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The 59th MES Annual Meeting is a Comin' to Drummond!

14-16 June 2013 - Please mark your calendars and hold the dates

Martin J. Andree, President-Elect
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Our 2013 Annual Meeting will be held at the beautiful Drummond Island Resort on Drummond Island, "The Gem of the Huron." Just an hour east of the Mackinaw Bridge, at the eastern end of Michigan's Upper Peninsula, Drummond Island offers a relaxing and idyllic location for our meeting. Drummond is also home to a very unique habitat called alvars that are characterized by exposed limestone, site specific flora and fauna, and widely fluctuating water levels. Alvars are found in only a few spots around the globe, such as in northern Europe, the United Kingdom, and the Great Lakes region, including Michigan's own Drummond Island!

The MES Governing Board is lining up a host of speakers who will focus on this fabulous habitat and local island history. The Annual Meeting will be a bit of a departure from past meetings, as we hope to spend as much time as possible outdoors. In addition to our traditional presentations, we are arranging field trips led by authorities on the island's unique features. We already have a commitment from Brad Slaughter an ecologist and botanist with Michigan Natural Features Inventory, **Continued on page 20**

Breaking Diapause 2013

16 March 2013; 10 am - 2 pm
University of Michigan
Biodiversity Research Collections
3600 Varsity Drive, Ann Arbor, MI

The 2013 MES Breaking Diapause gathering will be held in the new Biodiversity Research Collections (BRC) on Varsity Drive in Ann Arbor, MI on 16 March 2013. The Museum of Zoology's wet collection and the University Herbarium are currently located there, and within 3 years, the dry collections from the Museums of Zoology, Anthropology, and Paleontology will be transferred to redesigned space at the complex. Our wet collection facility is state of the art, and tours will be available of the vast collections.

Easily accessed from I-94, the BRC complex is situated in the former University Stores warehouses at the north end of Varsity Drive. There is ample free parking, and there are nearby eating establishments on State Street.

Take Exit 177 S onto State Street from I-94, go E on Ellsworth, and go N on Varsity Drive (just after the RR tracks). Take Varsity Drive to the end, following the signs that say "University Herbarium." You will be entering at the front entrance, which will be marked for the event.

For more information, contact Mark O'Brien via e-mail at mfobrien@umich.edu, or call 734-647-2199.

See Map on p 31

2012-2013 Officers of MES

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Current Annual Dues Schedule

Student $12.00
Active $25.00
Sustaining $35.00
Institutional $45.00
Life $500.00

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The Wisconsin Dragonfly Society (WDS) will have its first meeting of 2013 on June 7 – 9, at the UW-Waukesha Field Station (10 miles west of campus off Hwy 18 at W349 S1480 S. Waterville Road). The meeting is designed to ignite regional interest in odonates, offer training in identification, explore some interesting habitats, and provide plenty of opportunities for relaxed camaraderie among dragonfly enthusiasts. For more information contact Alex Johnson (Johna1529@uwc.edu). For information about the WDS, contact Bob DuBois (robert.dubois@wisconsin.gov) and like us at our facebook page (https://www.facebook.com/WisconsinDragonflySociety).

Martinoptera

Bugs: The Gateway Pet

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Compared to dogs, cats, gerbils or hedgehogs, bugs as pets have a difficult time winning a lot of hearts and are not very popular pets. While this may be true for most of the world, bug pets are de rigor for the entomologically minded, especially in our youth. We hold in abeyance the defining characteristics of traditional pets, as we lie to ourselves and believe a terrarium full of cockroaches will come when we call, fetch our slippers, and curl up next to us on the couch as we read by the fire.

As a small boy, returning from my constant campestral wanderings with jars full of ants, beetles and caterpillars, it was inevitable that my first pet would be a bug. The one bug pet that stands clearest in my mind was a large, pale green, female praying mantis. I picked her up on the side of our garage and promptly ensconced her in a cricket cage that my grandfather had made for me. The cage's original intent was to hold crickets as bluegill bait. I still have it sitting on a shelf in my office. It's made out of scrap pine boards and window screen. Standing a foot tall with an eight-inch square base, the top has a round access door cut in on an angle, like the top of a jack-o-lantern. It's hinged, secured by a storm window turn latch and crowned with a grubby red, plastic knob. After plopping in my new pet mantis, I added a twig that lodged diagonally across the cage and stood back to admire how craftily I had made her new home look so natural. Not satisfied with the look and feel quite yet, I added a compliment of miniature field artillery pieces, a Matchbox garbage truck, several toy soldiers from the French side of the Napoleonic Wars and one of those strange naked troll dolls with orange hair. It was all so lifelike and natural in every way. I was very pleased.

The next several weeks were spent in constant pursuit of nourishment for my new pet. She ate constantly and her care was a full time job. I turned into a grasshopper hunter extraordinaire. Bounding over the fields that bordered the cemetery behind our house, I would exhibit acrobatic feats of the most nimble character as I netted grasshopper after grasshopper. I gently removed them from the folds of the netting and carefully placed them in an olive jar filled with lawn clippings, complete with a stopper made out of a wad of newspaper. I was a grasshopper-hunting machine. I could be no other, as her appetite proved insatiable.

On our back porch, sitting in her resplendent realm, my giant green dragon would sway on her perch, lording over the battle between Napoleon, the troll and the garbage collectors. I would study her through the screen; her eyes followed mine as I walked around the cage. Here she was, the supreme predator of the insect world, the giant monster of the miniature world I had created below her and she was watching me, studying my habits. It was a bit unnerving, as I always seemed drawn into her world. It didn't take but a minute and I was an inch tall and she was the

size of a Macy's Thanksgiving Day parade balloon and I was fixing bayonets along with France's finest.

It was hypnotic. When I would eventually snap out of it and assume my normal proportion, I would reach for the olive jar of hoppers. The inside of the jar would be covered with grass clippings, condensation, swarming hoppers and gross, running stains of their dark brown saliva, universally known to all kids as "tobacco juice."

I would work loose the newspaper stopper, turn the latch on the cricket cage, open the top just a crack, and then release the unsuspecting hopper into the lions' den. For the events that were about to unfold, for an eight-year-old boy, the reward of this pet ownership was beyond the pale. No dimwitted hamster, lethargic guinea pig or terrified guppy could ever compare.

The second the hopper hit the deck, the frozen statue of the lethal pet awoke. Like an alien cyborg, it's mechanical head, the triangle of a thousand terrible deaths, would click a few degrees toward the hopper. Just the head would move and then the dance would begin. The hopper, doing what he does best, would begin to mindlessly hop about. Not being much of a tactician and never one to take stock of his situation and develop a battle plan, let alone a survival strategy, the hopper ignored the resources at his feet. Instead of having a parley with the French, the garbage haulers and the troll in hopes of marshaling their forces to take out the menacing threat of the green dragon above, he hopped around willy-nilly, knocking over the soldiers and forever ruining their well-positioned enfilade of fire. His mad hopping sent the garbage truck hurling into the artillery like a well-played tiddlywink, and finally he grossly spewed tobacco juice all over the troll's perfectly quaffed orange hair. As battle plans go, the hopper could have done better. I write this off as a fault of his phylogenetic history. Hoppers are pack animals and when separated, they tend to not think too clearly. It was immediately clear that his jumpy disposition did not favor personal heroics of any kind. He was doomed and I knew it.

Unlike the hopper, the mantis remained steady and focused. In the face of the reigning chaos on the battlefield below, only her pseudopupil moved as she followed the blundering hopper's every mistake. Evolution favors her lone wolf hunter status. I would have liked to ask her husband about her predilection for working alone, but after being duped by love, he mistakenly agreed to join her for a romantic dinner. It was his last. As an eight year old, the love life of the mantids (and all other creatures for that matter) was of little concern to me, but had I known about the concept of sexual cannibalism, at some point I might just have asked myself, "Wait a gosh darned minute! What the heck kind of pet do I have here?" To be honest, this knowledge still gives me pause.

