg	4	5.4
Larva	10.9 ± 0.1	13.2 ± 0.1
Pupa	9.8 ± 0.1	16.5 ± 0.2
Survival (%)		
Egg	98 (60)*	97 (78)
Larva	100 (50)	88 (50)
Pupa	92 (50)	77 (44)
Overall	90	66

*Values in parentheses refer to the number of individuals at the beginning of the stage.

Table 2. Influence of empty cocoons of alfalfa leafcutting bees on developmental success of C. oculata.

Treatments	Per cent survival (Mean ± SE)		
	Larvae to pupa	Pupa to adult	Overall
Control (65)*	88 ± 4	77 ± 6	68 ± 6
Empty leafcutting bee cocoons (15)**	100 ± 0	93 ± 7	93 ± 7

*Values in parentheses refer to the number of individuals at the beginning.
**Empty leafcutting bee cocoons provided on the 9th or 10th day after hatching.

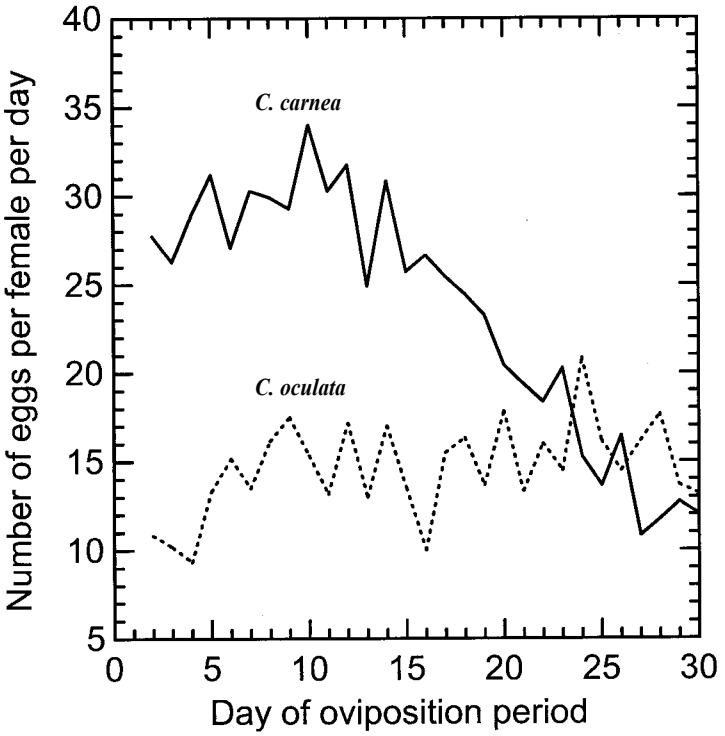

Fig. 1. Mean fecundity of *C. carnea* and *C. oculata* females in the laboratory in the observed 30 days of the oviposition period (results are based on 15 *C. carnea* and 10 *C. oculata* females).

Scientific Programme Abstracts for the 2005 Annual Meeting of the Entomological Society of Manitoba 61st Annual Meeting 21-22 October, 2005, Winnipeg, Manitoba

Abstracts

Keynote Address

IT'S GUT CHECK TIME: VARIOUS MOLECULAR ASSAYS FOR EXAMINING PREDATOR GUT CONTENTS. James R. Hagler, USDA-ARS, Western Cotton Research Laboratory, 4135 E. Broadway Rd, Phoenix, AZ, USA.

Immunoassays (ELISA) for the detection of pest-specific proteins and PCR assays for the detection of pest-specific DNA are state-of-the-art predator stomach content assays. Unfortunately, these gut content assays are not quantifiable and do not lend themselves to studies of entire arthropod assemblages (e.g, an arthropod-specific MAb or DNA probe must be developed for every arthropod in the assemblage). Consequently, there is a dearth of information on the quantitative impact that generalist predators have on suppressing pest populations. These challenges were the impetus for me to develop a technique to study the predator activity of an entire arthropod community. I conducted studies to determine if protein markers could be substituted for pest-specific ELISA and PCR assays for the immunological detection of prey in predator guts. Protein markers used in concert with protein-specific ELISAs offer a simple, precise, rapid, economical, and sensitive method for studying the feeding activity of an entire predator assemblage without the burden of developing a pest-specific MAb or DNA probe for each insect. I will discuss the pros and cons of all of the currently used molecular gut content assays and I will demonstrate how the prey marking can be used to quantify the predatory activity of an entire arthropod assemblage.

SUBMITTED PAPERS

FORMIC ACID FUMIGATION OF HONEY BEE, *APIS MELLIFERA* L, SHIPPING PACKAGES TO CONTROL *VARROA DESTRUCTOR* ANDERSON AND TRUEMAN. R.W. Currie, Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2.

Honey bees are often shipped in cardboard tubes or screened boxes tcontaining 6,000 to 12,000 workers enclosed with a single caged queen. Beekeepers are concerned about the risk of importing unwanted acaricide-resistant mites while importing shipping packages.

The objectives of this study were to determine if short-term high-concentration formic acid fumigation could be used to control varroa in packaged bees. Screened packages containing 1.4 kg of honey bees and a caged queen were placed in a fumigation chamber held at 21°C and exposed to high concentration fumigation with formic acid for periods of 4, 8 and 12 h. Formic acid concentration was monitored throughout the treatment and worker, queen and mite mortality was assessed at the end of the experiment.

IMPACT OF BEE VISISTATION ON NUT SET IN COCONUT (*COCUS NUCIFERA* L.) IN INDIA. S. Desai[1] and M. Muthuraman[2], [1] Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2 and [2] Tamil Nadu Agricultural University, Coimbatore, India.

Pollination experiments were conducted to find out the benefits received by coconut palm from honey bees through cross pollination in south India. Nut set in open pollination (wind and insect) in tall varieties was 30% whereas with wind pollination alone it was only 17%. Hence the difference in nut set of 13% could be attributed to pollination due to insects. Since honey bees were the dominant insect visitors during the study, we can infer that honeybees are playing a vital role in enhancing nut set in coconut by 13%. In hybrid coconut, the impact of bee visitation in nut set was only 6%. The study has clearly revealed the importance of keeping bee colonies for improving the nut productivity of tall coconut palm.

EXAMINING THE RELATIONSHIP BETWEEN BROOD REARING IN HONEY BEES AND POPULATIONS OF VARROA MITES IN WINTER. P. Kozak and R.W. Currie, Department of Entomology, University of Manitoba, Winnipeg MB R3T 2N2.

The parasitic varroa mite is a major problem for beekeepers in Canada. The closed environment of overwintering facilities used by bee keepers provides an opportunity to treat honey bee colonies to control levels of varroa mites. The goal of this research is to examine the relationship between brood rearing by honey bees and increases in the populations of varroa mites in winter and to examine the effect of winter brood rearing on the efficacy of formic acid treatments. Colonies of honey bees were fumigated with low levels of formic acid to control varroa mites in an indoor wintering facility. Half of the colonies were randomly selected to have frames of brood removed to limit the amount of honey bee reproduction and mite reproduction. Bottom board samples were collected on a daily basis to determine the mite and bee mortality in each treatment group. The differences in bee and mite mortality between the fumigation treatment, brood removal treatment and the control will be discussed.

THE RESPONSE OF BUCKWHEAT PLANTS TO LYGUS BUG INJURY. A. Mostafa and N.J. Holliday. Department of Entomology, University of Manitoba, Winnipeg MB R3T 2N2.

