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T.D. Galloway
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The Entomological Society of Manitoba was formed in 1945 “to foster the advancement, exchange and dissemination of Entomological knowledge”. This is a professional society that invites any person interested in entomology to become a member by application in writing to the Secretary. The Society produces the Newsletter, the *Proceedings*, and hosts a variety of meetings, seminars and social activities. Persons interested in joining the Society should consult the website at <http://home.cc.umanitoba.ca/~fieldspg>, or contact:

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HISTORICAL PERSPECTIVE

Five Decades of Entomology Come to an end: Winnipeg Research Station – Cereal Research Centre, 1957-2013

(Reprinted from the Bulletin, Entomological Society of Canada, Volume 45(3)
September 2013)

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and Colin Demianyk**

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The Cereal Research Centre (CRC) of Agriculture & Agri-Food Canada (AAFC) will close in early 2014, after 90 years on the campus of the University of Manitoba in Winnipeg. The facility opened in 1924 as the Dominion Rust Research Laboratory, in response to devastating rust outbreaks. Research focused on plant pathology and cereal breeding from the beginning, and on entomology since 1957. The final year of operation is an opportune time to remember CRC entomologists and review their contributions. This summary is based on staff lists prepared by Brent McCallum, CRC, earlier accounts (Bird 1963; Loschiavo 1990), biographies in *Entomologists of Manitoba* (Riegert 1989), and publications and memories of those who worked at CRC.

The first Entomology Section, led by Ralph Bird, was formed in 1957 when the Stored Product Insect Laboratory, Winnipeg, and the Field Crop Insect Laboratory, Brandon, relocated to the Research Station. In recognition of the amalgamation of three units in a new building, the laboratory was renamed the Winnipeg Research Station (WRS) in 1959. The next big change came in 1972 with the closing of the Entomology Research Institute, Belleville, Ontario, and transfer of many of its staff to WRS. The newcomers formed the Integrated Pest Management Section led by Bill Turnock, existing in parallel with the already established Crop Protection Section led by Fred Watters. The sections were reorganized as Stored Products and Integrated Pest Control in 1983, only to be recombined as a Crop Protection Section 6 years later. In 1995, budget cuts resulted in a substantial reduction to the entomology program, achieved primarily by transferring all research on non-cereal crops to the Saskatoon Research Centre. A number of entomologists were forced to take early retirement, or did so voluntarily, to avoid moving late in their careers. Those remaining joined the Cereal Quality Protection Section or the Cereal Breeding Section in the renamed Cereal Research Centre.

In 1957, ten entomologists began research at WRS (Table 1) out of a total scientific staff of 36. These numbers include two AAFC employee categories: Research Scientists who direct a research program and Biologists who carry out independent research under the direction of a Research Scientist, but not technicians or other support staff. When the Integrated Pest Management Section was formed in 1972, WRS had 18 en-

tomologists. Scientific staff peaked four years later at 46, including 16 entomologists. A decade later, six stored-product entomologists and eight crop protection entomologists were still active. By 1996, after reductions to the field crop entomology program, six entomologists remained. The last Research Scientist working on entomology of field crops retired in 2003 and was not replaced, leaving two Biologists working with wheat breeders on resistance to wheat midge, and three stored-product entomologists. When CRC closes, three stored-product entomologists will continue to be employed by AAFC, in rental space at the University of Manitoba.

Over the years, many technicians, visiting scientists, graduate students and summer students contributed greatly to entomology at WRS-CRC. The highlights of the contributions of all the entomologists to agriculture and to the scientific literature are described below.

Stored-Product Entomology

In the first 30 years after 1957, stored-product entomologists at WRS focused on pest control using fumigants, detecting low densities of insects in grain bulks, and the basic biology needed to understand stored-product pests (Fig. 1) (Loschiavo 1990). Sam Loschiavo made important contributions to sampling stored product insects and to understanding the feeding biology of the pests (Baker and Loschiavo 1987). His escape-proof, pit-fall, probe trap allowed effective sampling of bulk grain. Versions of his trap continue to be manufactured and used in many countries to detect living insects in stored grain. Lawrie Smith's research on the cold tolerance of the ten most important species of stored-product insects set the stage for the use of ambient air to cool and protect grain. After earlier work on DDT and fumigants, Phil Barker spent many years conducting developmental studies of mites in stored grain. Upon retirement he continued volunteering at CRC, turning his attention to pests of wheat in the field, particularly the wheat midge (see below). Ron Sinha pioneered a community ecology and whole system approach for stored products. He developed a long-term collaboration with Bill Muir in the Agricultural Engineering Department, University of Manitoba (Sinha and Muir 1973). This research led to an improved understanding of the role of insects, mites and fungi in the heating of stored grain, and ultimately the introduction of aeration technology to dry and cool grain stores (Sinha and Watters 1985). His work was recognized with a Gold Medal from the Entomological Society of Canada in 1985.

Since Ron Sinha's retirement, this work has been expanded by Noel White in collaboration with Digvir Jayas at the now Biosystems Engineering Department, University of Manitoba. Over the years they have co-supervised 75 MSc and PhD students on aspects of stored grain management, usually including an entomological component. Recent studies used CAT scans to measure intergranular space in grain bulks, MRI to measure and then model moisture changes in single grains, and X-rays to detect insects in grain kernels. This collaboration was recognized by the 2008 NSERC Brockhouse Award for outstanding interdisciplinary research. Their work improved monitoring and control of insect pests infesting bulk stores of food (White 1995).

Paul Fields was hired in 1988 to work on the eco-physiology of stored-product insects. With colleagues, he has developed pest control strategies based on diatomaceous earths and a patented legume extract, and continues to test botanicals as control agents. He has worked extensively on heat and cold treatments to disinfest food products at various points in the food production system (Fields 1992), and is active in developing and promoting alternatives to methyl bromide in flour mills as this ozone-depleting substance is phased out as a fumigant (Fields and White 2002). Recently, he developed an application for mobile phones to identify stored-product insects, in collaboration with colleagues at the Canadian Grain Commission. The stored-product entomologists working at CRC recently are shown in Fig. 2.

Field Crop Entomology

At WRS-CRC, research on field crop entomology went through three phases: testing chemical pesticides and pest monitoring systems; developing economic thresholds and more precise monitoring tools for farmers, studying pest biology to identify novel control strategies, and biocontrol; and developing crops resistant to key pests of field crops.

When Harold Westdal arrived at the Research Station in 1957, he continued his groundwork research on sunflower pests. Wally Romanow continued the Manitoba grasshopper survey first established by Norman Criddle at the beginning of entomology in western Canada (Bird 1963). When the new oilseed rape crop (canola) became important in the early 1970's, Harold Westdal developed an insecticidal control program for the key pest, flea beetles. This control program became a standard for the new industry and set the stage for research that came with the influx of entomologists in 1972.

When Bill Turnock arrived as Section Head of Integrated Pest Management with the group of entomologists from Belleville, he brought with him an ecological perspective from his time in forest entomology, and an enthusiasm for multi-disciplinary research and a systems approach. Many of the entomologists who arrived with him were physiologists or biochemists and few had backgrounds studying insect pests of field crops. As a group, they decided to focus on the diverse pests of oilseed rape (canola), especially as the area sown to this new crop was growing rapidly, and new pests seemed to be attacking the crop each year. Garth Bracken, a physiologist and biochemist, and Gord Bucher, an insect virologist, began a series of studies on bertha armyworm. This careful field and laboratory research culminated in a reliable economic threshold for the pest, remarkable in part because the research departed so dramatically from their previous experience, and because it so effectively integrated an understanding of the armyworm's feeding biology with the estimation of a threshold (Bracken and Bucher 1984). A publication from this research described a rearing method for bertha and is still one of the most cited papers in *The Canadian Entomologist*.

Damage assessment and economic thresholds became an important focus for the field crops group. Research was completed on many of the crops and pests important in western Canada: bertha armyworm, flea beetle larvae (Garth Bracken), lygus bugs (Bob Lamb and Ian Wise), and root maggots (Bill Turnock) on canola; aphids on field

peas (Bob Lamb), flax (Ian Wise and Bob Lamb), and wheat (Bob Lamb); Hessian fly (Ian Wise) and wheat midge (Bob Lamb, Ian Wise and Marj Smith) on wheat. Once thresholds were established, monitoring systems were often developed to help farmers use them effectively. Graduate students from the Department of Entomology, University of Manitoba, conducted some of this research at WRS-CRC as part of their degree programs.

The damage assessment work was underpinned by research on the life histories and ecology of pests, many of which had been little studied in western Canada. Noteworthy was the long term research on red turnip beetle (George Gerber), a native canola pest, and on the seasonality of cutworms (Gord Ayre). Initially, cold hardiness was the focus of many studies, with the thought that pest outbreaks might be better predicted and managed if the effects of winter weather were understood. Studies on cold hardiness were completed for red turnip beetles (George Gerber), flea beetles (Bill Turnock and Bob Lamb), and root maggots (Bill Turnock, Bob Bodnaryk and Bob Lamb). Studies on the seasonal timing of pest life histories and the effects of temperature on development were completed to time control of pests better, including bertha armyworm (Gord Bucher and Garth Bracken), red turnip beetle (Bob Lamb and George Gerber), cutworms (Gord Ayre and Bob Lamb), and pea aphids (Bob Lamb and George Gerber). Bob Lamb's contribution to this work was recognized by a Gold Medal from the Entomological Society of Canada in 2002.

Largely as a result of Bill Turnock's enthusiasm for ecological entomology and integrated pest management, this approach remained central to the work as long as a critical mass of entomologists was present in the group. So, the economic thresholds were thought of as a first step, to be integrated with other approaches that might improve pest control and reduce pesticide use. Biological control was actively pursued for flea beetles and pea aphids (Glen Wylie) and root maggots (Bill Turnock). Ozzie Morris transferred to the group in 1982 to investigate the use of *Bacillus thuringiensis* as a bacterial insecticide, focussing on the identification of new strains of *Bt* for use in Prairie agriculture. Bill Turnock's perspective of the insects of the large area field crops of western Canada as an ecological system was well defined for canola early in the development of the group (Turnock 1977). The multidisciplinary and broad ecological approach was a success, rapidly leading to a body of knowledge on insect pests of canola, and their interactions with the new crop (Lamb 1989). Field crop entomologists involved in this work are shown in Fig. 3.

The interest in damage assessment of pests on crops initially focussed on the development of economic thresholds for insecticide applications, but gradually led to a more basic understanding of insect-plant interactions (Bob Lamb and Bob Bodnaryk) and by the mid-1980's to an attempt to develop crop resistance. The first target for crop resistance was flea beetles on canola because control of this pest seemed intractable except by prophylactic applications of systemic insecticides that were gradually being withdrawn from the market. Progress was made (Bob Lamb, Bob Bodnaryk and Swamy Pachagounder), but no breakthrough, and the work on crop resistance to flea beetles stopped at WRS with the cuts to the program in 1995. The remaining entomological expertise on field crops (Bob Lamb, Marj Smith and Ian Wise) was transferred to the wheat program.