I was mesmerized by the dance between predator and prey but I was in awe of her deadly patience. Her terrifying beauty was not just held in her sinister and elegant design, but also in her approach. Nothing hurried her; she was the epitome of grace under pressure, of steady to shot. She knew her limitations, the length of her reach, the speed of her jab. So we waited, she and I both knowing that the hopper would make a mistake. Sooner or later, he would screw up, not pay attention, forget about the monster and venture too close. I couldn't leave. I felt like a very young Nostradamus, I knew the outcome and I had to see the prophecy fulfilled.

As hard as I tried to watch, to catch the motion, to see the fantastic, it escaped me. She was too fast. She was too good at the game. The hopper would settle down and lose whatever common sense he had. He would stop hopping and start walking. First over the ruins of the battlefield, then up the troll's leg and then up the side of the screen, closer and closer to the praying mantis who was praying for him to move just one more millimeter in her direction.

Then it would happen, he would take one more step and in a flash the mantis would strike like a bolt of lightning and grab the hopper. It always happened so fast, I was never sure if I had seen the movement or not. It was like a shadow in the corner of my eye. It was what made it so addicting to watch. The hopper was on the screen and a nanosecond later he was in her grasp. She showed no emotion, her eyes like a shark, her forearms tightening, the hopper was held fast. The game was up.

When it was over, the hopper's wings and parts of various legs rained down on the field of battle. The rest was consumed with perfect sinister precision. She never missed a beat and watched me as I watched her consume her meal.

After a few weeks the game ended up something like grasshoppers zero, mantis thirty-two, and things slowly began to change. She was growing larger and larger, her abdomen swelling. I chalked all of this up to my monumental grasshopper collecting efforts. One morning she was much thinner, but up in the corner of the cricket cage was a large, foamy brown mass. She seemed content and somehow less savage. My parents convinced me it was time to return her to her world and I watched in amazement as she took flight. With her wings out, she rose above the house looking more like a real dragon than any I could have ever imagined while she was in her cage. Even today, when I am mowing the last cutting of hay in August, and I see the mantises flying out ahead of the sickle bar, I think of that moment of her release.

I set the cricket cage in the garage for the winter and started to check it daily in the spring. Once the temperature had warmed up enough, I witnessed a true alien invasion. Several hundred mini-mantises were erupting out of the egg mass. They were quick and spider-like and poured out of the top of the open cricket cage, spilled out onto the grass and disappeared. My thirty-two grasshoppers had resulted in two hundred hungry, perfect predators. My only thought was, "I'm glad they are all running away…. In spite of my gold-plated hopper hunting status, I could never hope to catch enough hoppers to feed them all!" Suddenly a vicious, flea infested, low maintenance rodent didn't sound like such a bad pet, but really, where was the excitement in that? In a sudden flash of kid brilliance, it came to me; I needed a pet snake to go with my pet rodent.

SEMBA: Southeast Michigan Butterfly Association

Next Meeting
January 16th, 2013
at
Nankin Mills
33175 Ann Arbor Trail
Westland, Michigan
See details at:
http://www.sembabutterfly.com/

Newly Documented Witch Hazel Pollinator

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Witch Hazel, *Hamamelis virginiana* L., one of Michigan's abundant understory trees is unusual in many respects. Unlike most plants that take advantage of warm weather and a rich field of potential pollinators, Witch Hazel blooms late in the fall, often after frosts, when few pollinators are still viable. The literature suggests that its pollination success rate is very low. Witch Hazel also has a very unusual seed dispersal mechanism that launches the seed several feet from the tree.

The striking, almost jungle orchid like, yellow-green blossoms of Witch Hazel stand out against the bare autumnal landscape as most of the other trees, including Witch Hazel, have lost their leaves for the season.

I have often wondered what pollinated this late bloomer. The literature mentions several small insects. There are several species of small hymenopterans and dipterans that have been associated with Witch Hazel flowers, and even an unidentified lepidopteran has been collected (de Steven 1983).

While raking leaves by the headlights of my pickup on 15 October 2012 in Kent County, MI, I noticed several noctuid moths converging in one direction from all compass points. I followed them and discovered that they were all heading towards a *H. virginiana* on the edge of the woods near my yard. The Witch Hazel tree was in full bloom and the moths were flocking to it.

The moth is one of our most common fall moths in Michigan, *Sunira bicolorago* (Guenée, 1852), the Bicolored Sallow, and can regularly be seen at baiting trails by the hundreds. I was able to take several photos as well as voucher specimens before the rain forced a hasty retreat.

Have any of you documented insect pollinators of Witch Hazel?

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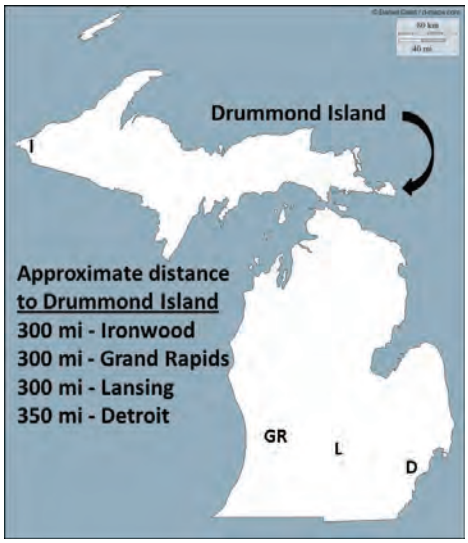
From page 17

to lead us on a field trip across the alvars and maybe even visit a little known parcel of old growth forest. If you've never been to this special part of Michigan, don't pass up this opportunity!

The sparkling blue of Lake Huron and the Saint Mary's River surround dozens of islands of pristine natural beauty. From the fossil beaches and the miles of shoreline to the alvars of the Maxton Plains, the unspoiled beauty of Drummond Island is some of Michigan's finest. Whether you're fascinated with ferns and trees growing straight out of solid limestone, the rich variety of birds, insects, plants and fossils, the close up view of the passing 1000-foot-long ore boats or the fascinating local history of the area, we hope to have something for everyone's interest.

We will hold our meeting at the Drummond Island Resort. This beautiful facility boasts a private setting, Arts and Crafts architecture, spectacular dining, exquisite lodging offerings (including private cabins or on site hotel rooms), fishing, golfing, kayaking, skeet shooting, and nature walks all in one of the most tranquil and stunning surroundings in the state.

It's all a short ten-minute ferry ride from the eastern UP city of DeTour. We hope you'll mark your calendars and plan to attend our 59th Annual Meeting.



Watch for more details on this exciting meeting in the next MES Newsletter and on the MES website. We will need to confirm room reservations in May, so plan ahead. Feel free to send me an email if you have any questions.

Abstracts of the 58th MES Annual Meeting: 22-23 June 2012

The 2012 MES annual meeting was held at the G.H. Gordon Biological Station and Rockwell Lake Lodge near Luther in Lake County, Michigan. This biological station is the largest in Michigan that is owned by a private college. The weather was great, the meeting was well attended and comradery was high, and the food was excellent and the lodging was rustic to elegant, depending on your selection. We thank MES President David Houghton and the staff at the G.H. Gordon Biological Station for all of their efforts. Below are abstracts that the authors submitted for their oral presentations or posters.

Robert A. Haack, MES Newsletter Editor

Duke Elsner and Ted Herig

The G.H. Gordon Biological Station is the legacy of its namesake, George Gordon, who purchased the land in 1995 to prevent its conversion into a golf course, and later donated it to Hillsdale College. Officially established in 1999, it is the largest private college biological station in the state of Michigan. The property encompasses nearly 700 acres of upland forest, meadow, and various types of wetland. Its centerpiece is the 50-acre Rockwell Lake, completely contained within the biological station property. Draining from the lake is Fairbanks Creek, a stream with naturally reproducing populations of brook trout. The creek is home to many species of aquatic insects found nowhere else in lower Michigan, and to several not found anywhere else in the state.