Our research found that small numbers of adult *Lygus lineolaris* appear on buckwheat crop in late July and if there is no insecticide control at this time a generation of nymphs

develops in August. An insecticide application in late July or early August resulted in gaining yield ranging from 12-78% in five different trials over three years. Buckwheat plants were much more damaged by lygus bug nymphs than by adults and flowering stage was the most vulnerable stage of buckwheat plant. Lygus bug nymphs attacking plants during the flowering stage resulted in significant decrease of seed weight, flower and seed numbers; and increase of percentages of dry flowers and shriveled seeds. Vulnerability of plants to lygus bugs decreases with increasing maturity of seeds.

EXPLORATION OF THE BEE BOWL METHOD FOR CHARACTERIZING THE BEE FAUNA (HYMENOPTERA: APOIDEA) IN A MANITOBAN MIXED-GRASS PRAIRIE PRESERVE. A.M. Patenaude and R.E. Roughley. Department of Entomology, University of Manitoba, Winnipeg MB R3T 2N2.

A continent-scale initiative to investigate patterns of bee diversity is being promoted to survey and monitor bee fauna in representative communities. The initiative promotes a modified version of pan-trapping, or bee bowls, as a primary method for sampling bee populations. The utility of bee bowls as an effective technique for determining species richness and abundance within a given community is affected by bowl characteristics and features of their placement in the field. Investigations into the effects of bowl colour and inter-bowl distance on bee captures were performed in conjunction with a project to characterize bee diversity and community structure on the Yellowquill Mixed-Grass Prairie in southwestern Manitoba. Preliminary results will be presented and discussed in terms of potential implications for a sampling program in mixed-grass prairie habitat.

DETERMINING THE EFFECTS OF ROTATIONAL CATTLE GRAZING ON THE SPIDERS AND CARABID BEETLES OF MIXED GRASS PRAIRIE. A. Stjernberg and R.E. Roughley, Department of Entomology, University of Manitoba, Winnipeg MB R3T 2N2.

The Yellow Quill Mixed Grass Prairie Preserve, owned by the Nature Conservancy of Canada and located 20 km south of Brandon, Manitoba, has been subjected to a twice-over rotational grazing system for the last 20 years. The effects of this type of disturbance on the invertebrates of the mixed grass prairie were examined using pitfall traps and sweep-netting to collect spiders and carabid beetles as representative bioindicators. A secondary experiment attempts to ascertain the impact that the season in which the grazing occurs (spring, fall, spring & fall) has on bioindicator species' diversity and abundance.

POTENTIAL REINTRODUCTION OF THE DAKOTA SKIPPER, *HESPERIA DAKOTAE* INTO SOUTHERN MANITOBA. C-Jae Morden and A.R. Westwood, Department of Biology, University of Winnipeg, 515 Portage Avenue, Winnipeg, Manitoba R3B 2E9.

The Dakota skipper, *Hesperia dacotae* is a rare butterfly, now confined to isolated areas of mixed and tall-grass prairie in Manitoba, Saskatchewan and several northern US states. Due to conversion of prairie into agricultural land, the population of this butterfly

has declined dramatically and the species is currently classified as threatened. Vegetation surveys were completed to assess the floral composition at the Tall-Grass Prairie Preserve near Tolstoi, Manitoba, where the skipper was previously recorded but has been absent since the mid 1980s, and in the southern Interlake, where a small population still exists. The study examined the link between the abundance of larval food plants and adult host plants, the presence of the Dakota skipper and the feasibility of re-introducing the Dakota skipper into the Tall-Grass Prairie Reserve.

AN EVALUATION OF THE SKINNY DIPPER METHOD OF SAMPLING MOSQUITO LARVAE AND PUPAE IN CATCH BASINS. A.L. Thomson[1], T.D. Galloway[1] and A.R. Westwood[2], [1] Department of Entomology, University of Manitoba, Winnipeg MB R3T 2N2 and [2] Department of Biology, University of Winnipeg, 515 Portage Avenue, Winnipeg, Manitoba R3B 2E9.

Catch basins are a component of any urban drainage system. The design of catch basins may cause them to retain up to 60 cm of standing water during the summer period. Catch basins have been shown to provide larval habitats for mosquitoes, specifically *Culex restuans* and *Cx. pipiens*. A simulated catch basin was constructed to evaluate the effectiveness of an aquatic dip net method to capture mosquitoes called the Skinny Dipper dip net. A total of 250, 500, 750, and 1000 larvae and pupae were added to the catch basin. For each number of larvae and pupae, water depths of 10, 20, 30, 40 and 47 cm were used. At each depth and number the basin was sampled with replacement with the Skinny Dipper dip net. Larvae and pupae caught by the dip net were counted and recorded. The experiment was replicated twice, once using a laboratory colony of *Aedes aegypti* and once using larvae and pupae from field-collected egg rafts of *Culex restuans*. For both species there was a positive significant relationship between the number of larvae and pupae collected with the Skinny Dipper and the number of individuals (density) within the basin. There was no significant relationship between number of larvae and pupae caught and water depth.

MANIPULATION OF *ALEOCHARA* SPP., NATURAL ENEMIES OF *DELIA RADICUM* (L.), WITH MUSTARD SEED MEAL. K. Riley[1,2], U. Kuhlmann[1], J. Whistlecraft[3] and N.J. Holliday[2], [1]CABI Bioscience Switzerland, Delémont, 1 Rue des Grillons, 2800 Delémont, Switzerland, [2]Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2, and [3]Agriculture and Agri-Food Canada, 1391 Sandford Street, London, ON N5V 4T3.

Studies on *Brassica* crops in Sweden demonstrated that the addition of white mustard seed meal as a mulch can attract *Aleochara* spp. (Coleoptera: Staphylinidae) to suppress *Delia radicum* (L) (Diptera: Anthomyiidae) populations. *Aleochara bilineata* (Gyll.) and *A. bipustulata* (L.) first instar larvae are important pupal ectoparasitoids of *D. radicum* in many *Brassica* crops in Europe. In North America, however, *A. bipustulata* does not occur, and therefore is a potential candidate as a biological control agent against *D. radicum* in Canadian canola.

We examined whether attraction of *Aleochara* species to mustard seed meal would occur in canola and which species are attracted. *Delia radicum* and *Aleochara* popula-

tions were compared between mustard seed meal treated and untreated field plots. In addition, Y-tube olfactometer tests were conducted to examine the attractiveness of mustard meal to *A. bipustulata* and *A. bilineata*.

SPRING EMERGENCE OF CANADIAN *DELIA RADICUM* (L.) (DIPTERA: ANTHOMYIIDAE) AND ITS NATURAL ENEMIES: AN ASSESSMENT FOR CLASSICAL BIOLOGICAL CONTROL. L. Andreassen[1,2], U. Kuhlmann[1], J. Whistlecraft[3], and N.J. Holliday[2], [1]CABI Bioscience Switzerland, Delémont, 1 Rue des Grillons, 2800 Delémont, Switzerland, [2]Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2, and [3]Agriculture and Agri-Food Canada, 1391 Sandford Street, London, ON N5V 4T3.

To evaluate the prospects for successfully introducing the natural enemy *Aleochara bipustulata* for biological control of *Delia radicum*, we assessed the thermal requirements for spring emergence of three different Canadian *D. radicum* populations, *A. bipustulata* from Sweden, and *Aleochara bilineata* from Winnipeg. Puparia in diapause were subjected to a 16 week cold treatment, after which all populations were divided into five constant temperature treatments. Insects were checked daily for emergence, and the emergence data were used to determine thermal accumulation requirements for each population. The median requirement for *D. radicum* from London was about 200 DDC (above 4°C) less than for *D. radicum* from Saskatoon and Winnipeg, and *A. bilineata*. No *A. bipustulata* emerged.