At about the same time, the wheat midge appeared to come out of nowhere as a major pest of wheat in Manitoba and Saskatchewan. Phil Barker, a stored-product entomologist who retired in 1991, continued to volunteer at the WRS-CRC and took an interest in the seed damage that was detected in wheat seeds harvested during the early years of the outbreak. He began looking at samples of wheat seeds from the WRS breeding program, comparing old samples with seeds from the current lines. His focussed interest on seed damage by stored-product pests and his familiarity with the morphology of the seed surface enabled him to recognize a novel type of damage in seeds from winter wheat being tested by the wheat breeder, Ron MacKenzie, for Hessian fly resistance. Phil referred to the seeds with subtle changes in their shape as “tubbies”. The lack of wheat midge larvae on these seeds led Phil and Ron to propose that some winter wheat lines might be resistant to wheat midge. A number of explanations other than crop resistance might have accounted for this phenomenon, but when the potential resistance was investigated further, the original hypothesis proved correct (Harris et al. 2003).

The closure of the canola program just when research on crop resistance was beginning to mature, the narrowing of the emphasis of entomology to cereals, the outbreak of wheat midge, and the sudden availability of a Research Scientist (Bob Lamb), two Biologists (Marj Smith and Ian Wise) (Fig. 4), and a number of entomological technicians provided a fortuitous environment for a strong collaboration between entomologists (including Phil Barker) and an enthusiastic, albeit retired, wheat breeder (Ron MacKenzie). The result was the rapid characterization of the *Sml* gene, which provides a high level of resistance against wheat midge, and the simultaneous incorporation of the gene in well adapted wheat cultivars by the wheat breeder Stephen Fox. The tradition of ecologically-based entomology research at WRS-CRC influenced the development of crop resistance leading to the adoption of an interspersed refuge based on the mating system and dispersal characteristics of the wheat midge (Berzonsky et al. 2003). This refuge system has been adopted by the industry in Canada and should prevent the resistance provided by the *Sml* gene from breaking down due to evolved virulence by the wheat midge.

The Future of Entomology in Manitoba

When CRC closes officially in early 2014, entomological research by Agriculture and Agri-Food Canada in Manitoba will be continued by three stored-product entomologists, Research Scientists, Noel White and Paul Fields, and Biologist Colin Demianyk. They expect to move to the Department of Biosystems Engineering at the University of Manitoba, to continue their collaboration with this agricultural engineering group. The remaining two field crop entomologists, Marj Smith and Ian Wise, were required to take early retirement at the end of March 2013. They will continue as volunteers until the end of 2013, as will Emeritus Research Scientist, Bob Lamb. At that point, no further field crop entomology research will be conducted by Agriculture and Agri-Food Canada in Manitoba. The Province of Manitoba has entomological extension personnel, but no research staff. When CRC closes in early 2014, research in field crop entomology in Manitoba will be in the hands of the Department of Entomology, University of Manitoba, which has one faculty position designated for this research area.

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Table 1. Entomologists employed as Research Scientists or Biologists* at the Winnipeg Research Station – Cereal Research Centre, 1957 – 2013.

	Start	End	Degree
	Year	Year	
Allen, W.R.	1957	1973	PhD (Minnesota)
Ayre, G.L.	1972	1989	MSc (British Columbia)
Barker, P.S.	1965	1993	PhD (McGill)
Berck, B.	1957	1977	MSc (Manitoba)
Bird, R.D.	1957	1966	PhD (Illinois)
Bodnaryk, R.P.	1972	1992	PhD (Waterloo)
Bracken, G.K.	1972	1991	PhD (Manitoba)
Bucher, G.E.	1972	1981	PhD (Ohio State)
Chopra, N.M.	1960	1965	PhD (Dublin)
Cole, T.V.	1957	1966	MSc (Manitoba)
Demianyk, C.J.*	1980	present	MSc (Manitoba)
Fields, P.G.	1988	present	PhD (Laval)
Forsyth, F.R.	1958	1959	PhD (Toronto)
Gerber, G.H.	1972	1996	PhD (Saskatchewan)
Grussendorf, O.W.	1962	1970	PhD (Leipzig)
Hegdekar, B.M.	1972	1984	PhD (Baroda)
Lamb, R.J.	1978	2003	PhD (British Columbia)
Liscombe, A.E.R.	1957	1965	PhD (Manitoba)
Loschiavo, S.R.	1957	1987	PhD (Manitoba)
McGinnis, A.J.	1966	1972	PhD (Oregon)
Morris, O.N.	1982	1988	PhD (Rutgers)
Osgood, C.E.	1972	1976	PhD (Oregon State)
Pachagounder, P.	1986	1995	PhD (Memorial)
Richardson, H.P.	1957	1966	PhD (Manitoba)
Romanow, W.*	1957	1987	MSc (Manitoba)
Sinha, R.N.	1957	1993	PhD (Kansas)
Smith, L.B.	1960	1986	PhD (Nottingham)
Smith, M.A.H.*	1996	2013	PhD (Manitoba)
Timlick, B.*	1992	1997	MSc (Manitoba)
Turnock, W.J.	1972	1993	PhD (Minnesota)
Watters, F.L.	1957	1981	PhD (Manitoba)
Westdal, P.H.	1957	1981	PhD (Manitoba)
White, N.D.G.	1981	present	PhD (Manitoba)
Wise, I.L.*	1988	2013	MSc (Simon Fraser)
Wylie, G.H.	1972	1987	PhD (Oxford)



Figure 1. The Stored-product Section, 1984, front Row: N. White, D. Abramson, R. Sinha; second row: M. Barron, G. Hamilton, R. Jenkins, P. Barker, J. Bell; third row: S. Loschiavo, L. Smith, T. Thorsteinson; top row: C. Demianyk, J. Mills.



Figure 2. The stored-product entomologists, 2008, from upper left to lower right: P Fields, T. Mayert, C. Demianyk, N. White.



Figure 3. Integrated Pest Management Section, 1984, from left to right, first row, ground level: R. Bioloiseau, M. Luo, W. Turnock, R. Wilson, W. Romanow, F. Mathe-son, G. Wylie, I. Toal, R. Bodnaryk; second row, first and second step: G. Ayre, J. Harding, C. Shearer, G. Maiteki, A. Kudryk, R. Lamb, G. Gerber; third row, third step: J. Walkof, M. Trottier, R. Butts, O. Morris, G. Bracken.



Figure 4. Wheat-midge entomologists, 2013, from left to right: S. Wolfe, I. Wise, M. Smith, and R. Lamb.

68th Annual Meeting Entomological Society of Manitoba, Inc.

Friday October 12, 2012

**Freshwater Institute
501 University Crescent
and**

Saturday October 13, 2012

**Room 219 Animal Science/Entomology Building
University of Manitoba**

ABSTRACTS

**Theme: Biological Changes in Lake Winnipeg, Manitoba's
Great Lake**

KEYNOTE ADDRESS

THE CHALLENGE OF MANAGING EUTROPHICATION IN LAKE WINNIPEG: AN EXCEPTIONAL GREAT LAKE.

Robert E. Hecky, F.R.S. Canada, Biology Department and Large Lakes Observatory, University of Minnesota-Duluth, 2205 East Fifth Street, Duluth, Minnesota, USA 55812.

Lake Winnipeg is the 11th largest freshwater lake in the world and 7th largest in North America – a great aquatic resource being exploited for power production, fisheries and wildlife, potable water and recreation. However, it is the shallowest of these large lakes with a mean depth of 15 m, and it also has the largest terrestrial catchment area to lake area ratio, 42, of any of the great lakes. These two factors make it extremely sensitive and responsive to changes in its terrestrial catchment. Over the past 20 years, the lake has undergone rapid nutrient enrichment to become the most eutrophic great lake in North America causing great concern for its sustainable use by stakeholders and the Province of Manitoba. Lake Erie is the best analog for Lake Winnipeg among other great lakes although there are important differences mostly

in Erie's highly urbanized shoreline and local catchments and in having much of its inflowing water filtered through the upper great lakes. Lake Erie largely recovered from anthropogenic eutrophication in the 1980s and 1990s providing evidence that reduction in excessive phosphorus (P) loading is a necessary management action for all lakes. However, in the past decade the positive trends in Lake Erie have been reversed due to the increasing importance of non-point source P loading, most likely as a combination of changing agricultural practices and climate change, the same factors driving the eutrophication of Lake Erie. The challenge of non-point P loading will require large scale mobilization and coordination potentially impacting agricultural practices and land management, as well as addressing urban sources of P, to achieve effective management and restoration of more natural P cycling on the land and in the lake. As world food production struggles to keep pace with the growing world population, non-point source nutrient management issues will continue to degrade global lakes unless new approaches are taken. Lake Winnipeg must be at the forefront of that effort.

SUBMITTED PAPERS

DETERMINATION OF HOST PLANT RESISTANCE IN TOMATO CROP AND LEAF CHARACTERS TO TOMATO FRUIT BORER, *HELICOVERPA ARMIGERA* (HUB.).

Muhammad Noor ul Ane, Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

The present study was designed to determine impact of leaf traits on *Helicoverpa armigera* larval population and resistance to tomato foliage. There was a significant difference in tomato varieties for larval population and fruit infestation. Hair length and hair density on lower surface as well as thickness of leaf lamina were negatively associated both with larval density and fruit infestation. Resistant varieties had more ferrous (Fe²⁺) and calcium contents in their leaves. Maximum yield was recorded in resistant varieties.

EVAUATION OF THE BROWN LACEWING, *MICROMUS VARIEGATUS*, FOR BIOLOGICAL CONTROL OF APHIDS ON GREENHOUSE PEPPERS.

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Brown lacewings (Neuroptera: Hemerobiidae) have been largely overshadowed by green lacewings (Neuroptera: Chrysopidae) in biological control programs for aphids. Brown lacewings are predatory as larvae and adults, and display low developmental

temperature thresholds which suggest potential advantages over green lacewings. We are currently evaluating the brown lacewing, *Micromus variegatus* (Neuroptera: Hemerobiidae), for biological control of aphids in British Columbia pepper greenhouses. Here, we present results of a greenhouse cage experiment where *M. variegatus* was released alone and simultaneously released with the parasitoid *Aphidius matricariae* (Hymenoptera: Braconidae) for management of the green peach aphid, *Myzus persicae* (Homoptera: Aphisidae) on greenhouse peppers.

THE USE OF MARKER-ASSISTED SELECTION IN BREEDING PROGRAMMES FOR TRAITS ASSOCIATED WITH RESISTANCE TO DISEASE AND PARASITES IN HONEY BEES.

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Honey bees are currently threatened by a broad array of parasites and pathogens. Breeding honey bees that are resistant to these threats is typically a very laborious process that involves monitoring full-size colonies over a long period, or using time-consuming assays in the field or lab. Recent advances in the field of genomics provide excellent potential for the use of proteomic-based markers to identify proteins associated with specific mechanisms of resistance. These methods could greatly facilitate the selection of stock with traits associated with resistance and thus improve honey bee colony survival. In this study, we compare the use of proteomic-based marker assisted selection with traditional field-assisted selection in stock that has been selected for hygienic behavior. F1 queens from different lines of bees were established in colonies and were inoculated with known numbers of varroa mites. Their hygienic behavior, ability to detect and remove mites and ability to suppress mite reproduction were assessed. Marker-assisted selection has good potential as a tool for selective breeding of honey bees.