The property has historically been used by Hillsdale College students and faculty for teaching, research, and recreation—including summer field courses and several published scientific studies. The addition of the Rockwell Lake Lodge in 2009 has allowed increased collaboration with other scientists and institutions. We welcome these collaborations and hope to see them increase in the future. If you are interested in using the property for teaching or research, please contact the director, David Houghton at <david.houghton@hillsdale.edu>.

David Houghton, MES President

So Many Caddisflies, So Little Time: Automating the Descriptive Taxonomic Process

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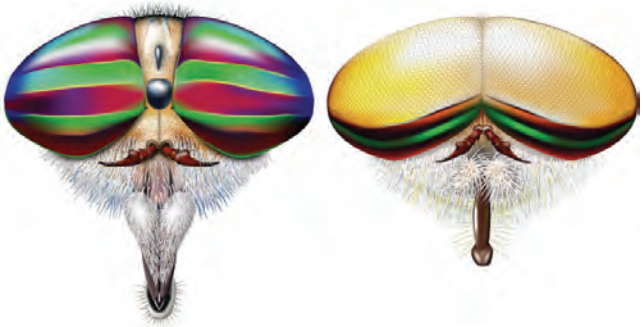
Descriptive taxonomy is a fundamental discipline within biology. It provides a system of nomenclature and classification that imparts stability to the discovery of new biodiversity and an understanding of the evolution of life on Earth. Descriptive taxonomy is a time consuming task requiring great attention to detail and access to historical collections and literature. Currently available digital resources provide new tools to aid this "traditional" discipline, including specimen management databases, automated species description software, digitized historical literature archives, digital illustration and enhanced photographic techniques, on-line taxonomic databases, interactive taxonomic keys, and new rules allowing on-line publication of taxonomic names, among many other resources. Still the need for training of new taxonomists, support of collections and museums, and field work are required to overcome the taxonomic impediment and to discover, describe, and protect the diversity of life on Earth.

Rosalia alpina (Linnaeus, 1758)
(Coleoptera: Cerambycidae)
By Mike Goblirsh



Tabanus lineola Fabricius, 1794 (Dipter: Tabanidae)
By Ralph W. Holzenthal

Digital Illustration of Insects

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Insects come in a remarkable array of sizes, shapes, colors and have complex morphological structures. These structures provide a basis for keys to the identification of insects, for the description of new species, and provide characters for inferring phylogenetic relationships among species. Illustration has been a fundamental component of new species description and identification keys in entomology. Traditional methods have included, among others, pen and ink line drawings and stippled illustrations as well as continuous tone illustrations such a carbon dust. Digital methods are now available to capture the complexity and diversity of insect form and color. Both bitmapped applications that allow for pixel-level, photorealistic detail, and vector applications, that produce crisp lines and smooth gradients, are available. The ability to edit drawings and easily correct mistakes or experiment with rendering tools to achieve the desired result makes these tools very versatile. Novice illustrators can produce professional, publishable results. Digital pens, brushes, filters, and other tools allow for almost unlimited artistic expression to capture the remarkable diversity of insect forms.

Caddisfly (Trichoptera) Biodiversity of the North-central U.S. — A First Look

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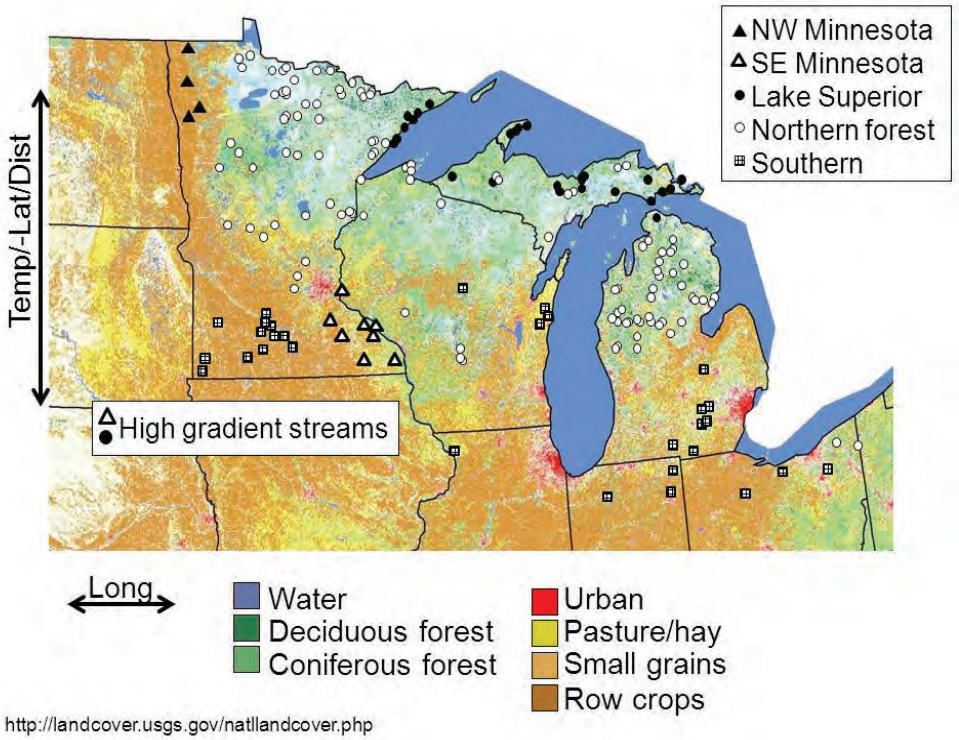

Despite the value of aquatic insects in aquatic ecosystem biomonitoring, few studies within North America have addressed relationships between aquatic insect assemblages and landscape level environmental variables. In this study, nearly 140,000 adult caddisfly specimens representing 253 species were collected and analyzed from 173 3–10 m wide streams throughout Minnesota, Wisconsin, Michigan, and northern Indiana, Illinois, and Ohio (see map). Detrended Correspondence Analysis and a UPGMA dendrogram of caddisfly relative abundance data determined five regions of caddisfly biodiversity within the sampling area. Species richness was significantly highest in the Lake Superior and Northern Forest regions, intermediate in the Southeastern Minnesota region, and lowest in the Northwestern Minnesota and Southern regions. Trophic functional composition was dominated (>80%) by fine particle filtering collectors in the last two regions, and balanced between the groups in the other regions. Canonical Correspondence Analysis determined three axes of caddisfly composition change—one related to temperature (Temp), latitude (Lat), and percentage of disturbed habitat (Dist), another related to longitude (Long), and a third related to stream gradient. Although a strong correlation between temperature, latitude, and percentage of disturbed habitat rendered determination of the relative importance of those variables difficult, it is likely that anthropogenic disturbance is influencing caddisfly assemblages in at least the northwestern Minnesota and southern regions.

Molecular Identification of Mycetophilid Species Based on the Mitochondrial COI Gene

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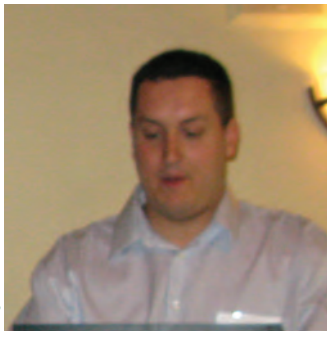
In this study we sequenced and analyzed the mitochondrial partial cytochrome oxidase subunit 1 (COI) gene for two new species of fungus gnats (Diptera: Mycetophilidae) to confirm the validity of *Boletina michigana* Taber and *Docosia walpurga* Taber as new species. Both species were originally described by Taber based on non-genitalic and mainly genitalic morphology.