THE POTENTIAL FOR WHEAT MIDGE TO ADAPT TO RESISTANT WHEAT: WILL IT MATTER WHERE THE RESISTANT WHEAT FIELDS ARE? M.A.H. Smith and R.J. Lamb, Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road Winnipeg, MB R3T 2M9.

Spring wheat carrying a gene conferring antibiosis resistance against wheat midge could soon be available commercially. A few larvae survive in experimental plots of resistant wheat suggesting the possibility that a mutation for virulence, allowing them to adapt to the resistance, may be present in the population. We developed a computer simulation model to explore the relative importance of several factors that could affect the rate of virulence evolution. The model predicts that the rate at which virulence increases and spreads in the population will be highly sensitive to the proximity of resistant wheat fields to each other in a wheat-growing region with a mix of susceptible and resistant wheat fields.

PERSISTENCE OF COLONIES OF A NATIVE APHID: THE CONSEQUENCE OF PREDATION AND DISPERSAL. R.J. Lamb[1] and P.A. MacKay[2], [1] Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road Winnipeg, MB R3T 2M9 and [2]Department of Entomology, University of Manitoba, Winnipeg MB R3T 2N2.

Colonies of the aphid *Uroleucon rudbeckiae* are rare on their host plant *Rudbeckia laciniata* in spring. Prevalence of colonies increases through summer, as production

of and dispersal by winged aphids occurs. However, most colonies are short-lived, surviving less time than is required to produce a new generation of adults. Predators and parasitoids quickly find and consume colonies. Many colonies are founded by two or more winged immigrants, in spite of the availability of large numbers of un-infested plants. We hypothesize that migrants have a mechanism to aggregate, so that some colonies increase in size rapidly enough to outstrip predation and survive through the next generation.

CHRONOSEQUENCE STUDIES AS PREDICTORS OF SUCCESSIONAL CHANGE: A TEST USING CARABID BEETLE ASSEMBLAGES IN MANAGED AND NATURAL JACK PINE FORESTS IN SOUTHEASTERN MANITOBA. K. Ryan[1], A.R. Westwood[2] and N.J. Holliday[1], [1]Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2 and [2]Department of Biology, University of Winnipeg, 515 Portage Avenue, Winnipeg, MB R3B 2E9.

From 1991–4, the influence of succession and regeneration type on carabid beetle assemblages was studied in naturally regenerating and planted jack pine forests. In this follow-up study in 2003–4, we examined the carabid beetle assemblages in the same sites and the changes over the intervening period. We evaluated how well temporal changes were predicted by the previous age-class-based experimental design. Carabid assemblages followed clear trends associated with forest age; certain patterns differed between managed and natural forests. These successional patterns were well predicted by the previous study.

INSECTS ON FIELD AND FORAGE CROPS IN MANITOBA IN 2005 – AN EXTENSION UPDATE. J. Gavloski, Crops Branch, Manitoba Agriculture, Food and Rural Initiatives. Box 1149, Carman, MB R0G 0J0.

Many of the insects causing the most injury to crops in Manitoba in 2005 do not overwinter well or at all in Manitoba, and the majority of their population is blown in on winds from the south. Diamondback moths (*Plutella xylostella*) were noticed on traps as early as April 18th, and were a concern on canola early in the season. Populations declined as the season progressed, however, and most of the control that was needed occurred early in the season. Armyworms (*Pseudaletia unipuncta*) caused significant defoliation to some cereal fields in the Central, Eastern and Interlake areas of the province. Larvae of the painted lady butterfly (*Vanessa cardui*) caused noticeable defoliation to Canada thistle in many areas of the province, but populations were also high and insecticides applied to control them in sunflowers, borage, and canola. Cutworms were a problem in some cereal and canola fields early in the season. Bertha armyworm, *Mamestra configurata*, was a problem on canola in the Northwest region of Manitoba in August, resulting in significant insecticide application.

POSTER PAPERS

IMPLICATIONS OF THE RAG1 SOYBEAN APHID RESISTANCE GENE ON BIOCONTROL. D.S. Crompton and P.J. Ode, Department of Entomology North Dakota State University, Fargo, ND 58105 USA.

A colony of *Aphelinus albipodus* was obtained from a colony at the University of Minnesota. Resistant and susceptible soybean lines were planted in greenhouse and aphids allowed to colonize each plant at the V-3 growth stage. Adult aphids (fourth instar) were parasitized with *A. albipodus* under observation and allowed to mummify. Mummies were then carefully collected, placed in glass vials, and parasitoids allowed to emerge. We attempted to differentiate any tri-trophic effects by characterizing body measurements, tibial length and head capsule width, along with the emergence percentage of parasitoids on each individual soybean line. We found no significant differences in parasitoid body size or percent emergence.

TRITROPHIC EFFECTS OF FURANOCOUMARINS ON POLYEMBRYONIC PARASITOIDS. E. Lampert and P.J. Ode, Department of Entomology. North Dakota State University, Fargo, ND 58105 USA.

Host diet can have direct or indirect effects on the life history of parasitic wasps. High and low concentrations of the furanocoumarin xanthotoxin to artificial diets of the parsnip webworm, host of the polyembryonic wasp *Copidosoma sosares*. Changes in webworm development time, webworm body size, wasp development time, wasp body size, and clutch size between the two diets and a control diet were compared. These comparisons allow us to determine if differences in wasp life history correlates are due to indirect or direct effects.

CLUTCH SIZE ADJUSTMENT AND INFORMATION USE IN PARASITOID WASPS. J.J. Pexton, Department of Entomology, North Dakota State University, 202 Hultz Hall, 1300 Albrecht Blvd., Fargo, ND 58105-5346 USA.

As larvae, solitary species of parasitoid wasps eliminate rivals, including sibs, through contest competition. In gregarious species, larvae tolerate each other and several individuals can develop from a single host. I report experiments at understanding how gregarious development evolved in one genus, and the consequences of larval interactions for parental behavior. In the transition from solitary to gregarious development, one possible intermediate stage is if solitary species frequently lay more than one egg per host. If the risk of conspecific superparasitism (another female of the same species oviposits into a single host) is high, optimal clutch size theory predicts the laying of multiple-egg clutches, because a female will increase the probability of the surviving larva being her own. Under the same conditions, theory predicts that gregarious species should reduce their clutch size.

Symposium: Biological control in the 21st century

PROGRESS TOWARDS CLASSICAL BIOLOGICAL CONTROL OF *DELIA RADICUM* IN CANOLA IN CANADA. N.J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2.

Delia radicum (cabbage maggot) is of Palaearctic origin, and is increasingly prevalent on Canadian canola, causing losses of up to $100 million in some years. Canadian biological control programs targeting *D. radicum* were abandoned in the 1950s when it was found that the introduced agents were already in North America. We are now revisiting the topic. Hemachandra compared parasitoid communities attacking *D. radicum* in canola in Canada and Europe. He found that the staphylinid beetle, *Aleochara bipustulata*, is absent from North America, but is an important parasitoid in Europe. K. Riley studied the interactions of *A. bipustulata* with *A. bilineata*, a common parasitoid of *D. radicum* on both sides of the Atlantic. Her results suggest that introduction of *A. bipustulata* would increase the total parasitism due to *Aleochara*. L. Andreassen is examining the host and habitat range of *A. bipustulata* to determine the threat posed to non-target Diptera. *Aleochara bipustulata* attacks some non-target Diptera, including a beneficial species in forests; however, the parasitoid appears to be a habitat specialist and so is unlikely to pose a threat to forest Diptera. Further data remain to be assembled to determine whether introduction of *A. bipustulata* for control of *D. radicum* is advisable.