LITTLE THINGS CAN MEAN A LOT: MICRO-RNA RESPONSES TO OXIDATIVE STRESS IN FRUIT FLIES.

N.J. Doughty, R.G. Jung, I.Y. Hougen, and S. Whyard, Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

Oxidative stress (OS) is considered to be an underlying mechanism in the pathogenesis of neurodegeneration. However, the underlying genetic mechanisms that induce the pathologies within neurons have not been identified. *Drosophila melanogaster* has emerged as an excellent model for identifying novel genes that help regulate neurodegeneration. Additionally, *D. melanogaster* raised in hyperoxia environments have been shown to develop neurodegeneration as a direct consequence of OS. In this study, microRNAs (miRNAs) were examined as potential epigenetic regulators of the OS

response. In an effort to identify miRNAs up- or down-regulated during oxidative stress, a microarray analysis was conducted to evaluate changes in miRNA expression in *D. melanogaster* exposed to hyperoxic versus normoxic conditions. Several candidate miRNAs were identified from the microarray screening, and quantitative RT-PCR (qRT-PCR) was subsequently used to confirm that those miRNAs altered their expression in response to varying durations of hyperoxic treatments. Computer algorithms were used to identify potential neuronal gene targets of these candidate miRNAs, and qRT-PCR was used to assess whether these neuronal genes were similarly affected by the OS. Additionally, cell-based assays were used to assess the ability of the miRNAs to regulate the translation of key antioxidant genes. This study has the potential to help explain how neural tissues can respond to oxidative damage, and using a simple insect model, we may be able to identify novel therapies to minimize neurodegenerative disorders associated with OS.

LIVING IN THE SHADOWS: THE LIFE AND TIMES OF *NOSOPONLUCIDUM* (RUDOW, 1869) (PHTHIRAPTERA: MENOPONIDAE) ON FALCONIFORMS (ACCIPITRIFORMES; FALCONIFORMES) IN MANITOBA.

Terry D. Galloway, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

More than 900 specimens of 16 species of salvaged falconiforms (hawks, eagles and falcons) were examined for lice from 1993 to 2011. *Nosopon lucidum* (Rudow, 1869) is a diminutive, polyxenous species; there is little published information on infestation parameters on its hosts. It was collected in addition to five other genera of falconiform lice: *Colpocephalum* and *Kurodaia* (Menoponidae), *Craspedorrhynchus* and *Degeeriella*, and *Laemobothrion* (Laemobothriidae). One thousand and nine specimens were found on eight species of falconiforms, in order of greatest to least prevalence: American Kestrel (22.9%; number of hosts (n)=70), Northern Harrier (20.6%; n=34), Prairie Falcon (12.5%; 8), Northern Goshawk (6.9%; 29), Cooper's Hawk (4.6%; n=65), Rough-legged Hawk (4.3%; n=47), Merlin (2.3%; n=262), and Red-tailed Hawk (0.7%; n=147). Greatest mean intensities of infestation were found on smaller hosts (<450g), Cooper's Hawk (78.7) and Merlin (77.8); lowest mean intensities were found on larger hosts (>990g), Red-tailed Hawk (8.0) and Rough-legged Hawk (3.0). No *N. lucidum* were found on Swainson's Hawk, Broad-winged Hawk, Sharpshinned Hawk, Bald Eagle, Golden Eagle, Osprey, Gyrfalcon or Peregrine Falcon.

PHYSIOLOGICAL AND BEHAVIOURAL CHANGES IN HONEY BEES (*APIS MELLIFERA* L.) INDUCED BY *NOSEMA CERANAE* INFECTION.

M. Goblirsch¹, Z.Y. Huang², and M. Spivak¹, ¹Department of Entomology, University of Minnesota, St. Paul, Minnesota, USA 55108; ²Department of Entomology, Michigan State University, East Lansing, Michigan, USA 48824.

Exposure to mite pests, poor nutrition, pesticides, and pathogens threaten the productivity and survival of honey bees. The capacity of a honey bee colony to buffer the negative effects of these threats to bee health provides an indication of its level of resiliency. In healthy colonies, young bees perform as nurses within the hive and

have high levels of the yolk protein, vitellogenin (Vg), and low levels of the endocrine factor, juvenile hormone (JH). As they transition to foraging behaviour, older bees have low levels of Vg and high levels of JH. The interaction of Vg and JH functions as a pacemaker that drives the sequence of behaviours that workers perform throughout their lives. We investigated the effects of infection with the emerging fungal pathogen, *Nosema ceranae*, on physiological factors underlying the division of labor in worker honey bees. We found that nurse-aged bees infected with this microsporidian had low levels of Vg while JH titer spiked. We also found that infected bees were more likely to engage in precocious foraging and had shortened life spans compared to uninfected controls. These patterns of endocrine signaling and behaviour are atypical and the reverse of what would be expected for healthy, non-infected bees. Disruption of the basic underpinnings of the division of labor due to infection may be a contributing factor to recent high colony mortality, as workers may not have the resiliency to respond to colony demands.

QUANTITATIVE ANALYSIS OF THE GENUS *ANATOECCUS* (PHTHIRAPTERA: PHILOPTERIDAE) ON CANADA GEESE (*BRANTA CANADENSIS*) AND MALLARDS (*ANAS PLATYRHYNCHOS*).

Alexandra Grossi, University of Manitoba, Department of Entomology, Winnipeg, Manitoba, Canada R3T 2N2.

Anatoecus icterodes and *A. dentatus* are chewing lice infesting Canada Geese and Mallards. These species coexist on the head and neck of their hosts. *Anatoecus icterodes* and *A. dentatus* are only distinguishable by the male genitalia. Prevalence of *Anatoecus* spp. was 32.8% on Canada Geese (n=265); mean intensity was 15.28 (range: 11.29-21.41). On Mallards (n=280), prevalence of *Anatoecus* spp. was 27.9%; mean intensity was 5.87 (range: 4.50-7.79). *Anatoecus icterodes* was generally more prevalent and present in greater numbers than *A. dentatus* on Canada Geese and Mallards.

CHEMICAL PARSIMONY IN *CHLAENIUS CORDICOLLIS* (COLEOPTERA: CARABIDAE) IN MANITOBA.

Holliday N.J.¹, A.E. Holliday², T.M. Mattingly², E.A. Williams², and K.M. Naccarato².
¹Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2; ²Department of Chemistry and Biochemistry, Swarthmore College, 500 College Avenue, Swarthmore, Pennsylvania, USA 19081-1397.

Chlaenius cordicollis is a large ground beetle that is common on some stony beaches of Lake Winnipeg. It overwinters as an adult and reproduction begins in early summer. GC-MS analysis showed that the defensive secretion of *C. cordicollis* was largely 3-methylphenol, with ≥ 8 phenolic minor components. In 2012, the composition of the defensive secretion of beetles in the field did not differ among sexes in late May, shortly after emergence from overwintering sites, but differed between males and females during the reproductive season in June 2012. Beetles collected in May were maintained in the laboratory until late July, so that a sequence of Y-tube olfactometer trials could be performed. In these trials, males preferred, and females avoided, the

olfactometer arm in which a female producing defensive secretion was confined, but responses to a male source beetle did not differ among sexes. During the course of the trials, the composition of the defensive secretion of laboratory beetles, while still exhibiting sexual dimorphism, differed from that in the field, particularly for males. These patterns of variation will be examined to address the hypothesis that defensive gland secretions of *C. cordicollis* also play a role in sexual communication.

COMPARISON OF PREDATION IN ANNUAL VERSUS PERENNIAL AGRO-ECOSYSTEMS: APHID PREDATION IN SOYBEAN VERSUS ALFALFA IN MANITOBA.

Alejandro C. Costamagna, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

A field study was conducted in four pairs of neighbouring alfalfa and soybean fields to compare natural enemy suppression of soybean and pea aphids. Natural enemy manipulations consisted of complete exclusion, ground predator exclusion and open controls using field cages. I will present the impacts of these manipulations on populations of sentinel aphids on alfalfa and on potted soybean plants.

INSECTS ON FIELD CROPS IN MANITOBA IN 2012 – AN EXTENSION UPDATE.

John Gavloski, Manitoba Agriculture, Food and Rural Initiatives, Box 1149, Carman, Manitoba, Canada R0G 0J0.

In cereal crops, armyworms (*Mythimna unipuncta*) were a concern in some areas, and aster leafhopper (*Macrosteles quadrilineatus*) was at very high levels in many fields in late-spring and early-summer. Lygus bugs were at economical levels in some fields of canola and dry beans. Lygus bugs were also controlled in some sunflower fields. There were localized problems with bertha armyworm, *Mamestra configurata* in canola. Diseased bertha armyworms were noted in some locations. High levels of flea beetles, *Phyllotreta* spp., in canola were a concern in some fields, even though most canola seed had seed treatments containing an insecticide. Levels of zebra caterpillar, *Melanchnra picta*, were abundant in some canola and alfalfa fields. Twospotted spider mite, *Tetranychus urticae*, populations were a concern in some soybean fields late in the summer. Alfalfa weevil (*Hypera postica*) was a concern in many alfalfa fields. Cutworms were a concern in many crops, including canola, corn, sunflowers, soybeans, and flax in May and June. Annual summaries of insect pests in crops in Manitoba are posted at: <http://www.gov.mb.ca/agriculture/crops/insects/index.html>.

EFFECT OF *LYGUS LINEOLARIS* ON NAVY BEANS IN MANITOBA.

Tharshy Nagalingam, and Neil J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

The effect of *Lygus lineolaris* on navy beans was characterized in the field by intro-

ducing adults and/or nymphs into 1 m² cages containing the crop at three different growth stages and leaving insects in the cages until harvest; at harvest, seed weight and quality were assessed. When insects were introduced at the mid-flowering to early pod stage (R2–R3) in an experiment in 2009, the yield of undamaged seed was reduced by 0.5 g/adult lygus bug. In contrast, when the experiment was repeated in 2011, there was an increase in weight of undamaged seed with increasing lygus bug densities. In the two experiments where lygus bugs were introduced at the mid-pod set to early seed fill stage (R4–R5), there was a reduction in weight of undamaged seeds but there was no evidence of a linear response to the number of lygus bugs. In cages infested with ≥ 30 insects at R4–R5, weight of undamaged seed was reduced by 42 g/m² when adults were introduced and by 85 g/m² when nymphs were introduced. In the two experiments where lygus bugs were introduced at the time of seed maturation (R6–R7), there was no evidence of reduction in yield quantity. Regardless of the stage of insect introduction, no significant reduction in quality of seed yield was detected. These results will be discussed in light of laboratory studies of growth stage-specific responses of navy bean plants to infestation by lygus adults and nymphs.