Total genomic DNA was extracted from whole specimens using a DNeasy kit. The appropriate region was amplified by PCR using primers to conserved sequences. Cycle sequencing was performed and sequences were determined in both directions using capillary electrophoresis on the CEQ 8000 (Beckman Coulter). The sequences were used to perform a BLAST search and aligned with known sequences from other insects. The sequences were not found to match any previously known species of mycetophilids in the BLAST database suggesting that these are in fact two new species. Phylogenetic analysis using previously submitted sequences of specimens from the same genera will be used to test these results. The sequences will also be sent to the Barcode of Life project (a DNA barcode reference library) to establish new species records.

Seasonality of Oak Twig Pruner Shoot Fall: A Long-Term Dog Walking Study

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From 1987 through 2012, our family has had seven wonderful family dogs, including (in chronological order) Chestnut, Truffle, Derby, Sadie, Sam, Shelby and Duster. Since we live close to the Dansville State Game Area (DSGA) in Ingham County, Michigan, I often walked our dogs there at least once a week throughout the year since 1989. In summer 1990, I started noticing several recently fallen shoots from oak (*Quercus*) trees along a certain stretch of trail that was bordered by both red oaks (*Q. rubra*) and white oaks (*Q. alba*). I soon discovered that almost all of these fallen shoots were infested with larvae of what is commonly called the oak twig pruner (OTP), *Anelaphus parallelus* (Newman) (Coleoptera: Cerambycidae). Over the next 20-plus years, I took notes on the seasonality and frequency of recently fallen OTP-infested shoots along a stretch of the trail. The last full-year of field data was in 2011.

OTP is native to eastern North America. OTP infests primarily oak trees, but occasionally they will infest hickory (*Carya*), walnut (*Juglans*), and other hardwoods. Over the years there has been much confusion in the literature between OTP and *Anelaphus villosus* (Fabricius), with some reports confusing the two species (Chittenden 1910, Clarkson 1885, Felt 1905, Gosling 1978, 1981, Hamilton 1887, Packard 1890, Townsend 1886). Moreover, adding to the confusion in the literature is the fact that OTP has been assigned to several genera since first described in 1840: first as *Elaphidion*, then *Hypermallus*, then back to *Elaphidion*, then to *Elaphidionoides*, and finally to *Anelaphus*.

In Michigan, OTP is believed to have a highly synchronized two-year life cycle, with adults typically emerging in odd-numbered years (Gosling 1978, 1981). Briefly, OTP adult females oviposit near the tip of short, living twigs. During the first summer, OTP larvae bore downward (towards the base of the twig) within the twig until they reach the next larger branch it is connected to. In the second summer, larvae eventually remove a disk of wood in the larger branch, just behind the junction where the smaller branch is connected. The severed branch eventually breaks (especially on windy days) and falls to the ground with the larva inside. In the fallen shoots (or branches), OTP larvae extend their galleries, then transform to pupae in autumn, overwinter, and finally emerge as adults the following summer.

In the present study, the number of recently fallen shoots with evidence of OTP infestation was recorded during each dog walk at the DSGA during 1990 – 2011. The shoots were moved off the trail after counting to prevent the same shoot from being counted multiple times. For each OTP-infested shoot, the date it was found, tree species (e.g., red oak, white oak, etc.), and the color of the foliage were recorded. Typically, green foliage indicates a shoot that has recently been severed by an OTP larva and promptly fallen from the tree, while brown foliage indicates a shoot that had been severed sometime earlier but remained in the crown for considerable time before falling to the ground.

All OTP-infested shoots (N = 492) fell in even-numbered years during the 1990-2011 study period, supporting the conclusion that OTP has a 2-year life cycle in Michigan. The number of shoots that fell along the trail during each even-numbered year varied considerably, from as few as 32 twigs in 2010 to as many as 168 in 2006. Shoot fall usually began between late May and mid-June, peaked between late June to mid-July, and ended between mid-August to early November. For all years combined, 83% of the recently fallen OTP-infested shoots collected in June had green foliage, compared to 41% of the shoots collected in July, 8% in August, and 4% in September. Of the 492 OTP-infested shoots, 385 were from red oaks, 93 from white oaks, 2 from shagbark hickories (*C. ovata*), and 12 from black walnut trees (*J. nigra*). I would like to acknowledge the assistance of several coworkers who conducted the OTP surveys during periods of time when I was not available, especially Toby Petrice and Therese Poland.

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Host Range Studies on *Agrilus* and Other Wood Borers in Southwest China

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The devastation to ash trees, *Fraxinus* spp., in North America by emerald ash borer (EAB), *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae), which is native to Asia (Haack et al. 2002), has raised awareness of the threat to North American forests posed by nonnative *Agrilus* and related borers. In 2012, we travelled to Yunnan Province in southwestern China to study *Agrilus* species, including those believed to be closely related to EAB, that if accidentally introduced into North America could become destructive forest pests. In April 2012, we stressed 37 hardwood trees at 4 sites by removing a ring of bark at breast height with a drawknife and severing the outer xylem tissue around the circumference of the tree with a hand saw. Many wood borers, especially *Agrilus* species, are attracted to stressed trees, included those that are artificially girdled (Cote and Allen 1980, Haack and Benjamin 1982, Dunn et al. 1986, McCullough et al. 2009). We girdled trees in the following genera: *Quercus, Cyclobalanopsis, Castanopsis*, and *Betula*. A clear sticky trap was placed around the trunk of each tree just above the girdle to capture adult borers that may land on the tree trunk. Sticky traps were removed approximately one month after girdling and replaced with fresh sticky traps that were removed about one month later (two months after girdling). Sticky traps were frozen to preserve insects until identifications could be made. Girdled trees were left standing to allow *Agrilus* and other borers to oviposit and develop. In early 2013, girdled trees will be felled and log sections will be dissected or reared to determine the species of *Agrilus* and other borers that have infested the trees, as well as their natural enemies. This study is part of a much larger project investigating the systematics and biology of EAB, and its relatives that may pose a threat to North American forests (Chamorro et al. 2011).

Bob Haack and Peng Chen debarking trees near Kunming

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Working with local foresters to place sticky traps on girdled trees near Luquan, Yunnan, China.

EAB Biological Control: Research and Mass-Production

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Three species of parasitoid wasps have been studied and approved for release in the United States as biological control agents for the emerald ash borer, *Agrilus planipennis* (Buprestidae). These three parasitoids are now being mass-reared at a USDA APHIS rearing facility in Brighton, MI, and the focus of that facility remains on improving the quantity and quality of the insect material produced.

Oobius agrili (Hymenoptera: Encyrtidae), a solitary parthenogenetic endoparasitoid of EAB ova, is reared in the laboratory by first culturing the borers themselves; their ova are harvested from filter papers and presented to the parasitoids. *Tetrastichus planipennisi* (Hymenoptera: Eulophidae; a gregarious koinobiont larval endoparasitoid) and *Spathius agrili* (Hymenoptera: Braconidae; a gregarious idiobiont larval ectoparasitoid) are both reared by provisioning the wasps with host larvae grown semi-artificially in the laboratory using ash bolts. Idiobiont parasitoids stop further development of their host and usually feed from outside the host, whereas koinobiont parasitoids allow their host to continue developing and they may feed from within the host (endoparasitoids) or outside the host ectoparasitoids). The development of the precise techniques used to rear the EAB parasitoids is the subject of ongoing research conducted at the rearing facility, with helpful collaboration from USDA Forest Service and Agriculture Research Service research staff.

The main focus of our work at the Brighton facility has been to increase the availability of quality host material to the parasitoids. To this end, I have tested a variety of rearing strategies to maximize beetle fecundity and thus the number of ova and larvae we can provision to the parasitoids. I have also targeted improved efficiency in operations: we now ship dormant life stages of some parasitoids, within their host material, to our destination, where cooperators can easily hang a cup or a small ash bolt from a tree, rather than fuss with live adult parasitoids.