WEAPONS OF MASS DESTRUCTION PRODUCED BY BIOCONTROL BACTERIA: ARE THEY FUNCTIONAL AGAINST INSECT PESTS OF CANOLA? W.G. Dilantha Fernando[1], Yilan Zhang[1], S. Nakkeeran[1], Rajesh Ramarathnam[1], and N.J Holliday[2], [1]Department of Plant Science, University of Manitoba, Winnipeg, MB R3T 2N2 and [2]Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2.

Using naturally occurring predators to control insect pests of crop plants has been a successful biological control strategy in several countries. However, there is limited knowledge of how biological control agents of plant pathogens such as phyllosphere bacteria could be used to control or limit the feeding habits of insect pests. *Pseudomonas chlororaphis* strain PA23 has consistently reduced *Sclerotinia sclerotiorum*, the stem rot pathogen of canola in greenhouse and field experiments. Polymerase Chain Reaction analysis confirmed the presence of phenazine and pyrollnitrin biosynthetic genes in the bacterium. High Performance Liquid Chromatography confirmed the production of phenazine-1-carboxylic acid (PCA), 2-hydroxy phenazine and pyrollnitrin antibiotics. PA23 produces three organic volatiles, nonanal, benzothiozole, 2-ethyl, 1-hexanol that are capable of completely inhibiting mycelial growth, and significantly reducing ascospore and sclerotia germination. PA23 induces higher activity of chitinase, β-1,3 glucanase, phenylalanine ammonia lyase, peroxidase, polyphenol oxidase, and phenol in canola plants in the presence of the pathogen conferring induced systemic resistance (ISR). Western blot analysis confirmed the induction of a 34kDa chitinase gene. ISR may help reduce the infection of other canola pathogens like the blackleg pathogen (*Leptosphaeria maculans*) and restrict canola insect pests like Bertha armyworm and

diamondback moth from damaging the canola crop. Studies are underway to investigate this.

EVADING THE NEXT INVASIVE SPECIES INTRODUCTION: IMPLICATIONS FOR BIOLOGICAL CONTROL. R.E. Roughley, Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2.

Agriculture in Manitoba is based primarily on European crops. Insect pests of these crops can be divided into two groups based on origin: native species which have adapted to the crop and become pests and pest species introduced from abroad. Traditionally, insect pest control has been implemented by insecticides but public perception of the risks of pesticides has led to drastic reductions in the variety and kinds of pesticides available as control options. An alternative is use of biological control which has become increasingly popular. There are examples, however, of biological control agents (*e.g. Harmonia axiridis*, Coleoptera: Coccinelidae; *Compsilura concinnata*, Diptera: Tachinidae) which have caused ecological disruption to natural systems and which have become invasive species. Mechanisms for the reduction of risk are explored including regulation, but with adequate enforcement, rigorous investigation of host range, and an increased knowledge of ecosystems and the role that insects play within ecosystems.

ABIETIV - A BIOLOGICAL PRODUCT FOR THE CONTROL OF THE BALSAM FIR SAWFLY. C.J. Lucarotti, Natural Resources Canada, Canadian Forest Service – Atlantic Forestry Centre, P.O. Box 4000, Fredericton, NB E3B 5P7, Canada.

In 1997, we isolated a nucleopolyhedrovirus (NeabNPV) from the balsam fir sawfly (*Neodiprion abietis*). The balsam fir sawfly had become a major defoliator of pre-commercially thinned balsam fir stands, especially in western Newfoundland, beginning in the early 1990s. With no control measures in hand, NeabNPV was developed as an agent for the biological control of balsam fir sawfly. To this end, research was carried out by a number of researchers on several fronts including: balsam fir sawfly life table, ecology and impact on balsam fir trees; NeabNPV field efficacy, mammalian and non-target invertebrate toxicology; NeabNPV genome sequencing and analysis. As part of the field efficacy trials 22,500 hectares of balsam fir sawfly infested forest were aerially treated with NeabNPV between 2000 and 2005. Results from all of the research, both basic and applied, were included in the submission to the Pest Management Regulatory Agency (Health Canada) in June 2004 for the registration of NeabNPV under the trade name, Abietiv.

HYMENOPTEROUS PARASITOIDS ATTACKING TABANID EGGS IN MANITOBA: TAXONOMY, PREVALENCE, AND SOME ASPECTS OF THEIR BIOLOGY. M. Iranpour, Department of Entomology, University of Manitoba, Winnipeg, MB R3T 2N2 and International Centre for Infectious Diseases (ICID), Winnipeg, MB.

Horse flies and deer flies (Diptera: Tabanidae) are serious pests of wild and domestic animals across Canada. Many natural enemies have been reported to attack the various developmental stages of Tabanidae. Eggs are attacked by hymenopterous parasitoids,

various insect predators, and fungi. During the summers of 1996-2000, adults and egg masses of Tabanidae were collected from different locations in Manitoba. Polymerase Chain Reaction and Restriction Fragment Length Polymorphism (PCR-RFLP) were used to differentiate adults and egg masses of several species of Tabanidae. From more than 90% of collected egg masses of *Hybomitra nitidifrons nuda* and *Chrysops aestuans,* scelionid and/or trichogrammatid egg parasitoids emerged. Within collected egg masses of *H. n. nuda* and *C. aestuans* more than 60% of individual eggs were either parasitized or damaged by egg parasitoids. Three scelionid and one trichogrammatid species emerged from the collected egg masses. The trichogrammatid species was identified as *Trichogramma semblidis*; however, three scelionid species were described as new species. Host-finding strategy, host partitioning, mating and oviposition behaviours, overwintering strategy, and possibility of mass rearing of parasitoids will be discussed

The Entomological Society of Manitoba gratefully acknowledges the following organizations which provided financial support for the 61st Annual Meeting

Canadian Grain Commission
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
Louisiana-Pacific Canada, Ltd.
Manitoba Agriculture, Food and Rural Initiatives
Metro Pest Control
National Microbiology Laboratory,
Health Canada
North/South Consultants
Orkin/PCO/Swat Team
Poulin's Pest Control Services
Province of Manitoba-Conservation

Entomological Society Of Manitoba
61st Annual Business Meeting

22 October, 2005
Department of Entomology, University of Manitoba

Attendance

President	Brent Elliott
Secretary	Noel White
President-Elect	Rhéal Lafrenière
Treasurer	Ian Wise
Regional Director to ESC	Pat MacKay

Bill Preston
Robert Lamb
Neil Holliday
Richard Westwood
Rob Carrie (also proxie for Desirée Vanderwel)
Blaine Timlick
Marj Smith
Sheila Wolfe
Kim Riley

1. ***Motion***: MacKay/Lamb — to accept the Agenda (Appendix A).....**Carried**
2. ***Motion****:* Holliday/Timlick — to accept previous Minutes of the 60th Annual Business Meeting.....**Carried**
3. Business arising from the previous Minutes..... **None**
4. ***Motion***: Holliday/Lamb — to receive reports .....**Carried**

   Appendix B — President

   Appendix C — Treasurer

   Appendix D — Regional Director to ESC; Action for 2009 President to invite ES Canada to Joint Annual Meeting

   Appendix E — Endowment Fund; now distributed, 1 scientific paper

5. **Committee Reports**

   Appendix F — Finance

   Motion*:* Smith/Lamb — for an additional $800 to be invested in the Endowment Fund .....**Carried**

Appendix G — Publicity/Newsletter

Appendix H — Social - 36 people attended the Banquet

Appendix I —Youth Encouragement

Appendix J — Archives

Appendix K — Scholarship and Awards - possibly increase size of scholarship

Appendix L — Scientific Program - 49 registered. President to send a letter of appreciation to Dave Rosenberg

Appendix M — Fundraising ($1220)

Appendix N — Memberships

Appendix O — Web Page

Motion: Lamb/Holliday — to accept reports as given .....**Carried**

6. **Election Results**

President-Elect..... Blaine Timlick
Member-at-Large..... Kim Riley
Regional Representative to ESC..... Pat MacKay

Motion*:* MacKay/Lamb — destroy ballots .....**Carried**

7. **New Business**

Extension of Member-at-Large position to 2 years
Holliday - no; MacKay - yes
It will remain at 1 year

Increase annual membership dues
Discussion - not yet needed. Perhaps if we raise the scholarship amounts (MacKay/Smith)

Importance of holding elected office more than once was discussed. People should also let their names stand on the ballot if an incumbent. We have difficulty in finding candidates.