MOLECULAR IDENTIFICATION AND PHYLOGENETIC STATUS OF *OCHLEROTATUS PUNCTOR* COMPLEX SPECIES (DIPTERA: CULICIDAE) IN MANITOBA, CANADA.

Hooman H. Namin, M. Iranpour, and B. Sharanowski, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

The *Ochlerotatus punctor* (Kirby) complex consists of three cryptic species in Manitoba including *Oc. punctor*, *Oc. hexodontus* Dyar and *Oc. abserratus* (Felt & Young). The length and number of comb scales, and the number of branches on seta 2 of the fifth abdominal segment are the diagnostic features used for identification in the larval stage. Females can be distinguished according to the quantity of scales on the probasisternum only. In males, *Oc. abserratus* can be separated from the other members of the complex only with respect to the shape of the gonocoxite. The members of this complex exhibit morphological variation over their ranges and therefore most of these characters overlapped among the individuals of these species. Molecular markers may provide more reliable and efficient ways for identification of cryptic-species, and also can be applied for the identification of species in all developmental stages. The objectives of this research are to evaluate the efficacy of DNA barcoding for identification of the members of the *Oc. punctor* complex in Manitoba, and to investigate the phylogenetic relationships of these species based on COI and ITS2 gene sequences.

HABITAT PREDICTORS OF *DERMACENTOR ANDERSONI* (ACARI: IXODIDAE) IN ALBERTA.

Kateryn Rochon¹, and T. J. Lysyk². ¹Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2; ²Lethbridge Research Centre, Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada T1J 4B1.

Rocky Mountain wood ticks (*Dermacentor andersoni*) were collected along defined transects at nine sites in Alberta in 2009 and 2010. Habitat characteristics including elevation, slope, exposure, amount and type of vegetation were assessed every 10 meters within transects. Using logistic regression, we built a model to determine which characteristics were most useful in predicting the presence or absence of ticks in both prairie and montane habitats. Although these habitats are different, the presence of *Rosa* sp. was the most consistent predictor for the presence of ticks in both habitat types. Co-occupation of quadrats by male and female ticks is also less frequent than expected by random distribution.

DETERMINATION OF DAKOTA SKIPPER, *HESPERIA DACOTAE* (LEPIDOPTERA: HESPERIIDAE), CRITICAL HABITAT IN MANITOBA: CHARACTERIZATION OF VEGETATION.

Richard Westwood, and Christa Rigney, Department of Biology, The University of Winnipeg, 515 Portage Ave., Winnipeg, Manitoba, Canada R3B 2E9.

The Dakota skipper, *Hesperia dacotae* (Lepidoptera: HesperIIDae), is a threatened butterfly restricted to fragmented prairies in Manitoba. There are limited data on the life history and habitat requirements in Canada to implement effective conservation measures. We seek to better understand key biological and physical habitat requirements to develop a preferred site profile. Vegetation and nectar flower surveys were conducted and analysis of the vegetation abundance and diversity was used to develop habitat profiles to determine optimal Dakota skipper habitat.

POSTERS

EFFICACY OF PEA FLOUR AND PEA EXTRACT TO CONTROL STORED-PRODUCT INSECTS IN LARGE-SCALE TEST.

Paul Fields¹, A.Y. Abdelghany¹, W. Taylor², and R.K. Hynes². ¹Cereal Research Centre, Winnipeg, Manitoba, Canada R3T 2M9; ²Saskatoon Research Centre, Saskatoon, Saskatchewan, Canada S7N 0X2.

This large-scale test was to simulate the application of insecticide and storage of grain on a farm or elevator. Efficacy of protein-rich pea flour, 1000 ppm, and a wettable powder formulation of pea extract, composed of insecticidal PA1-b and soyasaponins, at 500 and 1000 ppm was applied to 350 kg wheat. Six hundred and sixty *Sitophilus oryzae*, *Cryptolestes ferrugineus* and *Tribolium castaneum* adults were released together on the grain surface in each barrel. Barrels were sealed with fine netting to prevent insects from dispersing to other barrels, but allowed insects to escape from the top or bottom of the barrel. Escaping insects were collected weekly. Grain samples were collected every three weeks, and the number of adults counted. After 2.6 months, pea flour caused 93% reduction in *C. ferrugineus* and 88% reduction in *S. oryzae* adults in grain compared to the untreated control. Pea extract reduced

populations of *S. oryzae*, causing 66% reduction at 500 ppm and 88% reduction at 1000 ppm. *Tribolium castaneum* populations were initially reduced by pea extract at 1000 ppm, but at 2.6 months there were no differences between treatments. Pea extract at 500 and 1000 ppm caused increased movement of *S. oryzae* out of grain compared to untreated grain.

A BASIS FOR PRIORITIZING REMOVALS OF AMERICAN ELM TREES WITH DUTCH ELM DISEASE.

Sunday Oghiakhe, and N.J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

In Manitoba, American elm trees are susceptible to Dutch elm disease, caused by the fungus *Ophiostoma novo-ulmi*, which is vectored by *Hylurgopinus rufipes*. A major component of disease management programs is the removal of infected trees, thus preventing emergence of spore-bearing beetles from them. In summer, symptomatic trees are marked, and may be sampled to detect the blue stained xylem that is characteristic of the disease. As spore-bearing beetles can emerge from diseased trees in fall, removal of marked trees before 31 August is desirable. In large cities, the number of trees to be removed exceeds the capacity to remove them in the desired time, and so a mechanism of prioritizing removals is needed. In dissected newly-symptomatic trees, the total numbers of *H. rufipes* ranged from 0 to over 40,000, 92% of branch sections had blue staining, and beetles were present in 32% of stained branch sections and 5% of unstained sections. The number of beetles in a tree was related to the percentage of stained branch sections with beetles: Total number of beetles in tree = $14.134 \times 100.029 \times x$, where x = % of stained sections with beetles. From this we can predict that when beetles are present in >50% of stained branch sections, the total number of beetles in the tree will exceed 390. Thus, by scoring a small number of stained branch sections from a symptomatic tree for the presence of *H. rufipes*, we can identify trees that are the greatest potential sources of future infections.

BEE POLLINATORS OF SOYBEANS IN MANITOBA.

Zoe Rempel, and A.C. Costamagna, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

A survey of the bee pollinators in soybean was conducted in Manitoba. Bees were captured using blue, white, and yellow coloured bee bowls in two fields, one in Carman and one in Glenlea. Bee bowls were left out for 24 hours, once a week during the flowering period, for a total of 4 weeks of sampling, and bees were identified to genus. A total of 204 bees were captured, belonging to seven genera from three families: Apidae - *Apis*, *Bombus*, *Melissodes*, Halictidae - *Halictus*, *Lasioglossum*, *Agapostemon* and Colletidae - *Hylaeus*. The most abundant genera were *Apis*, *Melissodes*, *Halictus* and *Lasioglossum*. Non-parametric tests showed a significant increase in bee captures from week 1 to week 2 of sampling, and higher captures in Carman than Glenlea overall. Blue bowls captured more *Melissodes*, *Halictus* and *Lasioglossum*, but colour did not affect the captures of *Apis mellifera*. More native

bees were caught in Carman, where alfalfa and natural vegetation were closer to the sampled field than in Glenlea, suggesting a potential effect of the landscape context. Knowing the diversity of pollinators visiting soybeans is important as bee populations are currently threatened and could be affected by insecticide applications targeting aphids in soybeans.

THE LAND OF 10,000 LAKES AND 10,000 HABITATS? MINNESOTA WATER BUG FAUNISTICS, TAXONOMY, AND BIOLOGY (HETEROPTERA: NEPOMORPHA, GERROMORPHA, LEPTOPODOMORPHA).

J.L. Snyder, and P.P. Tinerella. Department of Entomology, University of Minnesota, 1980 Folwell Avenue, Saint Paul, Minnesota, USA 55108.

Ten-thousand lakes is a modest estimate for the number of lakes in Minnesota, and perhaps a significant underestimate for the available water bug (Hemiptera-Heteroptera) habitats. Though in decline from historical size, there are presently over 10 million acres of wetlands in Minnesota, critical habitats that support myriad aquatic life. Over the past 133 years, researchers in entomology and associated with the University of Minnesota Insect Collection (UMSP) have periodically reported on the state's aquatic and semiaquatic true bug fauna, publishing statewide distributions, biology, and taxonomy, resulting in a total of 108 documented species. This research is focused on an integrated, modern faunistics treatment of the aquatic and semiaquatic true bugs of Minnesota, including taxonomic keys, distributions, biology, and comparisons of historical and modern-day faunal compositions. Data sources include aggregation of the UMSP and other relevant regional collections data, previously published studies, the recently UMSP-accessioned U.S. Geological Survey National Water Quality Invertebrate Collection, and statewide water bug sampling. Results and findings of this faunistics research will be published as a traditional paper manuscript, as well as integrated with the emerging "Faunistics E-Pubs" resource associated with the UMSP Virtual Insect Collection and biodiversity data discovery initiative. <http://www.insectcollection.org>.

ADVANCES IN COLLECTIONS DIGITIZATION AND BIODIVERSITY DATA DISCOVERY: STATUS AND ACCESSIBILITY OF THE UNIVERSITY OF MINNESOTA [VIRTUAL] INSECT COLLECTION (UMSP).

Paul P. Tinerella, G.M. Wilbrandt, J.L. Snyder, and R.W. Holzenthal, Department of Entomology, University of Minnesota, 1980 Folwell Avenue, Saint Paul, Minnesota, USA 55108.

Projects began in June 2011 to digitize, computerize, and make electronically accessible the collection holdings at the University of Minnesota Insect Collection (UMSP). The UMSP is among the top U.S. public institutional insect research collections and retains 3,772,949 specimens, representing 50,233 described species of insects and relatives (as of December 2011). To date, all major collection storage types including pinned insects, microscope slides, and a portion of ethanol preserved material (vials) have been digitized, constituting more than 3.2 million specimens. High-resolution

imaging techniques, as well as newly developed automated data capture methods have been implemented for digitization of the collection. Computerization of UMSP specimen images and associated biodiversity data is currently in progress, with integrated collection data stored in an imaged-based data repository (database) for electronic WWW access, data integration, and end-user discovery. Access to examples and this emerging collections biodiversity data resource is at: <http://www.insectcollection.org>.

MORTALITY FACTORS OF CUTWORMS IN FIELD CROPS IN MANITOBA.

Whitney Lodge-Zaparnick¹, and Barbara J. Sharanowski². ¹Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2; ²Department of Entomology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

Cutworms are difficult to control in agricultural crops as they are subterranean and nocturnal and are usually sporadically distributed within fields. Parasitoid wasps provide a natural means of control of cutworms. Unfortunately, we have a very limited understanding of which parasitoid species use cutworms as hosts in Manitoba, and how effective they are at controlling cutworm populations. Here we examined the parasitoid species attacking cutworms in Manitoba and investigated their effectiveness to control cutworms. Although some parasitoid species may be valuable control agents, we discovered that entomopathogenic fungi cause the highest mortality in cutworms, and thus, may provide efficient control of cutworms in Manitoba.