Other work conducted at the rearing facility seeks to understand the phenology of the larval parasitoids (the phenology of *Oobius* is tightly synchronous with EAB ova production in June and July) to better guide field releases, as well as potential interactions between the larval parasitoids we rear for release and the native larval parasitoids (*Atanycolus cappaerti* and *Spathius floridanus*). Results of the interaction study, for example, corroborate ARS field work that shows *Atanycolus* posing quite a "threat" to *Tetrastichus* at some sites.

These and other studies will be continued over the course of the next year, with particular aims at continuing rearing improvements, and a simulation of climate indoors to examine diapause and voltinism in the larval parasitoids under "natural" conditions.

Encouraging Citizen Science Activity to Obtain Data on Butterfly Distribution in Michigan

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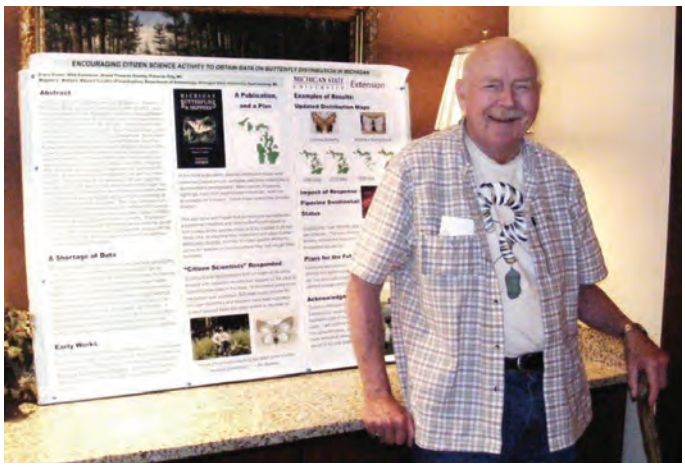

"Michigan Butterflies & Skippers" by Mogens C. Nielson, Michigan State University Extension bulletin E-2675, was first published in 1999. Although information was gathered through many decades of personal study and examination of museum specimens by Mr. Nielsen, county distribution data appeared to be incomplete. Even for some very common species that are found virtually anywhere, there were no actual collection records for many Michigan counties. Rather than providing speculative distribution maps in the bulletin, it was decided to show only the verified county species records. This was done to spur the interest and activity of readers to become "citizen scientists," hoping they would be encouraged to examine their personal collections of specimens and photographs, as well as make specific efforts to search for species in certain counties, and submit further data on the distribution of Michigan butterfly species. The response was impressive, with numerous individuals providing data accounting for hundreds of new county records for the state. The data collected from this process was extensive enough to remove one species (pipevine swallowtail, *Battus philenor*) from the "special concern" list in the state, based on new information about populations of the butterfly. Published county distribution maps of selected species and the updated maps after public input will be presented, along with the protocols that were used to assure accuracy of identifications by the data contributors. (Poster)

Costa Rican Arthropods… and Other Delights

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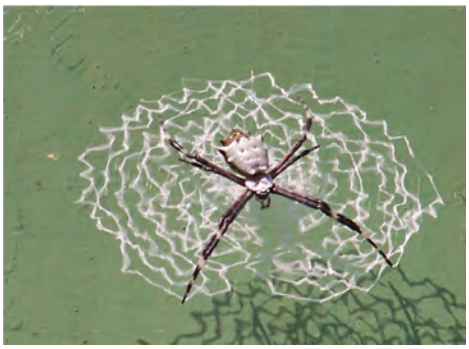
Arenal volcano in Costa Rica

Ralph with a coleopteran friend, a Hercules Beetle (*Dynastes*)

For the field component of a tropical biology course I taught at Lansing Community College for six years, I was "forced" to take students to Costa Rica each spring for a firsthand look at the biodiversity of that remarkable Central American country. At this MES meeting I wanted to share some photos of the arthropods, birds, mammals, and reptiles we found there. We began our photo journey at La Paz Waterfall Gardens (near Poas volcano) to tour one of the most successful butterfly farms in Costa Rica. Photos of morphos, cracker nymphalids, heliconia butterflies and the rearing facility were shown. Then on to the Monteverde Cloud Forest Preserve for a walk on the canopy suspension bridges. Next on to La Selva Biological Station where we found Mexican white bats looking like marshmallows asleep under folded leaves, poison Strawberry Dart Frogs, army ants and the enormous mounds of leaf-cutter ants (*Atta*). Finally a boat trip north on the Tortuguero canal, which parallels the Caribbean coastline, to view crocodiles, howlers stretched out on overhead branches, aerial termite nests on dead snags, and many species of wading birds. It was my hope to give everyone a taste of what one can expect to see if you are ever fortunate enough to travel to this little Neotropical gem.

Red Postman (*Heliconius erato*), a common nymphalid in the La Paz butterfly farm

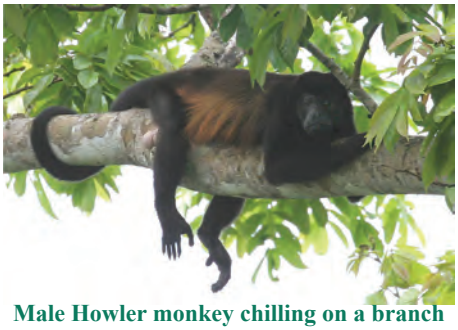


A Costa Rican orb weaver with an interesting doily-patterned snare.

Unknown weevil in the Monteverde Cloud Forest Preserve

A leaf-cutter ant (*Atta*) hard at work

Tina Ciaramitaro in 2005 (now MES Treasurer) has a Red-eyed Tree Frog in her hand



Male Howler monkey chilling on a branch over the Tortuguero River

Looking up into the hollow "trunk" of a strangler fig tree in the San Luis Valley near Monteverde

Can Submerging Black Ash Logs Kill Emerald Ash Borer and Preserve Wood for Native American Basketry?

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Black ash, *Fraxinus nigra*, is used by many Native American tribes for basket-making because its ring-porous wood allows the annual layers of xylem to be easily separated. The emerald ash borer (EAB, *Agrilus planipennis* (Coleoptera: Buprestidae) is threatening North America's ash resource including black ash. Native American basket makers are concerned about the impact EAB will have on large black ash trees which are preferred for basket making and about movement of black ash from EAB infested areas where it is cut to uninfested tribal lands, which could be several hundred km away, where it is pounded and split to make baskets. We evaluated the practice of storing black ash logs submerged in running water as a possible method for preserving wood moisture and quality while simultaneously killing EAB. In 2010, we submerged EAB infested black ash logs in running water in the spring and evaluated EAB mortality at different time periods after submergence. In 2011, we compared winter and spring submergence and different time periods for each.

In April 2010, we felled black ash trees infested with overwintering EAB larvae and cut them into 60-cm bolts. Bolts were randomly assigned to five different treatments: a) unsubmerged control bolts; or bolts submerged for b) 1 week; c) 1 month; d) 2 months; or e) 3 months. Logs were submerged on 10 May in the Red Cedar River, Okemos, Ingham County, MI. After submergence, half of the logs were dissected within 24 h to determine larval mortality. Then the logs were pounded and peeled into splints to assess wood color and quality for basket making. Larvae removed from dissected logs were held at room temperature for 24 h and observed periodically for movement to determine if they were alive or dead. The remaining logs were placed into rearing tubes to determine EAB survival and adult emergence. EAB larval mortality was very low after 1 week of submergence. After 1 month of submergence, mortality was higher; however, there were still several live EAB larvae and a few pupae, suggesting that some larvae had continued to develop. All EAB larvae had died when logs were submerged for 2 or 3 months. Similarly, the number of live EAB adults that emerged from logs decreased with length of submergence time and no adults emerged from logs that were submerged for 2 or 3 months. Quality and pliability of wood splints was not impaired after 3 months of submergence.