8. **Transfer of Office** to Rhéal Lafrenière

9. **Reappointment of Auditor**

Motion: Wise/MacKay — to retain Tony Nicholson as Auditor to the ESM (Financial Review).....**Carried**

10. **Adjournment** — Holliday

APPENDIX A

The Entomological Society Of Manitoba, Inc.
Agenda Of The Entomological Society Of Manitoba
61st Annual Business Meeting

22 October, 2005

Department of Entomology, University of Manitoba

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 — Brent Elliott
   Treasurer — Ian Wise
   Regional Director to the ESC — Patricia MacKay
   Editor of the Proceedings — Terry Galloway
   Endowment Fund Board — Marjorie Smith

5. **Reports -** Committees
   Finance — Marjorie Smith
   Publicity / Newsletter — Mahmood Iranpour, Patricia MacKay
   Social — Rhéal Lafrenière, Sheila Wolfe
   Youth Encouragement / Public Education — Andrea Patenaude
   Archives — Rob Roughley
   Scholarship and Awards — Richard Westwood
   Scientific Program — Neil Holliday
   Membership — Brent Elliott
   Web Page — Mahmood Iranpour

6. Election results — Scrutineer, Colin Demianyk

7. New Business

   A — Extension of Member-at-Large position to 2 years

   B —Increase in annual membership dues

   C —Importance of holding elected office more than once

8. Transfer of Office.

9. Reappointment of Auditor.

10. Other business.

11. Adjournment.

Appendix B: Report of the President – 2004-2005

The Executive Committee of the ESM has met twice to consider the Society′s business. The first Executive Meeting of the year was held on March 7, 2005. Issues that were discussed included several items, the first of which was the Scientific Program for 2005 as presented by Neil Holliday. The theme for the meeting was agreed to be bio-control. It was recommended that there be an update to the responsibilities of the Scientific Program Chair needed to be done and this has been ongoing and is now complete. A budget update was held and the vote to accept the proposed ESM budget was held later (April 28) via email. The proposed budget was approved. An update on the ESM/ESA-NCB meeting was presented. It was indicated that any profits or losses are the responsibility of the North Central Branch of the ESA.

The second Executive Meeting was held on September 23, 2005. The primary focus of the meeting was approval of the budget for the 2005 annual meeting. The annual meeting will be held at the Freshwater Institute and at the University of Manitoba on October 21-22. Invited speakers include Chris Lucarotti (CFS-Fredericton) and James Hagler (USDA-ARS Phoenix). In addition, updates regarding the budget, endowment fund and treasurer's report were given. Sponsorship for the Winnipeg Art Gallery event was solicited, and it was agreed the Society should support this event. The issue of an electronic newsletter was again discussed but no action will be taken regarding a change in format.

During the year, I have been very fortunate to be supported by an excellent executive and committee chairs that function within the guidelines of the ESM without any difficulties. I would like to thank the various committee chairs for all of their very hard work that makes the President's job very easy.

Brent Elliott
President, ESM

Appendix C: Report of the Treasurer

Entomological Society of Manitoba, Inc. Financial Statements, Unaudited —(see Review Engagement Report)

31 August, 2005

DOUG NICHOLSON* & CO.

Certified General Accountant

REVIEW ENGAGEMENT REPORT

To the Members of the **Entomological Society of Manitoba Inc.**

I have reviewed the statement of financial position of **Entomological Society of Manitoba Inc** as at **August 31, 2005** and the statement of revenues, expenditures, and surplus for the year then ended. My review was made in accordance with Canadian generally accepted standards for review engagements and accordingly consisted primarily of enquiry, analytical procedures, and discussion related to information supplied to me by the company.

A review does not constitute an audit and consequently I do not express an audit opinion on these financial statements.

Based on my review, nothing has come to my attention that causes me to believe that these financial statements are not, in all material respects, in accordance with Canadian generally accepted accounting principles.

"Doug Nicholson"
Doug Nicholson & Co.,
Certified General Accountant

Winnipeg, Canada
October 13th, 2005

PROFESSIONAL CORPORATION

ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.
STATEMENT OF FINANCIAL POSITION
AUGUST 31, 2005

ASSETS

CURRENT	**2005**	**2004**
Cash in bank	$ 2,708	$ 3,491
Canadian T-Bill fund (note 3)	13,072	4,811
Investment Certificates (notes 2, 4)	30,135	37,550
	$45,915	$45,852

LIABILITIES

LIABILITIES	nil	nil

SURPLUS

SURPLUS	$45,915	$45,852
	$45,915	$45,852

APPROVED BY THE BOARD:

_____ President _____ Treasurer

The accompanying notes form an integral part of these financial statements

ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.
STATEMENT OF FINANCIAL POSITION
UNAUDITED - (SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2005

ASSETS

CURRENT	**2005**	**2004**
Cash in bank	$ 3,491	$ 3,092
Canadian T-Bill fund (note 3)	4,811	4,737
Investment Certificates (note 2, 4)	37,550	36,892
	$45,852	$44,721

LIABILITIES

LIABILITIES	nil	nil

SURPLUS

SURPLUS	$45,852	$44,721
	$45,852	$44,721

APPROVED BY THE BOARD:

_____ President _____ Treasurer

The accompanying notes form an integral part of these financial statements

ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.
STATEMENT OF REVENUES, EXPENDITURES AND SURPLUS
UNAUDITED - (SEE REVIEW ENGAGEMENT REPORT)
FOR THE YEAR ENDED AUGUST 31, 2005

REVENUE	**2005**	**2004**
Annual meeting (see Schedule A attached)	$1,660	$1,708
Donations	$1,700	$2,210
Fundraising committee	$960	$372
Interest income	$1,544	$1,597
Members fees	$1,761	$1,868
Miscellaneous	$184	$390
Proceedings	$259	$234
Social committee	$88	$217
Youth encouragement & public education	$500	$295
	$8,656	$9,891
EXPENDITURES		
Awards and Scholarships	$1,500	$1,450
Donations	$500	-
Fundraising	$626	-
General	$1,318	$2,217
Meetings	$3,666	$4,527
Newsletter	$403	$200
Proceedings	$456	-
Social Committee	-	$234
Youth encouragement & public education	$124	$132
	$8,593	$8,760
EXCESS OF REVENUES OVER EXPENDITURES	**$63**	**$1,131**
Add: Surplus, beginning of the year	$45,852	$44,721
SURPLUS, END OF YEAR	**$45,915**	**$45,852**

The accompanying notes form an integral part of these financial statements

ENTOMOLOGICAL SOCIETY OF MANITOBA, INC.
NOTES TO THE FINANCIAL STATEMENTS
UNAUDITED - (SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2005

NOTE 1 PURPOSE OF THE ORGANIZATION

The Entomological Society of Manitoba Inc. was formed to foster the advancement exchange and dissemination of Entomological knowledge. The Entomological Society of Manitoba was incorporated on July 21st, 1976 under the laws of the Province of Manitoba as a non-profit organization and a registered charity under the Income Tax Act.