WHAT IS *SIGARA* (HETEROPTERA: CORIXIDAE)? 237 YEARS OF FASCINATIONS, FRUSTRATIONS, AND FACIES.

G.M. Wilbrandt and P.P. Tinerella, Department of Entomology, University of Minnesota, Saint Paul, Minnesota, USA 55108.

Since its inception by Fabricius in 1775, there has never been a comprehensive revision of the water boatman genus *Sigara* (Heteroptera: Corixidae). With over 200 described species worldwide, a large body of literature is available but remains fragmented, impeding our understanding of the group. This present review of *Sigara* includes an exhaustive literature search, initial morphological examination of North American subgeneric exemplars, and study of biology and biogeography, to better understand the current infrageneric classification. Results of the review will contribute to a modern infrageneric conspectus and revision of the group.

SYMPOSIUM:

BIOLOGICAL CHANGES IN LAKE WINNIPEG, MANITOBA'S GREAT LAKE

THE USE OF BENTHIC INVERTEBRATES IN AQUATIC BIOASSESSMENTS: STANDARD APPROACHES AND RECENT ADVANCES.

Lee Grapentine, Water Science and Technology Directorate, Environment Canada, Burlington, Ontario, Canada L7R 4A6.

Benthic invertebrates have been examined since the early 1900s in studies aimed at determining the spatial extent and degree of impacts of aquatic pollution and other forms of human disturbance. Their presence in almost any aquatic environment, sedentary habits, well understood biology, and known responses to a range of ecotoxicological stressors favour their use as indicators of environmental conditions. Bioassessments typically involve community-level analyses, as well as the responses of individual species. The key goals are to distinguish natural from human-induced variation in the biological endpoints and identify the cause of any adverse effects. Study designs include observational surveys, field experiments, and laboratory tests. Recent developments in approaches to bioassessments with benthic invertebrates include the analysis of ecological traits of community taxa, which allows indirect evaluations of functional responses to environmental factors, DNA barcoding for rapid characterization of the taxonomic composition of invertebrate samples, limiting-factor analysis to identify stressor-response relationships, and other formalized procedures for diagnosing causality of adverse effects.

LAKE WINNIPEG ZOOBENTHOS: A VIEW FROM THE BOTTOM OF THE LAKE.

Brenda J. Hann¹ and M. Wishart². ¹Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2; ²S. Watson, Environment Canada, National Water Research Institute, Burlington, Ontario, Canada L7R 4A6.

Many environmental stressors impinge on the state of the Lake Winnipeg ecosystem, primarily accelerated nutrient loading and climate warming over the last decades. What are the consequences to the zoobenthos and the benthic food web? Density and community composition in 1969 was contrasted with 2002-2011. Overall density of benthos in Lake Winnipeg has doubled since 1969, but with notably inter-annual fluctuation in lakewide density over the last decade. Benthos density is highest in the North Basin, followed by the Narrows, and the South Basin. Inter-annual and seasonal patterns of abundance of dominant taxa in Lake Winnipeg, e.g. Chironomidae, Oligochaeta, *Diporeia*, and *Hexagenia* were examined to assess the effects of eutrophication and climate warming (e.g. hypoxia, changes in stratification). Influences of these stressors on North Basin, the Narrows, and South Basin were also compared. *Diporeia* remained at highest density in the Narrows in all seasons, whereas chironomids and oligochaetes were most abundant in the North Basin. The Chironomidae/Oligochaeta

ratio, however, was higher in the Narrows and South Basin than in the North Basin, reflecting variation in the structure of the benthos community. Detailed spatial analysis of distributions of taxa is preliminary; however, benthos densities were elevated in the spring and fall in the North Basin. This was particularly striking in the fall, north and west of Long Point, especially at stations in the vicinity of Grand Rapids. Further examination is required at finer taxonomic resolution to understand spatial patterns that may be correlated with variation in sediment characteristics.

FINDINGS ON LAKE WINNIPEG PELAGIC ZOOPLANKTON SINCE THE 1969 FISHERIES RESEARCH BOARD OF CANADA SURVEY.

Alex Salki. Department of Fisheries and Oceans Biologist (retired), Salki Consultants, Inc., 981 Kilkenny Drive, Winnipeg, Manitoba, Canada R3T 4K5.

The 1969 Fisheries Research Board of Canada surveys on Lake Winnipeg provided baseline information on the seasonal structure and dynamics of its pelagic zooplankton community. During the following 43 years, the Department of Fisheries and Oceans did not support a formal zooplankton research program on Lake Winnipeg although DFO scientists did study components of the Lake Winnipeg-Nelson-Churchill River hydro project. All post-1969 Lake Winnipeg zooplankton samples were collected opportunistically through efforts organized by other agencies: the Geological Survey of Canada (1994), the International Joint Commission (1998) and the Lake Winnipeg Research Consortium (1999 – 2012). Findings from the GSC and IJC studies are published, all existing data from 1969 to 2007 are entered into the Lake Winnipeg Data Portal, but the bulk of zooplankton samples collected by the LWRC remain archived and unanalyzed. Observations of significant change in Lake Winnipeg zooplankton samples from 1994 to 2007 include significantly increased total crustacean abundance, an invasive cladoceran species, *Eubosmina coregoni*, now a North Basin dominant, decimation of the 2003 fall North Basin population of *Daphnia longiremis*, and the increased lakewide distribution of the cyclopoid, *Mesocyclops edax*. Although a second exotic cladoceran, *Bythotrephes cederstroemi*, was detected in Lake Winnipeg fish gut contents, it was not observed in 66 SB zooplankton samples collected in the 2010–2011 period. Further sample analyses and data assessment at the species level is recommended to examine the impact of Red River flooding and expansion of the Netley cut on South Basin zooplankton composition, to confirm the potential impact of blue-green algae on North Basin herbivores, and the impact of climate warming on the Lake Winnipeg ecosystem.

TEMPORAL AND SPATIAL VARIATION IN THE FISH COMMUNITY OF LAKE WINNIPEG.

Chelsey Lumb¹, Jeff Long¹, William Franzin², Brian Parker¹, Douglas Watkinson³, and Geoff Klein¹. ¹Manitoba Conservation and Water Stewardship, Fisheries Branch, 200 Saulteaux Crescent, Winnipeg, Manitoba, Canada R3J 3W3; ²Laughing Water Arts Science, Inc., 1006 Kilkenny Drive, Winnipeg, Manitoba, Canada R3T 5A5; ³Fisheries and Oceans Canada, 501 University Crescent, Winnipeg, Manitoba, Canada R3T 2N6.

Since at least the late 1800s, Lake Winnipeg has supported important subsistence, recreational and commercial fisheries. There have been many ecological changes in the lake over the last fifty years, from increasing nutrient loading to water level regulation and the introduction of non-native species. Despite its ecological, social and economic importance, dynamics of the fish community are not well understood. To understand better some of the patterns of temporal and spatial variation of the fish community in offshore waters of Lake Winnipeg, daytime midwater trawl surveys were conducted near lakewide monitoring stations beginning in 2002. Trawl samples collected during spring, summer and fall from the south basin, channel, and north basin were used to study effects of season and geographic region within the lake on fish species biomass estimates. Of the most commonly caught species, across all seasons, greater biomass of emerald shiner (*Notropis atherinoides*) and cisco (*Coregonus artedii*) were found in the south basin and the channel, compared to the north basin. Biomass of the non-native rainbow smelt (*Osmerus mordax*) was greater in the north basin compared to the south basin or the channel. Yellow perch (*Perca flavescens*) and introduced white bass (*Morone chrysops*) biomass varied temporally and spatially, with greatest biomass captured in the summer in the south basin. Estimated biomass of walleye (*Sander vitreus*) was greatest in the south basin, followed by the channel, and the north basin. Reliable estimates of fish biomass depend on sampling methods that account for temporal and spatial variation. In the summer of 2011, trawl samples collected from the north and south basin were used to compare fish biomass estimates from three depth strata, from surface to near lake bottom, from two diel periods (day and night). A suite of environmental variables was measured to assess patterns between the fish community and environmental variation. Results from this work will be presented. These data form a baseline against which effects of changes, such as lake trophic state or establishment of non-native species, can be assessed.

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Abell Pest Control

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Canadian Centre for Mosquito Management

Canadian Grain Commission

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68th Annual Business Meeting

13 October, 2012

Department of Entomology, University of Manitoba

Attendance

President	Lisa Capar
Secretary	David Wade
President-elect	Robert Lamb
Regional Director to ESC	Terry Galloway
Proceedings Editor	Terry Galloway
Member-at-Large	Barb Sharanowski
Treasurer	Ian Wise

- Neil Holliday
- Rob Currie
- John Gavloski
- Kathy Cano
- Kateryn Rochon
- Alejandro Costamagna
- Blaine Timlick
- Erica Smith
- Chalsie Warren
- Alexandra Grossi
- Jordan Bannerman
- Pat Mackay
- Robbin Lindsay

Regrets: Joel Gosselin, Désirée Vanderwel, Richard Westwood, Matthew Yunik, Colin Demianyk, Marjorie Smith

1. **Acceptance of Agenda**
Motion: Holliday/Mackay – to accept the Agenda (Appendix A)Carried
2. **Acceptance of the Minutes of the Last Annual Business Meeting (23 October 2011)**
Motion: Gavloski/E. Smith – to accept previous Minutes of the 67th Business MeetingCarried
3. **Business Arising from the Minutes**
There was no business arising from the Minutes.

4. Reports – Executive

Motion: Mackay/Holliday – to receive the reports.....Carried

Appendix B – President

Capar listed the major activities she was involved in on behalf of the Society for the past year. This included highlighting the letter she wrote to the Government of Canada protesting the closure of the Experimental Lakes Area research station.

Appendix C – Treasurer

Wise reviewed the financial statement for the year. The Society currently has \$54,491 in assets. Difference in revenue from 2011 is due to a smaller GST rebate. There was some general discussion about the financial statement from the Society members.

Appendix D – Regional Director to the ESC

Galloway reported that this year's ESC governing board meeting will be held in November in Edmonton. He also mentioned the ESC website was recently redesigned by Rick West and the ESC also started a blog and a Twitter account. Galloway also provided an update on The Canadian Entomologist and how the journal is doing in its current agreement with Cambridge University Press.

Appendix E – Editor of the *Proceedings*

Galloway reported that volume 67 (2011) was printed and distributed at this year's meeting but publication costs were not available yet. He is also looking for more scientific papers and notes to publish in upcoming volumes of the *Proceedings*. Sharanowski asked what the submission deadline was (May 1st) and Gavloski asked if colour can be used for the online version which Galloway agreed was doable.

Appendix F – Endowment Fund Board

Cano reported the principal stood at \$42,000 at the time of the meeting.

5. Reports – Committees

Appendix G – Finance

Cano reported that we are still in good financial shape.

Appendix H – Publicity/Newsletter

Presented by MacKay. Marjorie Smith replaced MacKay as co-editor and two issues were distributed in 2012. Thanks were given to those who have contributed material to the newsletters and they are always looking for more content contributions from the membership.