Tom and Tina submerging EAB-infested ash log.

In 2011, we conducted two experiments (winter submergence and spring submergence) to evaluate efficacy of log submergence at different times of the year with different water temperature and to refine the period of time required for complete EAB mortality. We felled infested black ash trees in February 2011 and cut them into 60-cm bolts. For the winter submergence experiment, infested logs were submerged in the Red Cedar River during the first week of March when water temperature was at freezing (0 ºC). We hypothesized that longer periods of submergence may be required to kill larvae at colder temperatures because larvae would remain dormant without feeding, thus would not be affected by the saturated conditions. Therefore, we selected longer time periods for the treatments of this experiment. Logs were randomly assigned to five submergence time treatments: a) 2 months, b) 4 months, c) 6 months, d) 12 months (on-going), and e) 18 months (on-going). All logs were dissected within 24 h of removal from the river then pounded and peeled into splints in order to assess the impact of prolonged submergence on splint quality. Larvae dissected from logs were held for 48 h at room temperature and observed periodically for movement. After 2 months of submergence (April), water temperatures had reached 5.6 ºC and very few larvae had died. All larvae had died after 4 (June) or 6 (August) months of submergence, when water temperatures had reached 21.5 ºC and 25.6 ºC, respectively. Splint pliability and quality did not deteriorate after 2-4 months of submergence; however, by 6 months the outer 1 or 2 rings of sapwood began to darken and decay and crumbled from the log during dissection. Interior rings of sapwood remained intact and pliable.

For the spring submergence experiment, we wanted to refine our estimate for the length of time required for complete mortality based on 2010 results. Therefore, we selected weekly time periods between 1 and 2 months. Infested logs were submerged in the Red Cedar River on 12 May 2011 when water temperature was 14.4 ºC. Initially, we planned to dissect half of the logs and rear adults from the remaining logs for each treatment. However, by week 6, when we still found little mortality of larvae during log dissection, we decided to prolong the experiment by foregoing rearing, and allowing those logs to remain submerged for a longer period. As a result the experiment had 9 treatments: a) unsubmerged control, or submerged for b) 4 weeks, c) 5 weeks, d) 6 weeks, e) 7 weeks, f) 8 weeks, g) 9 weeks, h) 13 weeks, or i) 14 weeks. After 6 weeks of submergence some live larvae were found in dissected logs and adults emerged from rearing logs. Some live larvae were found in logs submerged for 7 or 8 weeks, but by 9 and 13 weeks of submergence all larvae had died. No adults emerged from logs submerged for 14 weeks.

Ed Pigeon of the Gun Lake Tribe pounding black ash logs after log submergence.

In summary, all EAB larvae had died and no adults emerged from logs submerged for 2 months in 2010, whereas some larvae survived and adults emerged from logs submerged during winter for 2 months and during spring for up to 9 weeks, in 2011. Increased levels of survival in 2011 may have been due to assessing mortality over a 48 h period after dissection rather than only 24 h as in 2010, allowing larvae more time to adjust after removal from the saturated logs. Different outdoor temperature conditions during the different experiments may also have influenced EAB survival. Based on our two years of data, 4 months of submergence during winter or spring should ensure complete mortality of EAB larvae and no emergence of adults while still preserving wood quality for basket making.

Laboratory Evaluation of Systemic Insecticides for Toxicity Against Emerald Ash Borer Larvae

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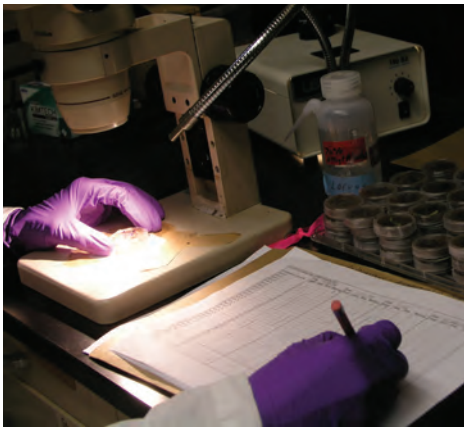
The invasive woodborer, emerald ash borer (EAB), *Agrilus planipennis* (Coleoptera: Buprestidae), has killed tens of millions of ash trees in North America since it was discovered near Detroit, MI, in 2002. EAB populations have been found in 18 US states and 2 Canadian provinces to date and it threatens the ash resource continentwide. EAB adults begin to emerge in May and feed on ash leaves for 10-14 days before becoming sexually mature. Females then lay eggs in bark cracks and crevices. Adults are active throughout the summer and continue to feed and mate during their entire 3-6 week lifespan. Larvae feed in the phloem in galleries which also score the outer sapwood. These galleries eventually girdle and kill the tree. There has been considerable research to develop tools to manage EAB and to protect the ash resource including the use of systemic insecticides.



Checking emerald ash borer larval mortality on insecticide-treated diet.

Preparing insecticide dilutions to add to diet.

Systemic insecticides are generally applied as single-tree treatments at or near the base of the tree. The tree transports systemic insecticides up the trunk and to the canopy. Systemic insecticides commonly used on trees include several products with the neonicotinoid imidacloprid; two products with dinotefuran, a more soluble neonicotinoid; a relatively new product with emamectin benzoate (an ivermectin); and two products derived from neem seed extract (azadirachtin). These products are applied by injection, trunk spray or soil drench and are much safer than conventional insecticides for applicators, non-target organisms, and the environment.

Systemic insecticides may result in high levels of adult EAB mortality when beetles feed on protected leaves. Impacts on larvae feeding within treated trees, however, are not well understood. We conducted a laboratory study to evaluate effects of different systemic insecticides on EAB larvae by feeding them insecticide-treated artificial diet. Live EAB larvae were dissected from logs cut from naturally-infested ash trees felled during winter 2009 and 2010. Larvae were fed artificial diet treated with different insecticide formulations and doses. They were checked twice per week for mortality and transferred to fresh diet of the same treatment every 3-4 weeks as needed. The insecticide formulations tested included Imicide (10% imidacloprid, J. J Mauget Co.), Safari (20% dinotefuran, Valent Professional Products), TREE-äge (4% emamectin benzoate, Arborjet), TreeAzin (5% Azadirachtin, BioForest Technologies, Inc.), and Azasol (6% Azadirachtin, Arborjet). For each insecticide, we tested 5 insecticide doses, a blank formulation control (if available) and an untreated control. Insecticide doses were based on treatment effects and residue levels we have observed in previous field studies.

All of the insecticide products tested were toxic to EAB larvae at doses that were similar to residue levels found in ash leaves in treated trees in the field. The amount of time required to kill EAB larvae at doses that were similar or higher than field residue levels for each insecticide was longer for Imicide or Safari (7-9 weeks) than for TREE-äge (6 weeks) or the azadirachtin products (3 weeks). Our results show that these systemic products are toxic to EAB larvae. Field efficacy varies among products, method of application, and time since application. Understanding more about the interactions between EAB larvae and systemic insecticide products will improve guidelines for protecting valuable landscape ash trees.

EAB larva feeding in artificial diet.