NOTE 2 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 expensed when acquired and, therefore, there are no annual amortization allowances.

NOTE 3 CANADIAN T-BILL FUND

The Canadian T-Bill fund was opened February 28, 1997 with a principal balance of $4,000. Additional purchases have been made during the year. The Canadian T-Bill fund is shown at market value at year-end.

NOTE 4 INVESTMENT CERTIFICATES

Certificate Number	Interest Rate	Maturity Date	Par Value
900055611-0007	2.40	Nov 16, 2006	$7,000
900055611-0008	2.00	Nov 16, 2005	$2,200
960006276-0004	3.00	Dec 11, 2008	$3,000
960006276-0005	4.55	Oct 31, 2007	$3,135
960006276-0008	3.30	Sep 16, 2008	$4,000
960006276-0009	2.75	Feb 10, 2009	$7,000
960006276-0010	2.10	Feb 12, 2007	$3,800
			$30,135

NOTE 5 STATEMENT OF CHANGES IN FINANCIAL POSITION

A Statement of Changes in Financial Position is not included with these financial statements as the Society uses the cash basis of accounting and would not provide any useful information that cannot be attained by the Balance Sheet and the Statement of Revenues, Expenditures, and Surplus.

Appendix D: Report of the ESC Regional Director

Over the past year, my third as Regional Director for the Entomological Society of Manitoba on the Governing Board of the Entomological Society of Canada, I have carried out several duties. As Regional Director I have served on the ESC Membership Committee and the ESC Science Policy and Education Committee. In addition to reporting on ESM activities at the Annual Meeting, I submitted a report to the Interim Meeting of the ESC Executive Council in Ottawa in April, 2005. These reports are available as attachments to the Minutes of the next ESM Executive Meeting following the report. At the time of writing, this year's election results for a new Regional Director are still unavailable. Neil Holliday and I were on the ballot, and from November 02 to 05, 2005, one of us will attend the Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Alberta in Canmore, Alberta, including the two scheduled Board Meetings and the Annual Business Meeting of ESC. At the latter, ESM member Bob Lamb will hand over the Presidency to Dan Quiring, a forest ecologist from UNB, and Peggy Dixon, AAFC, Newfoundland, will become 1st Vice-President. For the first time in several years, the ESM Annual Meeting precedes the ESC Annual Meeting, and the new members of the ESC Executive, including the 2nd Vice-President, are not known at this time. At the Canmore meeting, ESM member Rob Roughley begins his second year as Director-at-Large on the Board of ESC.

The next ESC Annual Meeting is a joint meeting with the Entomological Society of Quebec in Montreal. Details of that meeting will be available at the time of the Canmore meeting in early November and will be listed in the Meeting Announcements of the next issue of the ESM Newsletter. According to the traditional pattern of annual meetings, ESM is scheduled to host the joint annual meeting again in 2009. That invitation has been extended to ESC by the President of the ESM.

Until this year, membership in the ESC had been in decline for some years; however, this year, numbers of regular members stabilized and numbers of student members increased, for a small overall increase in membership. Moreover, ESC continues to be in good financial shape as a result of surpluses every year for the last five years. Nevertheless, there are concerns for the long term prospects of the Society as a result of both the membership issues and the financial implications of the decline in institutional subscriptions to the Canadian Entomologist. In response to these concerns, the Society has instituted a strategic review process aimed at developing strategies to ensure that the Society remains in a position sustainable for the long term. This review will go to the Board for consideration at its meeting in November 2005. ESC plays a critical role in Entomology in Canada which benefits all entomologists in the country, whether they are members of the national society or not. The health and strength of ESC is critical to all of us.

Patricia A. MacKay

Regional Director for ESM on the ESC Board
October 2005

Appendix E: Report of the Endowment Fund Board for 2005-2005

The Endowment Fund provides a basis for funding the publication of the Proceedings and other Society activities. In the past the Fund provided full support for these commitments, but income generated has declined each year as maturing GIC's are reinvested at lower interest rates. A total of $1,394 in interest was generated during the 2004-2005 fiscal year. Almost half of this was generated by one large five-year GIC which was invested at a rate of 6.00%. It matured in November 2004 and was the last of the certificates held at the higher interest rate, so yearly interest has dropped considerably.

The Endowment Fund Board met on 20 October 2005, to review the investments. Following the plan approved at the 2003 Annual Business Meeting, the Board has continued to redistribute the current GIC's so that approximately $7,000 of certificates matures each year, and combine the certificates that mature in a given year into one GIC. This will reduce paperwork, simplify the audit, and provide a hedge against year to year fluctuations in interest rates.

There is currently $5,000 of Endowment Fund money being held in the Treasury Bill account (Table 1). When Certificate no. 900055611-0008 matures on 16 November 2005 the $5,000 will be added to the principle amount of $2,200 and reinvested as one GIC of $7,200 for a period of five years (Table 2).

The principle amount in the Fund is currently $35,135, but the cap is $40,000, which was approved in 1998. It may be time to consider increasing the Fund. This could be done by increasing the amount invested as each certificate matures.

Marjorie Smith, Chair
Ian Wise
Pat MacKay

ENTOMOLOGICAL SOCIETY OF MANITOBA, INC
ENDOWMENT FUND GUARANTEED INVESTMENT CERTIFICATES

Table 1: Account information as of August 31, 2005. Interest generated during the 2005-2006 fiscal year.

Certificate No.	Principle	Interest Rate (%)	Maturity Date	Annual Interest
900055611-0001	$ 3,000.00	Held in Treasury Bill account until Nov. 16, 2005		
900055611-0002	$ 2,000.00	Held in Treasury Bill account until Nov. 16, 2005		
900055611-0007	$ 7,000.00	2.40	Nov 16, 2006	$ 168.00
900055611-0008	$ 2,200.00	2.00	Nov 16, 2005	$ 44.00
960006276-0004	$ 3,000.00	3.00	Dec 11, 2008	$ 90.00
960006276-0005	$ 3,135.00	4.55	Oct 31, 2007	$ 142.64
960006276-0008	$ 4,000.00	3.30	Sept 16, 2008	$ 132.00
960006276-0009	$ 7,000.00	2.75	Feb 10, 2009	$ 192.50
960006276-0010	$ 3,800.00	2.10	Feb 10, 2007	$ 79.80
Total	**$ 35,135.00**			**$ 848.94**

Table 2: Projected account information as of August 31, 2006. Interest generated during the 2006-2007 fiscal year.

Certificate No.	Principle	Interest Rate (%)	Maturity Date	Annual Interest
900055611-	$ 7,000.00	2.40	Nov 16, 2006	$ 168.00
900055611-	$ 7,200.00	2.70	Nov.16, 2010	$ 194.40
960006276-0004	$ 3,000.00	3.00	Dec 11, 2008	$ 90.00
960006276-0005	$ 3,135.00	4.55	Oct 31, 2007	$ 142.64
960006276-0008	$ 4,000.00	3.30	Sept 16, 2008	$ 132.00
960006276-0009	$ 7,000.00	2.75	Feb 10, 2009	$ 192.50
960006276-0010	$ 3,800.00	2.10	Feb 10, 2007	$ 79.80
Total	**$ 35,135.00**			**$ 999.34**

Appendix F: Report of the Finance Committee for 2004-2005

The Finance Committee met on 20 October, 2005, to review the 2004-2005 Financial Statement and the budgets for the current fiscal year. The Society continues to be in good financial shape, with yet another surplus. Although the Society has a projected loss this fiscal year, it is balanced by a projected surplus the following year. The aim of the Finance Committee is to break even or accumulate small surpluses over the long term, which is in keeping with the Society's status as a non-profit organization.