Appendix I – Social

Capar reported that the New Members Social was held on April 18th at the Granite Curling Club. Kathy Cano gave a very interesting and informative presentation about bed bug detecting dogs at the social.

Appendix J – Youth Encouragement/Public Education

Presented by Grossi. Minor renovations were made to the insectary to make

room for more insects and for giving tours to small groups. Business cards were designed and printed to give out to current and potential clients. A big thank you was given to all the volunteers who assisted with tours and presentations.

Appendix K – Archives

Sharanowski reported that there was no activity to report.

Appendix L – Common Names

Sharanowski reported that there was no activity to report.

Appendix M – Scholarship and Awards

Presented by Currie. The winners were as follows: Student Achievement – none awarded; Orkin/SWAT award – Zoe Rempel; ESM Graduate Scholarship – Matthew Yunik; Student Paper Competition – Michael Goblirsch.

Appendix N – Fundraising

Presented by Wade. \$1500 was raised from 13 donors from September 2011 to August 2012.

Appendix O – Scientific Program

Galloway reported that there were 59 registrations for this year’s meeting. There were 14 submitted papers, of which 6 were part of the student paper competition. There were also 6 submitted posters. Thanks were given to all the judges, the session chairs, and to Barb Sharanowski for organizing the food and beverages.

Appendix P – Membership

Presented by Currie. Membership is at 103, up from 94 last year.

Appendix Q – Web Page

Currie provided a summary of the status of the web site. Scanning of older Proceedings is occurring with the help of Robert Lamb.

Motion: Galloway/Holliday – to pay students to scan older copies of ESM publications.....Carried

6. Election Results

President-Elect..... Robbin Lindsay
Member-at-Large..... Lara Toews

Appendix R

Motion: Holliday/Currie – to destroy the ballotsCarried

Holliday mentioned not to include actual numbers with results. There was also a general discussion about ways to increase the number of votes returned including having a later deadline or an electronic voting option. Electronic option will be looked into further, including looking at what ESC uses.

7. New Business

Galloway presented on behalf of Brent Elliot a report about the upcoming International Congress of Entomology in Florida in 2016 and how it could impact our next joint ESC/ESM meeting. A general discussion followed re-

garding what we should do as 2016 would normally be our turn to host a joint meeting.

Motion: Holliday/Lamb – to have Regional Director invite ESC to hold a joint meeting in 2017Carried

8. **Moment of Silence for Deceased Members This Year**

No members passed away this year.

9. **Transfer of Office** – Lisa Capar to Robert Lamb

10. **Reappointment of Auditor**

Motion: Currie/Timlick – to entrust the Executive to make a decision regarding yearly auditsCarried

11. **Other Business** – None

12. **Adjournment** – 3:43 p.m.

Motion: Holliday – to adjourn the meetingCarried

APPENDIX A

**The Entomological Society of Manitoba, Inc.
Agenda of the Entomological Society of Manitoba
68th Annual Business Meeting
13 October, 2012**

1. Acceptance of Agenda
2. Acceptance of the Minutes of the Last Annual Meeting (22 October 2011)
3. Business Arising from the Minutes
4. Reports – Executive
 - President** – Lisa Capar
 - Treasurer** – Ian Wise
 - Regional Director to the ESC** – Terry Galloway
 - Editor of the *Proceedings*** – Terry Galloway
 - Endowment Fund Board** – Kathy Cano
5. Reports – Committees
 - Finance** – Kathy Cano
 - Publicity/Newsletter** – Marjorie Smith, Mahmood Iranpour
 - Social** – Lisa Capar
 - Youth Encouragement/Public Education** – Matthew Yunik
 - Archives** – Barb Sharanowski
 - Common Names** – Barb Sharanowski
 - Scholarship and Awards** – Richard Westwood
 - Fund-Raising** – Joel Gosselin
 - Scientific Program** – Terry Galloway
 - Membership** – Désirée Vanderwel
 - Web Page** – Rob Currie
6. Election Results – Scrutineer, Colin Demianyk
7. New Business
8. Moment of Silence for Deceased Members This Year
9. Transfer of Office
10. Reappointment of Auditor
11. Other Business
12. Adjournment

APPENDIX B

Entomological Society of Manitoba President's Report – Annual Business Meeting

The past year has been quite dry, but not in the world of entomology. Several events took place this year. Below is a list of some of the main items that came up this year that the President was involved with:

- In March, the ESM Executive met for our annual meeting. See minutes for details.
- In April, the Scientific Programme Committee met to plan this year meetings. A huge thanks to Terry Galloway for volunteering to chair this year's Scientific Programme Committee! The ESM Executive approved a budget of \$3000 for the meeting by e-mail vote.
- In June, I wrote a letter on behalf of the society in protest to the closing of ELA research station. Both Keith Ashfield and Stephen Harper's Correspondence Officer responded with letters thanking me for my correspondence.
- In July, the ESM Executive approved a donation to DEGSA for their new microscope and imaging system.
- In August, Michel Cusson (ESC President) was sent an invitation to attend our 2012 ESM meeting. He had to decline since he already nearly exhausted his travel credits for this year.
- We were approached by ESC to contribute to their blog. I did not yet submit anything, but Matt did on behalf of the grad students. Is someone interested in writing an abstract of our newsletter as a submission to the blog?

Lisa Capar
President, Entomological Society of Manitoba

APPENDIX C

Report of the Treasurer

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
FINANCIAL STATEMENTS
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2011

Ryan Rawluk Certified General AccountantPROFESSIONAL CORPORATION

REVIEW ENGAGEMENT REPORT**To the Members of:****Entomological Society of Manitoba Inc.**

I have reviewed the balance sheet of **Entomological Society of Manitoba Inc.** as at **August 31, 2011** and the statements of revenues and expenditures, and net assets 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 us by the Society.

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

These financial statements have been prepared using the cash basis of accounting as further described in Note 2. The effects of this departure from Canadian generally accepted accounting principles on the unaudited financial statements has not been determined.

My review indicates that, because these financial statements are prepared using the cash basis of accounting as described in the preceding paragraph, these financial statements are not in accordance with Canadian generally accepted accounting principles.

Winnipeg, Manitoba
September 28, 2011

 C.G.A.
Ryan Rawluk
Certified General Accountant
Professional Corporation

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
BALANCE SHEET
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2011

		ASSETS	
		<u>2011</u>	<u>2010</u>
CURRENT			
	Cash	\$ 9,344	\$ 11,561
	Money market fund (Note 3)	3,676	3,656
	Term deposits (Note 4)	<u>8,000</u>	<u>8,000</u>
		21,020	23,217
	TERM DEPOSITS (Note 4)	<u>33,280</u>	<u>32,280</u>
		<u>54,300</u>	<u>55,497</u>
CURRENT	LIABILITIES	nil	nil
		NET ASSETS	
	INTERNALLY RESTRICTED (Note 5)	41,280	40,000
	UNRESTRICTED NET ASSETS	<u>13,020</u>	<u>15,497</u>
		<u>54,300</u>	<u>55,497</u>
		<u>\$ 54,300</u>	<u>\$ 55,497</u>

APPROVED BY THE BOARD:

_____ Director

_____ Director

The accompanying notes form an integral part of these financial statements

Ryan Rawluk Certified General Accountant
PROFESSIONAL CORPORATION

**ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
STATEMENT OF REVENUES AND EXPENDITURES
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
FOR THE YEAR ENDED AUGUST 31, 2011**

	2011	2010
REVENUES		
Annual meeting	\$ 670	\$ 2,000
Donations	1,800	--
Interest income	1,143	1,173
Joint ESC/ESM Annual Meeting (Note 6)	--	6,305
Members fees	1,619	1,271
Miscellaneous	1,284	66
Proceedings	31	329
Youth encouragement and public education	650	550
	7,197	11,694
EXPENDITURES		
Awards and scholarships	1,500	2,100
General	2,061	845
Meetings	2,473	2
Newsletter	143	460
Proceedings	1,771	327
Social committee	--	273
Youth encouragement and public education	446	298
	8,394	4,305
EXCESS/(DEFICIT) OF REVENUES OVER EXPENDITURES	\$ (1,197)	\$ 7,389

The accompanying notes form an integral part of these financial statements

Ryan Rawluk Certified General Accountant
PROFESSIONAL CORPORATION

**ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
STATEMENT OF CHANGES IN NET ASSETS
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
FOR THE YEAR ENDED AUGUST 31, 2011**

	<u>Internally restricted</u>	<u>Unrestricted net assets</u>	<u>2011 Total</u>	<u>2010 Total</u>
Balance, beginning of the year	\$ 40,000	\$ 15,497	\$ 55,497	\$ 48,108
Excess/(deficit) of revenues over expenses	--	(1,197)	(1,197)	7,389
Fund transfer	1,280	(1,280)	--	--
Balance, end of the year	<u>\$ 41,280</u>	<u>\$ 13,020</u>	<u>\$ 54,300</u>	<u>\$ 55,497</u>

The accompanying notes form an integral part of these financial statements
Ryan Pawluk Chartered General Accountant

PROFESSIONAL CORPORATION

**ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
NOTES TO THE FINANCIAL STATEMENTS
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2011**

NOTE 1 PURPOSE OF THE ORGANIZATION

The Entomological Society of Manitoba Inc. ("The Society") was formed to foster the advancement, exchange, and dissemination of entomological knowledge. The Society 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 interest is not accrued. Capital assets are expensed when acquired and, therefore, there is no annual amortization allowances.

NOTE 3 MONEY MARKET FUND

The Society has a money market fund with Royal Mutual Funds Inc. The investment is highly liquid and consists of short-term government bonds. The investment is shown at market value at year-end.

NOTE 4 TERM DEPOSITS

The Society has five term deposits with Royal Trust Corporation of Canada. The term deposits generally have five year maturities and interest is paid annually. The table below summarizes the term deposits.

<u>Certificate Number</u>	<u>Interest Rate (%)</u>	<u>Maturity Date</u>	<u>Par Value (\$)</u>
900055611-0010	4.000	Nov 16, 2011	\$ 8,000
Total current term deposits			\$ 8,000
900055611-0011	3.850	Nov 9, 2012	\$ 8,000
980006276-0012	3.500	Dec 12, 2012	8,280
900055611-0012	3.000	Nov 5, 2014	8,000
900055611-0013	2.100	Nov 16, 2015	9,000
Total long term term deposits			\$ 33,280

NOTE 5 INTERNALLY RESTRICTED NET ASSETS

The Society's board of directors has internally restricted \$41,280 (August 31, 2010 - \$40,000) to be held for endowment purposes. These internally restricted amounts are not available for unrestricted purposes without approval of the board of directors.

Ryan Rawluk Certified General Accountant
PROFESSIONAL CORPORATION

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
NOTES TO THE FINANCIAL STATEMENTS
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2011

NOTE 6 JOINT ESC/ESM MEETING

In October 2009, the Society hosted a joint annual meeting with the Entomological Society of Canada. The revenues and expenses of the joint annual meeting are shown as a net figure on the statement of revenues and expenditures. The following statement shows the breakdown of the revenues and expenditures of the joint annual meeting.