Validation of CTM Protocols Using Cased and Uncased *Pycnopsyche guttifer* (Trichoptera: Limnephilidae) Larvae

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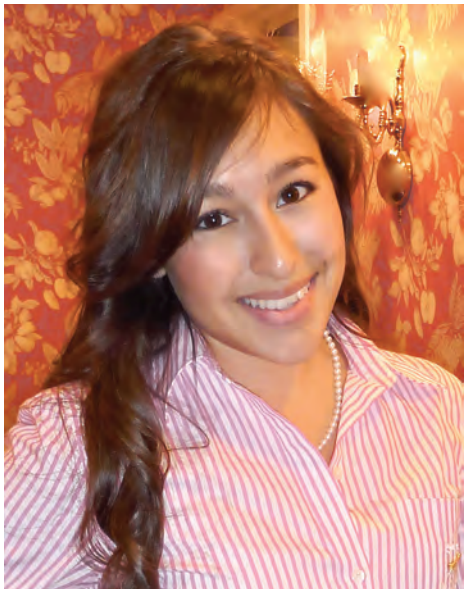
An organism's temperature tolerance is frequently evaluated by its critical thermal maximum (CTM), which is the non-lethal endpoint at which the organism begins to exhibit the effects of thermal stress. The goal of this study was to evaluate how changing the rate of temperature increase affected the average CTM values for a single species. To do so, I determined the CTM of the caddisfly *Pycnopsyche guttifer* using four different rates of temperature increase (0.1, 0.3, 0.5, and 0.7 ºC per minute), and two caddisfly case states (intact and removed). All larvae were collected from the Little Manistee River, located near Luther, MI and studied over a 6-week period from late May to early July, 2012. Three sets of 5 cased larvae and three sets of 5 uncased larvae were tested at each temperature. Across all temperature increase rates, larvae that had been removed from their cases had a significantly lower average CTM (31.7 ºC) compared with those that remained in their cases (32.8ºC), suggesting that the case can affect the larva's ability to tolerate thermal stress. In addition, regardless of case state, the average CTM was significantly lower at the 0.1ºC per minute increase rate (30.3ºC) compared with the other three rates tested (32.9ºC). This is likely due to the increased amount of time that the 0.1ºC caddisflies were exposed to heated water before they reached their CTM. This indicates that CTM studies done using 0.3–0.7ºC per minute increase protocols are comparable with each other, but not with studies using an increase rate of 0.1ºC per minute.



(2nd place winner in Student Competition)

Seasonal Changes in the Thermal Tolerance of Four Species of Aquatic Insects

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Critical thermal maximum (CTM) is a widely used measurement for assessing an organism's thermal tolerance. This study was carried out at the G.H. Gordon Biological Station near Luther, MI, with the objective to understand seasonal changes in CTM of four aquatic insects, including one mayfly species [*Stenonema femoratum* (Ephemeroptera)], and three species of caddisflies [*Hydropsyche slossonae*, *Dolophilodes distinctus*, and *Parapsyche apicalis* (Trichoptera)]. I collected the immature insects for this study from Fairbanks Creek, which is a small stream at the Biological Station, in winter (February), spring (April), and summer (June) 2012. Sample sizes varied from 7 to around 30 individuals per species during each test period. The mix of larval instars also varied with season. The test insects were acclimated in a laboratory stream set to ambient temperature and photoperiod. CTM trials occurred in a water bath with temperatures raised at a rate of 0.33º C per minute until CTM for all specimens was reached. CTMs increased as the season progressed for *Stenonema femoratum* (31.2, 34.0, 35.0º C, respectively), *Dolophilodes distinctus* (28.9, 31.7, 36.2º C), and *Hydropsyche slossonae* (28.5, 29.4, 35.2º C). In *Parapsyche apicalis*, however, there was little seasonal change in the CTM (23.9, 24.1, 24.1º C). My results indicate differential adaptability to changing thermal regimes, even among species that live in the same stream.

(1st place winner in Student Competition)

Field Research and Funding Opportunities in the Huron Mountains

The Huron Mountain Wildlife Foundation (HMWF) supports field research focused on the landscape and ecosystems of the Huron Mountains in Marquette County, MI. The Huron Mountains is a 10,000-acre private natural area, consisting of old-growth forests and variety of pristine aquatic systems. The HMWF provides housing and research facilities at the Ives Lake Research Station north of Big Bay, MI. The HMWF also offers small grants. Several taxonomic studies have already been conducted at the Huron Mountains. See the taxonomic database at www.hmwf.org. There is interest in spider and mite studies in particular. Research proposals that request funding for 2013 should be submitted by 1 Feb 2013. More details and guidelines for proposals can be found at, www.hmwf.org, or by contacting Kerry Woods, Director of Research for HMWF, at <kwoods@bennington.edu>.

Update on the Hemlock Woolly Adelgid Detection in Southwest Michigan

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Email: bedfordj@michigan.gov

In the June 2012 issue of the MES Newsletter it was reported that Hemlock Woolly Adelgid (HWA, *Adelges tsugae*) had been detected on two landscapes in the New Buffalo area in southwest Michigan (Bedford 2012). It was also reported that a delimiting survey was conducted that included all hemlocks within ½ mile of the positive sites and that 49 infested trees were identified, cut down and burned.

Since then, the Michigan Department of Agriculture and Rural Development's (MDARD) Pesticide and Plant Pest Management Division (PPPMD) has twice treated approximately 350 hemlock trees on 35 parcels that surround the two properties that had the infested trees in New Buffalo. In June 2012 the trees were treated with the systemic insecticide Dinotefuran. In September the same trees were treated with the systemic insecticide Imidacloprid. Both treatments were done using low volume soil injections.

Closeup of hemlock foliage infested with HWA

Plans for continued follow up on the infestation site include (1) "½ Mile Re-Survey" in late winter to early spring in 2013-15, and (2) insecticide re-treatment in 2013 and 2014. Michigan has had an external quarantine in place for HWA since May 2001. The quarantine restricts the movement of hemlock into the state, and includes a complete ban on the movement of hemlock from infested areas of the country.

MDARDs HWA Quarantine can be found at <http://www.michigan.gov/documents/MDA_Hemlock_Woolly_Adelgid_Quarantine_97324_7.pdf>. Additional information on HWA can be found on MDARD's website at: <http://www.michigan.gov/exoticpests>.

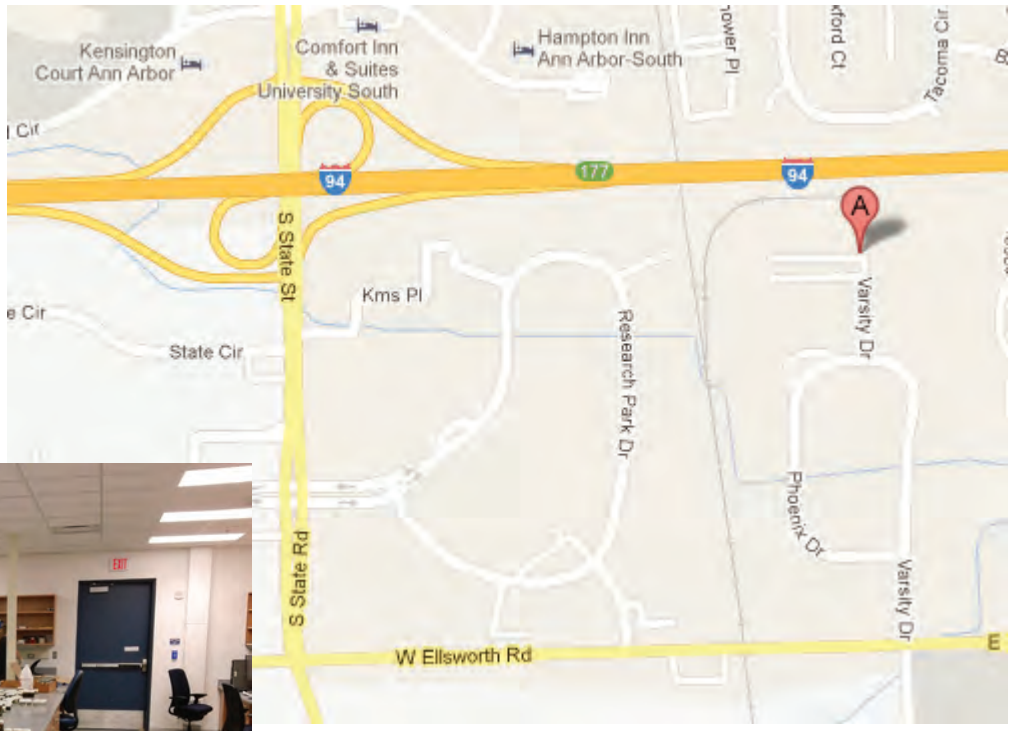
References

Bedford J. 2012. Hemlock woolly adelgid detected in southwest Michigan. Newsletter of the Michigan Entomological Society. 57: 12.