Over the past ten years the Society's average balance has been a substantial net gain of over $1,000 per year. The Endowment Fund Board has developed a plan to invest some of the surplus by increasing the Fund to its cap of $40,000 over the next five years (see Report of the Endowment Fund Board).

Marjorie Smith, Chair
Ian Wise
Pat MacKay

BUDGET ITEMS REVISED 20 October 2005	**2004-05 Actual**	**2005-06 Actual and Projected**	**2006-07 Projected**
Endowment Fund	$35,135.00	$35,935.00	$36,935.00
REVENUE			
Membership Dues	$1,761.00	$1,760.00	$1,760.00
Proceedings	$259.00	$250.00	$250.00
Social Committee	$88.00	$0.00	$0.00
Youth/Education Committee	$200.00	$200.00	$200.00
Donations: from YEC activities	$100.00	$100.00	$100.00
fundraising for AGM	$1,700.00	$1,000.00	$1,000.00
Fundraising Committee	$960.00	$300.00	$0.00
Student Awards and Scholarship	$200.00	$200.00	$200.00
Meetings: ESM/AGM	$1,660.00	$1,750.00	$1,750.00
NCB - ESA - ESM JAM	$0.00	$0.00	$ 2,054.00[1]
Interest: GIC income	$1,394.00	$850.00	$1,000.00
T-Bill Account/Chequing	$150.00	$100.00	$100.00
Miscellaneous - GST rebate	$184.00	$132.00	$100.00
TOTALS	$8,656.00	$6,642.00	$8,514.00
EXPENSES			
General Society Expenses	$1,318.00	$1,200.00	$800.00
Proceedings	$456.00	$800.00	$800.00
Newsletter	$403.00	$400.00	$400.00
Social Committee	$0.00	$100.00	$100.00
Youth/Education Committee	$124.00	$200.00	$200.00
Fundraising Committee	$626.00	$0.00	$0.00
Student Awards and Scholarships	$1,500.00	$1,500.00	$1,500.00
Meetings: ESM/AGM	$3,316.00	$ 3,350.00[2]	$3,000.00
NCB - ESA - ESM	$0.00	$0.00	$0.00
Donations	$500.00	$0.00	$0.00
Representation at ESC	$0.00	$400.00	$400.00
TOTALS	$8,593.00	$7,950.00	$7,200.00
Net Gain (Loss), year ending Aug.	$413.00	$(1,308.00)	$1,314.00

[1] Reimbursement of expenses incurred in 2002-03 for sending Paul Fields and Brent Elliott to the NCB/ESA meeting.

[2] $350 of the budget for the 2005 AGM was spent in the previous fiscal year. It has been included here with the 2005-06 budget rather than the 2004-05 budget.

Appendix G: Report of the ESM Newsletter Committee

In 2005, we produced three issues of Volume 32 of the ESM Newsletter. The winter issue was distributed on February 22, 2005; the spring/summer issue on July 05, 2005; and the fall issue on October 07, 2005. These issues contained 18, 14 and 12 pages of text and photographs, respectively. The membership list was appended to the winter issue. A sheet advertising the Annual Meeting and including a call for papers was attached to the spring/summer issue. The envelope for the fall issue included a copy of the program for the Annual Meeting. The average cost of an issue of the Newsletter in 2005 was $134.26; the budgeted amount was $150. Cost of supplies was $26.51; the budgeted amount was $50.

Several unsolicited items appeared this year, and no one refused a request from the editors to submit an item. We strongly encourage the membership to continue to submit to us either items or ideas for items, in order that the Newsletter continue to provide interesting material for the membership.

Patricia MacKay
Mahmood Iranpour
Co-editors, ESM Newsletter
October 2005

Appendix H: Report of the Social Committee

On Friday, April 8, 2005, the ESM Social Committee hosted a 'New Members Mini-Golf Night.' The event took place at The Golf Dome with 17 people, including two new members in attendance. The admission costs were: ESM members and guests $12.00, students $8.00 and new members were free. This cost covered the mini-golf, pool tables, snacks and pop. Despite the small turnout, the event made a small profit of $87.00. The participant's golf scores, as well as any 'special' shots, were used to win tickets, which were then put into a draw for prizes. A separate draw was held for two $50.00 gift certificates for The Keg, which were donated by Labtronics and Demos Tool & Die. The prizes were provided by the following sponsors: Bee Maid Honey, Boston Pizza, R & C Lafrenière, McDonald's, Fabutan, Roger's Video and Labtronics and Demos Tool & Die.

The Committee held one luncheon this past year with John Gavloski speaking on the History of Grasshopper Control. There were 26 people in attendance. Given that everyone paid for their own lunch, the only cost incurred was $11 for the Speaker's lunch. The Social Committee hopes to be able to continue the luncheon series and invites the membership to contact the Committee Chairs with suggestions and ideas for luncheon speakers and topics.

The ESM Banquet was held at the University Club on October 21st. The menu featured a wide array of Italian dishes.

Rhéal Lafrenière
Sheila Wolfe
ESM Social Committee Co-Chairs

Appendix I: Report of the Youth Encouragement Committee

General Programs

Core programming of the Youth Encouragement Committee (YE) includes insect and spider presentations, and tours of the Department of Entomology. Participants in these programs come from elementary schools, day cares and youth groups. From November 2004 to October 2005, YE volunteers provided 23 tours or presentations, reaching over 750 students.

YE programs were discontinued between May and August this year due to lack of availability of most YE volunteers during the summer research season. As a result, a total of 15 presentations had to be declined. Two department tours were offered by summer students working for the department and at least two external presentations were given by an individual ESM member.

Special Events

Incredible Insects

In partnership with the Department of Entomology, YE collaborated with the Manitoba Children's Museum to develop and execute their 'Incredible Insects' exhibit. The event drew over 3,000 children and their parents between March 5 and April 17. Fourteen graduate students and ESM members participated in the event.

Amazing Agriculture Adventures

AAA continues to promote agriculture awareness to urban students in grades 4 to 6. YE organized two insect substations, one on apiculture, and one on insect metamorphosis, for the Winnipeg event which ran September 13 to 15. Over 1,200 children attended the event. One ESM member, three graduate students and three undergraduate students volunteered at this event.

Fundraising

A total of $123.15 was raised through donations from schools. Also, we applied for and received a $200 Public Encouragement Grant from the Entomological Society of Canada to support the program.

New Additions

We have recently added eight new praying mantids to our live insect collection which will add diversity and appeal to our programs. Thanks to Anita Stjernberg for welcoming them and helping them adjust to their new home!

Acknowledgements

Thank you to Lisa Babey, Christie Borkowski, Lisa Capar, Rob Currie, Suresh Desai, Cherie Dugal, Terry Galloway, Mahmood Iranpour, Paul Kozak, Bob Lamb, Alicia Leroux, Pat MacKay, Scott McMahon, Ayman Moustafa, Wendy Ray, Kim Riley, Jeff Shaddock, Margaret Smith, Dave Wade and Ian Wise for assisting with YE programming. A special thanks to Kathleen Ryan for having been an excellent coordinator and for assisting me in making a smooth transition into the Chair position. Good luck!

Andrea Patenaude
Chair, Youth Encouragement Committee

Appendix J: Report of the Archivist

The archives of the Entomological Society of Manitoba are held in a brand new filing cabinet located in the laboratory of Dr. R.E. Roughley in Room 213, Animal Science Building. Any item which members of the ESM feel is of historical or archival importance can be submitted to the archivist at any time.

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

Student Achievement Award

Awarded to a student who is in a Bachelor's degree program or recently completed a program. This award recognizes students who have shown exceptional interest in entomology, as evidenced by their insect collections, insect photography, published articles of entomological interest, insect experiments and/or outstanding contributions during summer employment.