	<u>2011</u>	<u>2010</u>
REVENUES		
Donations	\$ --	\$ 25,369
Registration fees	--	57,669
	<u>--</u>	<u>83,038</u>
EXPENDITURES		
Bank service fees	--	1,649
Facility rental	--	47,037
Printing and promotional	--	3,417
Refunds	--	793
Speaker and special guests	--	1,295
Travel	--	17,695
Volunteers	--	2,100
	<u>--</u>	<u>73,986</u>
EXCESS OF REVENUES OVER EXPENSES	<u>\$ --</u>	<u>\$ 9,052</u>
ALLOCATED AS FOLLOWS:		
Earned by Entomological Society of Canada	--	2,747
Earned by Entomological Society of Manitoba	--	6,305
	<u>\$ --</u>	<u>\$ 9,052</u>

NOTE 7 STATEMENT OF CASH FLOWS

A statement of cash flows is not included with these financial statements as the Society uses the cash basis of accounting and it would not provide any useful information that cannot be attained by the balance sheet and the statement of revenues, expenditures, and surplus.

**ENTOMOLOGICAL SOCIETY OF MANITOBA INC.
NOTES TO THE FINANCIAL STATEMENTS
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)
AUGUST 31, 2011**

NOTE 8 FINANCIAL INSTRUMENTS

The Society's financial instruments consist of cash, money market fund, and term deposits. Unless otherwise noted, it is our opinion that the Society is not exposed to significant interest rate, currency, or credit risk arising from these financial instruments. The fair value of the instruments approximates their carrying values.

Interest rate risk

The Society's cash is held in an interest bearing account. The Society's cash, money market funds, and term deposits are all subject to prevailing market conditions.

APPENDIX D

Entomological Society of Manitoba Report of the ESC Regional Director

The Entomological Society of Canada is the national forum for entomologists, and continues to evolve to meet the needs of its members across the country. The website (<http://www.esc-sec.ca/index.php>) was recently redesigned by Rick West to provide easy navigation and access to information about the society. Not to be left behind in this world of evolving social media, ESC now has a blog (<http://escsecblog.com/>) and The Canadian Entomologist is on Twitter.

The ESC President this year is Michel Cusson (Service canadien des forêts, Ressources naturelles Canada, Sainte-Foy, QC) and he will preside over the governing board meeting in Edmonton on 3 November. Rosemarie DeClercke-Floate (Agriculture and Agri-Food Canada, Lethbridge) is 1st Vice-President, and Rebecca Hallett (University of Guelph) is 2nd Vice-President. The next ESC Annual Meeting is coming up quickly; this, a joint meeting with the Entomological Society of Alberta, will be held in Edmonton, 4-7 November, 2012.

Cedric Gillott is the editor of the ESC Bulletin. If you have articles or information to submit to the Bulletin, please send them directly to Cedric at the Department of Biology, University of Saskatchewan, Saskatoon, SK S7N 5E2, cedric.gillott@usask.ca. Cedric always appreciates interesting submissions and any good suggestions for articles about our regional entomological activities.

The new Editor-in-Chief of The Canadian Entomologist is Christopher Buddle, Department of Natural Resource Sciences, McGill University, Macdonald Campus, Ste-Anne-de-Bellevue, chris.buddle@mcgill.ca. Chris and the Publications Committee have ushered in the next phase in publication of TCE, which is a seven year agreement with Cambridge University Press, officially begun 1 January, 2012. Manuscript submission and management are now done electronically through the user-friendly on-line system, ScholarOne Manuscripts. Potential authors should note, pages charges for publication in TCE have been eliminated, and there is no charge for colour. This suddenly makes TCE an extremely attractive journal for your manuscripts. In addition, since manuscripts first entered the new publication stream in September of 2011, turn-around times have been 30 days or less. Once a manuscript has been accepted, CUP has EarlyView, which allows PDF access to manuscripts as soon as they are ready, available up to several weeks before the article appears in the print version of TCE. Although there were some initial delays in the transfer of back issues to CUP, everything is now available on-line. Chris Buddle and the editorial team have initiated theme issues for TCE, the first of which is "Perspectives on Arctic Arthropods". At last notice, this first theme issue should be published early in 2013.

This is the last report in my term as Regional Director to ESC. It has been a pleasure to serve ESC in this capacity. I encourage you all to explore the benefits of membership in ESC, and to participate to the extent you are able in Society business and activities.

Terry Galloway
Regional Director

APPENDIX E

Entomological Society of Manitoba Report of the *Proceedings* Editor

Volume 67 (2011) of the *Proceedings of the Entomological Society of Manitoba* was sent to Warren Schuetz and his staff in The University of Winnipeg print shop in September, and was available for distribution to the ESM membership in time for the Annual General Meeting. Volume 67 consists of 49 pages, with one submitted manuscript, the abstracts from the Annual Meeting of the Entomological Society of Manitoba held at the Freshwater Institute and the Department of Entomology on 21-22 October, 2011, and the Minutes of the 67th Annual Business Meeting of the Entomological Society of Manitoba held on 22 October in Room 219, Animal Science/Entomology Building. Bound copies of the *Proceedings* were printed and available just this week, so I don't know the total cost yet. I shall present the bottom line to the ESM Executive at its next meeting. Warren and his staff have been great to work with on the production of the *Proceedings*; he makes things as simple and easy as possible in the production process. After several times through this exercise, I guess we have many of the bumps smoothed out.

There was again a small number of submitted manuscripts for Vol. 67, only two. One manuscript, if accepted, will be published in Vol. 68. If you have a manuscript of relevance to entomology in Manitoba, I encourage you to consider submitting it to the *Proceedings*. Scientific Notes as well as full Scientific Papers are welcome. All submitted manuscripts are peer-reviewed; all published papers are available as PDF's reprints on the web. Rob Currie has already posted Volume 67 on the ESM website; thanks very much to Rob who posts the *Proceedings* so efficiently, even when he is on Research Study Leave! The *Proceedings* are fully accessible using on-line search engines. There are no page charges to authors for published manuscripts of reasonable length. The *Proceedings* are freely available to entomologists around the world, so your papers will have international access at the touch of a button.

My thanks go to authors who submitted manuscripts last year and to the anonymous reviewers for their assistance.

Proceedings Editor
Terry Galloway

APPENDIX F

ENTOMOLOGICAL SOCIETY OF MANITOBA Report of the Endowment Fund Board for 2011-2012

A summary of investments and projected interest income for the fiscal year is attached (Table 1). Interest generated by the Endowment Fund provides a basis for funding the publication of the Proceedings and other Society activities. The Endowment Fund principal was \$41,000 as of October 2012.

The \$8,000 GIC #900055611-0011 matures on 9 November, 2012 and will be reinvested for an additional 5 years and the interest will be paid annually into the chequing account.

The \$8,000 GIC #960006276-0012 matures on 12 December 2012 and will be reinvested for an additional 5 years and the interest will be paid annually into the chequing account.

Kathy Cano, Chair
Marjorie Smith
Ian Wise
Pat MacKay

APPENDIX G

ENTOMOLOGICAL SOCIETY OF MANITOBA Report of the Finance Committee for 2011-2012

The Finance Committee will be meeting in early November 2012 to review the 2011-2012 financial statement and the budgets for the current and next fiscal years. The Society continues to be in good financial shape.

Kathy Cano, Chair
Marjorie Smith
Ian Wise

ENTOMOLOGICAL SOCIETY OF MANITOBA

Income and expenses for fiscal year ending 31 August.

BUDGET ITEMS	2011-2012	2012-2013	2013-2014
REVISED 12 October 2012	Actual	Actual and Projected	Projected
ASSETS			
T-Bill Account/Chequing	13,000	13,000	13,000
Endowment Fund	43,183.50	43,183.50	44,000
REVENUE			
Membership Dues	1,498.50	1,400	1400
Proceedings	159.23	200	200
Social Committee	0	300	300
Youth/Education Committee	575	500	500
Donations: from YEC activities	0	100	100
fundraising for AGM	1,700	1,600	1,600
student awards		200	200
Fundraising Committee	0	0	0
Meetings: ESM/AGM	775	800	800
Interest: G.I.C. income	1057.43	1,100	1,100
Miscellaneous	136.64	1,100	1,100
TOTALS	5901.80	7,000	7,000
EXPENSES			
General Society Expenses	1,182.40	800	800
Proceedings	759.36	500	500
Newsletter	281.62	600	600
Social Committee	163	200	
Youth/Education Committee	153.46	200	200
Fundraising Committee	0	0	
Student Awards and Scholarships	1,500	1,500	
Meetings: ESM/AGM	896.01	2,000	
Donations	900	0	0
Representation at ESC	0	600	600
TOTALS	5835.85	6,400	6,000
Net gain (loss), year ending Aug. 31	65.95	300	300

APPENDIX H

Entomological Society of Manitoba Report of the Newsletter Committee

The Newsletter Committee produced two Newsletters in the last fiscal year. Volume 38, issues 2 and 3, were produced as a combined issue and distributed in January 2012. The cost for this combined issue of 14 pages was \$101.64. Former co-editor Patricia MacKay resigned after completing and distributing Volume 38. Mahmood and the new co-editor Marjorie Smith would like to thank Pat for 8 years of generous service to the committee.

Volume 39.1 consisted of 14 pages and was distributed in June 2012. Printing cost was \$96.04. Additional costs were \$50.35 for stamps and \$33.59 for mailing envelopes.

Currently \$600 is budgeted by the Society for the Newsletter, \$180 for each of three issues and \$60 for supplies. We were well within that limit this year.

Thank you to those ESM Members who generously contributed articles for publication in the ESM Newsletter. Items for future issues would be most welcome.

Marjorie Smith
Mahmood Iranpour
Co-editors, ESM Newsletter

APPENDIX I

Entomological Society of Manitoba Report of the Social Committee

On April 18th, we had our New Members Social at the Granite Curling Club. Kathy Cano spoke about the training and use of bed bug detecting dogs. During her presentation she showed us videos of live bed bugs and specially trained dogs sniffing the critters out. Thanks Kathy for the interesting and informative presentation. If anyone is interested in speaking at one of our social events, we would be pleased to have you present your research; you can contact me or another committee member for more information.

The ESM Executive agreed to give discounts to students attending this year's New Members Social.

Lisa Capar
Chair, Social Committee

APPENDIX J

Entomological Society of Manitoba Youth Encouragement and Public Education Committee

The society's youth encouragement program has continued to disseminate entomological information to youth groups and interested parties for another year. Shortly after the last meeting, we received a \$200 grant from the Entomological Society of Canada. This funding was, in part, used for some minor renovations to the insectary in the Department of Entomology. We now have more space for new colonies and have made the rearing room a more pleasant place in which to work and provide small groups with tours. Part of this funding was also used to cover the cost of printing our new business cards, designed by Jonathan Veilleux. These cards have been provided to the coordinators of the various youth groups we visited through the year and to interested parties at the festivals where we have had demonstrations.

One such event was the City of Winnipeg's 4th Annual Monarch Butterfly Festival held on July 17 at the Living Prairie Museum. This was the Society's first time attending this event and we really stole the show. We have been invited back for the next festival and this will likely become an annual event for us.

I am also pleased to report that the society's youth encouragement program continues to work with the Faculty of Agricultural and Food Sciences' Information Office. Throughout the year, we have sent entomological ambassadors, human and insect, to Aggie events promoting the department and studies in Entomology.

Finally, thanks to all those volunteers within the society who assisted with tours and presentations. Included in this group are the undergraduates in the Department of Entomology who are taking an active role in assisting with presentations and the responsibilities in the rearing room.

Matt Yunik
Chair, Youth Encouragement & Public Education
Committee

APPENDIX K

Entomological Society of Manitoba Report of the Archivist

No activity to report.

Barb Sharanowski
Archivist

APPENDIX L

Entomological Society of Manitoba Report of the Common Names Committee

No activity to report.

Barb Sharanowski

APPENDIX M

Entomological Society of Manitoba Report of the ESM Student Awards and ESM Scholarship Committee

ESM Student Achievement Award:

The purpose of this Award is to encourage and reward student interest in Entomology. It is awarded to a student who is in their final year of a Bachelor's degree program and has shown an exceptional interest in entomology, as evidenced by their insect collections, insect photography, published articles of entomological interest, excellence in class assignments in entomology, insect experiments or outstanding contributions during summer employment.

There were no nominations for the ESM Student Achievement Award this year. Nominations may have been discouraged since the criteria for the Award indicate that the candidates should be chosen from students who are majoring or planning to major in entomology – however, there is currently no university in the province that offers a Major in Entomology. The Scholarship Committee will make a recommendation to the ESM Executive to revisit the description for this award.

Orkin 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 of the Orkin Student Award is Zoe Rempel. Zoe is currently a third year student working towards her B.Sc. in Biological Sciences, and has taken several courses in Entomology, including World of Bugs, Pollination Biology, Insect Taxonomy and Morphology, and Crop Protection Entomology. Zoe has an impressive GPA, which helped her to be awarded the highly coveted NSERC USRA two years in a row. Zoe spent her first summer on the NSERC USRA program under the supervision of Dr. Terry Galloway studying wildlife ectoparasites. According to Zoe, this is when she discovered that she loved entomological research – in her own words, she loves “the thrill of discovery and the continuous questions that arise”. Since the

summer of 2011, Zoe has also worked with Dr. Paul Fields, studying the biology and ecology of stored product insects, and with Dr. Alejandro Costamagna, studying bee assemblages visiting soybeans in Manitoba. Zoe has presented the results of her work at the Annual University of Manitoba Undergraduate Research Poster Competition and at the Entomological Society of Manitoba Annual Meeting; she has volunteered in the Annual Monarch Butterfly Festival and in the Department of Entomology as a Youth Encouragement Presenter. All things considered, Zoe is a highly deserving recipient of the Orkin Student Award.

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 Oct. 1 of the award year. This award recognizes superior scholastic ability, high research potential as evidenced by industriousness, good judgement, originality, a conscientious attitude and organizational ability, and excellent communication skills.

This year's winner is Matt Yunik. Matt earned his B.Sc. (Hons) from the University of Manitoba in 2011, and is currently working towards a M.Sc. in Entomology under the supervision of Dr. Terry Galloway, studying vectors of bovine anaplasmosis in southeastern Manitoba. Matt accumulated considerable experience in entomology and vector ecology during his undergraduate career: his undergraduate thesis was on ectoparasites of Richardson's ground squirrel, he worked one summer in the Cadham Provincial Health Lab on West Nile Virus, and he spent two summers with the City of Winnipeg Insect Control Branch. Matt is a hard worker, a talented and knowledgeable researcher and is described as "a curious student" by one of his referees. Matt has also been very active in the Department of Entomology Graduate Students' Association and the Youth Encouragement and Public Education Committee of ESM.

Joel Gosselin,
Rhéal Lafrenière
Taz Stuart
Désirée Vanderwel (Acting Chair)

APPENDIX N

Entomological Society of Manitoba Fundraising Committee

The Fundraising Committee raised a total of \$1,500.00 from 13 donors to cover some of the costs of the AGM, such as bringing in the speakers from out of town. The Fundraising Committee acknowledges the continued support of our sponsors in making the AGM successful in providing quality speakers for this very educational event.

Joel Gosselin,
Chair, Fundraising Committee

APPENDIX O

Entomological Society of Manitoba Report of the Scientific Programme Committee

The 68th Annual meeting of the Entomological Society of Manitoba was held at the Freshwater Institute on 12 October and in the Entomology/Animal Science Building on 13 October, 2012. A total of 59 people (22 students; 34 regular members; 3 day registrants) registered for the meeting. This year's theme was "Biological Changes in Lake Winnipeg, Manitoba's Great Lake". The keynote address was delivered by Dr. Robert Hecky, F.R.S. Canada, Biology Department and Large Lakes Observatory, University of Minnesota-Duluth, 2205 East Fifth Street, Duluth, MN 55812 USA. Bob is a former Fisheries and Oceans Canada research scientist who worked for many years in the Freshwater Institute, and who is well versed in problems faced in large lakes, in Lake Winnipeg in particular. His address was titled, "The challenge in managing eutrophication in Lake Winnipeg: an exceptional great lake". Bob provided his audience with the sobering realities of the similarities in the deterioration in water quality in Lake Winnipeg with what has been documented in Lake Erie. He provided a superb foundation for our symposium speakers on Saturday morning. There were 14 submitted papers presented during the morning and afternoon sessions on Friday, 12 October. Of these, there were six papers submitted for the student competition. Special thanks to Rob Currie, Ahmed Abdelgheny and Matt Yunik for serving as judges for the student paper competition (being a judge is one of the most difficult jobs associated with a scientific meeting), to the chairs for the Friday sessions (Alejandro Costamagna, Kateryn Rochon and Mahmood Iranpour), and to Lars Andreasson and Rassol Bahreini for their assistance with loading and projecting the presentations. Although the number of student presented papers was down, there were six posters, including two submitted by students from the University of Minnesota. There was also one poster submitted by an undergraduate student. Zoe Rempel was an NSERC Undergraduate Summer Research Assistant in 2012. These student posters are a tribute to their dedication and an indication of what the future might hold for these young entomologists. Thanks, too, to Barb Sharanowski who stepped in and organized the beverages and superhealthy snacks for the meeting. This became something of a challenge on Friday, since the cafeteria in the Freshwater Institute was no longer in operation.

On Saturday morning, 13 October, the symposium on the theme, "Biological Changes in Lake Winnipeg, Manitoba's Great Lake" continued in Room 219 in the Entomology/Animal Science Building on the University of Manitoba campus. Thanks to Don Cobb who chaired the session and to Alexandra Grossi who served as projectionist.

Invited speakers and their titles in the symposium were:

The use of benthic invertebrates in aquatic bioassessments: standard approaches and recent advances. **Lee Grapentine**, Water Science and Technology Directorate, Environment Canada, Burlington, ON L7R 4A6.

Lake Winnipeg zoobenthos: a view from the bottom of the lake. **Brenda Hann**, Department of Biological Sciences, University of Manitoba, Winnipeg, MB R3T 2N2.

Findings on Lake Winnipeg pelagic zooplankton since the 1969 Fisheries Research Board of Canada survey. Alex Salki, DFO biologist retired, Salki Consultants Inc., 981 Kilkenny Drive, Winnipeg, MB R3T 4K5.

Temporal and spatial variation in the fish community of Lake Winnipeg. **Chelsey Lumb**¹, Jeff Long¹, William Franzin², Brian Parker¹, Douglas Watkinson³, and Geoff Klein¹. ¹Manitoba Conservation and Water Stewardship, Fisheries Branch, 200 Saulteaux Crescent, Winnipeg, MB R3J 3W3; ²Laughing Water Arts Science, Inc., 1006 Kilkenny Drive, Winnipeg, MB, R3T 5A5; ³Fisheries and Oceans Canada, 501 University Crescent, Winnipeg, MB R3T 2N6.

In the afternoon, the Annual General Business Meeting was attended by 20 members.

Special thanks go to Pat MacKay and Bob Lamb who once again opened their home to host the meet-the-speaker mixer. The mixer is a special part of the ESM annual meeting, and an evening that everyone looks forward to, in large part due to the gracious hosts.

Thanks again to Joel Gosselin, who served as chair of the Fund-raising Committee. There were a number of sponsors who contributed to the operations of the annual meeting; a list of contributors was printed along with the Abstracts, and posted in the break room on Friday.

Thanks go to our keynote speaker, Bob Hecky and the symposium speakers for their contributions to a stimulating focus for the meeting. It never ceases to amaze me that a small society such as ours is able to offer a meeting with such a diversity of interesting presented papers and posters. Thanks very much to these contributors and to the Executive for their continued support for the meeting. Thanks to Ian Wise and Bob Lamb for their efficient management of the registration desk. John Gavloski and Marj Smith provided some of the back-up files from the 67th Annual Meeting to facilitate preparation of this year's documents. As in any meeting, there are always many people who contribute in many ways when called upon, sometimes in the face of emergency. Thanks to all of you.

Scientific Programme Committee

Lisa Capar, Don Cobb, Terry Galloway (Chair), Dave Rosenberg, Joel Gosselin (Fund-raising Committee)

APPENDIX P

Entomological Society of Manitoba Report of the ESM Membership Committee

There are currently 103 members in the ESM, compared to 94 last year. I thank Ian Wise (Treasurer) for his careful record keeping of the membership.

Désirée Vanderwel

Chair, Membership Committee

APPENDIX Q

Entomological Society of Manitoba Web Site Report

The Entomological Society of Manitoba operates a website that is currently hosted through the public access portion of Paul Field's personal University of Manitoba web page. The website contains information about the Society and its committees, dates of meetings, programs for meetings, and provides links to other sources of entomological resources on the web.

The new website design that was created by Jonathan Veilleux seems to be working well. The website contains copies of the newsletter and *Proceedings*. These are typically posted shortly after (or before) they are released to the membership. PDF-reprints of papers that have been published in the *Proceedings* are available on the site and papers from back issues are posted for years dating back as far as 1989. These papers are picked up by many search engines and thus provide a wide exposure for the published research. Older papers will be posted if scanned pdf's are provided to the web master; no additional archived papers were posted but new reprints from the proceedings were added.

Any suggestions for additions or changes to the website should be forwarded to Rob Currie, Dept. of Entomology, University of Manitoba (rob_currie@UManitoba.ca).

Rob Currie

APPENDIX R

Entomological Society of Manitoba Election Report 2011-2012

Elections closed September 10, 2012 for the Entomological Society of Manitoba offices of President-elect, Member-at-Large and Regional Director. The successful candidate for President-Elect is Robbin Lindsay, for Member-at-Large is Lara Toews, and for Regional Director is Kateryn Rochon. We thank all candidates for their willingness to participate in the election. Formal announcement and commencement of terms will be at and after the ESM Annual Business Meeting, respectively. The time, date and location of the meeting will be announced at a later date.

Colin Demianyk, Chairperson, Scrutineer Committee
Ian Wise, Witness