This year's winner is Ms C-Jae Morden. C-Jae is completing her last year of an undergraduate honours degree at the University of Winnipeg in Biology and is hoping to continue her education as a graduate student in entomology at the University of Manitoba. C-Jae is completing an undergraduate thesis examining the status of the threatened Dakota Skipper in Manitoba and has worked in forest entomology-related summer research programs during the last several years at the University of Winnipeg Centre for Forest Interdisciplinary Research. C-Jae has been a summer NSERC undergraduate award winner and has impressed the Scholarship Selection Committee with her interest in entomology in the classroom and the field, her keen work ethic and academic proficiency.

Orkin/Swat Student Award

This award is designed to foster and encourage student interest in general entomology including natural methods of insect pest control and the proper use of insecticides. Candidates must have a demonstrated interest in entomology, superior scholastic ability, high research potential, originality and industriousness in their university courses and/or summer work.

This year's winner is Ms Chérie Dugal. Chérie is completing a major degree in the Zoology program in the Faculty of Science at the University of Manitoba. Chérie has taken a number of entomology courses where she has excelled academically and shown a great interest in insects in general. Cherie has been employed answering calls on the University of Manitoba 'Bug Line' where she has demonstrated diligence and professionalism when dealing with the public. Faculty of the Entomology Department have noted her excellent performance as a summer student employee, praising her research ability and conscientious approach to her work.

The ESM Graduate Scholarship

This scholarship is awarded to a student in a M.Sc. or Ph.D. program in entomology at the University of Manitoba. Students must be enrolled in their graduate program for at least 12 months prior to October 1st of the award year. This award recognizes superior scholastic ability, high research potential as evidenced by industriousness, good judgment, originality, a conscientious attitude and organizational ability, and excellent communication skills.

This year's winner is Mr. Ayman Mostafa. Ayman is currently a Ph.D. candidate in the Department of Entomology at the University of Manitoba working under the supervision of Dr. N. Holliday. Ayman received his B.Sc. in 1993 and M.Sc. in 1997, both from Alexandria University. Ayman has received several awards since joining the Department including a University of Manitoba Graduate Fellowship and an Alumni Association Travel Award. Ayman's Ph.D. project is examining the interrelation between mirid plant bugs and buckwheat and alfalfa crops.

Joel Gosselin
Richard Westwood (Chair)
October 21, 2005

Appendix L: Report of the Scientific Programme Committee

The 61st Annual Meeting of the Society was held on 21st and 22nd October 2005 and the theme of the meeting was 'Biological Control in the 21st Century.' The lead speaker on 21 October was Dr. J. Hagler, USDA, Phoenix, who discussed new methods of assessing predator diets. On the morning of 22 October there was a symposium on the theme topic, with five speakers, including special guests Dr. C. Lucarotti, CFS, Fredericton,

Dr. D. Fernando, University of Manitoba and R. Roughley, M. Iranpour and N. Holliday of the Society. There were 14 orally-presented papers of which 9 were entered in the student paper competition, and 3 poster papers were presented. Total registration for the meeting was 49 (30 regular members and 19 students).

The venue for 21 October was the Freshwater Institute, and the Committee would like to thank Dave Rosenberg for assistance with the arrangements there. The venue for 22 October was the Department of Entomology. The Committee would like to thank the many members whose volunteer efforts made the program possible. These include session chairs (Rhéal Lafrenière, Neil Holliday, Rob Currie), projectionists (Sheila Wolfe, Pat MacKay, Bob Lamb, Andrea Thomson), a set-up crew (Lars Andreassen, Pat MacKay, Sunday Oghiakhe, Sheila Wolfe, Kim Riley), door holders (Jasminder Mangat, Kim Riley, Lars Andreassen), snack buyers (Desirée Vanderwel and Brent Elliott) and those who assisted in transporting and entertaining guest speakers (Lynda Holliday, Pat MacKay, Brent Elliott, John Gavloski). The Committee was greatly aided by the cooperative efforts of the Social Committee (Rhéal Lafrenière and Sheila Wolfe) who organized the banquet at the University Club, Pat MacKay and Bob Lamb, who hosted the meet the speakers mixer at their home, Joel Gosselin, who sought corporate sponsorship to support the meeting and Ian Wise and his crew at the registration desk.

The Chair would like to thank all the members of the Scientific Program Committee (Desirée Vanderwel, Brent Elliott, Andrea Thomson, Joel Gosselin [Chair, Fund Raising Committee] and Rhéal Lafrenière and Sheila Wolfe [Co-Chairs, Social Committee]) for their unstinting support and help in making the meeting possible. The Chair, in consultation with last year's Chair, has undertaken to review the Committee Guidelines for the Committee as it is clear that these vary considerably from the practices the Committee has followed in recent years.

N.J. Holliday, Chair

Appendix M: Report of the Fundraising Committee

The Committee was able to raise **$1,700.00** through 17 sponsors to assist in covering some of the costs of the AGM, such as bringing in the speakers from out of town. The Fundraising Committee also had revenues of $270 from items in inventory and $690 for sweatshirts purchased during 2004. Sweatshirt expenditures were $625.99 for a profit of $65.01. Therefore, total revenues for items sold were **$335.01**.

The Fundraising Committee raised a grand total of **$2,035.01**.

Joel Gosselin
Chair, Fundraising Committee

Expenses			Receipts		
Travel		$800.00	**Sponsors**		$800.00
Jame Hagler Airfare	$800.00				
Chris Lucarotti	$0.00		**Banquet**		$834.00
Airfare					
			Regular (18 × $35)	$630.00	
Accommodations for invited speakers		$640.80	Students (12 × $17)	$204.00	
Jame Hagler (3 nights)	$320.40				
Chris Lucarotti (?)	$320.40		**Registration**		$870.00
			Regular (31 × $25)	$775.00	
Meals (Invited Speakers)		$390.00	Students (19 × $5)	$95.00	
Jame Hagler	$70.00				
Christ Lucarotti	$70.00				
Group lunch Saturday	$120.00				
Group dinner Saturday	$200.00				
Mixer		$300.00			
Refreshments (for breaks)		$183.17			
Tim Hortons (donuts)	$21.25				
Zellers (juice, napkins, etc)	$22.24				
Bill from FWI	$89.68				
Bill from U of M	$50.00				
Office Expenses		$64.42			
Staples (mainly banquet tickets)	$25.16				
Postage	$39.26				
Banquet 32 × $30 + $30 for room		$1,000.00			
Student Paper Award		$100.00			
Total Expenses		$3,478.39	Total Receipts		$2,504.00
Deficit		$(974.39)			

Appendix N: Report of the ESM Membership Committee

Membership — March 7, 2005: 112

New Members — 2005: 8
Suresh Desai
Candice Grant
Sarah Fandych
Andrea Patenaude
Derek Crompton
John Pexton
Evan Lampert
Fuji Jian

Dropped Members — 2005
K.S. Hemachandra
Ernest Liscombe
Diana Saunders
Rebekah Rooney

Membership — August 31, 2005: 116

Appendix O: Election Report

October 20, 2005

Elections closed October 20, 2005 for the Entomological Society of Manitoba offices of President-Elect, Member-at-Large and ESC Representative. The successful candidate for President-Elect is Blaine Timlick, for Member-at-Large is Kim Riley, and for ESC Representative is Pat MacKay. We thank all candidates for their willingness to participate in the election. Formal announcement and commencement of terms will be at the Annual Business Meeting after the ESC Annual Meeting.

Sincerely,

Colin Demianyk	Noel White
Chairperson, Scrutineer Committee	Secretary