Breaking Diapause 2013

16 March 2013
10 am - 2 pm

University of Michigan
Biodiversity Research
Collections
3600 Varsity Drive
Ann Arbor, MI



Directions: Take Exit 177 S onto State Street from I-94, go E on Ellsworth, and go N on Varsity Drive (just after the RR tracks). Take Varsity Drive to the end, following the signs that say "University Herbarium."

MES Historical Notes

Robert A. Haack, Newsletter Editor

1987 – 25 years ago. In early 1987, Mark O'Brien was President; Ken Kraft was President-Elect; Dave Evans was immediate Past-President; Mo Nielsen was Executive Secretary; Dick Fleming, Robert Husband, and Gary Simmons were the three Members-at-Large; Dave Gosling was Journal Editor; and Lou Wilson and George Heaton were the Newsletter Editors. The 33rd MES Annual Meeting was held on 5 June 1987 at the Ford Forestry Center, a Michigan Tech University research facility, near L'Anse, MI. This was the first time that a MES annual meeting took place in Michigan's Upper Peninsula. Dan Young from the University of Wisconsin-Madison presented the keynote address on the significance of insect larvae. There were 14 additional talks at the annual meeting on topics that ranged from agricultural and forest pests to the incidence of giardia on Isle Royale and the translocation of moose from Ontario to Michigan's UP. Some of the feature Newsletter articles in 1987 dealt with collecting Lepidoptera in Isle Royale and emergence of brood X of the 17-year periodical cicada. Michigan's first list of state-listed threatened and endangered insects was published by the Michigan DNR, including two endangered beetles and six threatened lepidopteran species. Annual dues were $8 per year for active members, and $15 per year for libraries. Journal page charges were $30/page. There were 413 members in good standing and 172 library subscriptions at the close of 1986.

1962 – 50 years ago. In early 1962, David Cook was President, Stanley Gangwere was President-Elect, Warren Wagner was immediate Past-President, and Theodore Cohn was the Executive-Secretary. The 8th annual meeting was held at the University of Michigan, in Ann Arbor on 24 March 1962. This annual meeting was held jointly with the Michigan Academy of Sciences. Henry Townes chaired the entomology section of the meeting, which included 19 insect-related talks. Some of the topics covered in these talks included ichneumonids, *Cimbex* sawflies, industrial melanism, heliconiids, cuckoo wasps, giant water bugs, millipedes, katydids, spittlebugs, *Agrilus* beetles, and dragonflies. MES member Ed Voss presented information on Michigan State Game Areas (SGA) that offered good insect collecting opportunities, such as Pittsford SGA in Hillsdale County, Lapeer SGA in Lapeer County, Tuscola SGA in Tuscola County, Three Rivers SGA in St. Joseph County, Flat River SGA in Montcalm and Ionia Counties, and Maple River SGA in Clinton and Gratiot Counties. In 1962, MES membership dues were $2 per year, MES had a balance of $399.34, and the journal "The Michigan Botanist" began production. I found no records on the number of MES members in 1961, but there were 76 members in 1964.

Robert W. Husband Elected to the Adrian College Professor Hall of Fame

Congratulations, Bob! MES member Robert W. Husband was elected to the Adrian College Professor Hall of Fame in 2012. Bob served as a Professor in the Biology Department at Adrian College in Adrian, Michigan for 33 years (1964 to 1997). Bob was the first professor to receive this honor at Adrian College. A plaque will be paced in the Adrian College library. Over his career, Bob and his many co-authors published 133 scientific papers that focused on mites, describing 156 new species and 20 new genera. Bob focused on mites in the family Podapolipidae and has worked with researchers worldwide, including China, Bangladesh, Brazil, Canada, Germany, India, Iran, Japan, New Zealand, Philippines, South Africa, Ukraine, United Kingdom, and the USA. At Adrian College, Bob initiated cadaver-based anatomy classes, medical technology career opportunities, and an endowment to improve biological education at Adrian College that provided travel and research grants to biology faculty and students. Bob involved students in independent research throughout his career at Adrian College, and spent his summers studying mites. Bob published his findings in several journals, including *Annals of the Entomological Society of America*, *International Journal of Acarology*, and of course, *The Great Lakes Entomologist*. Here are citations for three of Bob's *TGLE* papers:

Husband, R. W. 1974. *Ovacarus peellei*, a new species of mite (Acarina: Podapolipidae) associated with the carabid *Pasimachus elongatus*. Great Lakes Entomologist 7: 1-7

Husband RW. 1993. A new *Eutarsopolipus* (Acari: Podapolipidae); parasite of *Harpalus herbivagus* (Coleoptera: Carabidae) from Michigan. Great Lakes Entomologist 26: 1-14.

Husband RW, and Husband DO. 2004. Distribution of *Eutarsopolipus* (Acari: Podapolipidae) and *Crotalomorpha camini* (Acari: Crotalomorphidae), ectoparasites of *Stenolophus* (Coleoptera: Carabidae) in Michigan, U.S.A. Great Lakes Entomologist 37: 10-15.

Robert A. Haack, MES Newsletter Editor

Perona Cabinets Available at MSU

John Perona focused his collecting efforts on insects from the Keweenaw area of Michigan's Upper Pennisula. Prior to his death, John sold his collection to the Michigan Entomological Society, and then MES donated the collection to Michigan State University for inclusion in the MSU insect collection. John's 8,000+ insects were housed in 5 cabinets. Now that John's specimens have been incorporated into the MSU collection, the MSU Entomology Museum is offering these cabinets with drawers to interested individuals at no cost. The dimensions of each of these cabinets and drawers are: **1)** Orange 12-drawer cabinet (#1), 45"H x 26.5"W x 22"D; 12 drawers, 21.5"W x 18"D x 3"H; wooden frame, glass tops, finger pulls. **2)** Orange 12-drawer cabinet (#2), 45"H x 26.5"W x 22"D; 12 drawers: 20.5"W x 18"D x 3"H; wooden frame, glass top, finger pulls. **3)** Orange 12-drawer cabinet (#3),45" H x 26.5"W x 22" D; Drawers: 1 drawer: 20.5"W x 18"D x 4.5"H and 11 drawers: 20.5"W x18"D x 3"H; heavy board frame, plexiglas tops, button pulls.**4)** Yellow 24-drawer cabinet, 49"H x 49.5"W x 22"D; 24 Drawers: 19.5"W x 16.5"D x 3"H; wooden frames, glass tops, button pulls. **5)** Yellow 12-drawer cabinet, 51"H x 30"W x 23"D; 12 drawers: 21"W x 18"D x 3"H; wooden frame, glass top, button pulls. If you are interested in any of these cabinets please contact the Collection Manager, Gary Parson via email <parsonsg@msu.edu> or by phone (517-353-1630) with questions or to make arrangements to pick up one or more of these good looking cabinets. **Ron Priest**

West Nile Virus in Michigan: 2012 Highlights

Erik Foster, Medical Entomologist
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Email: FosterE@michigan.gov

Mosquito-spread diseases can impact human health, animal health, tourism, outdoor recreation and fitness. West Nile virus (WNV) tops the list for public health entomology highlights in Michigan this year. 2012 saw the worst outbreak of the mosquito-borne virus in Michigan since 2002, which was Michigan's previous banner WNV outbreak year.

WNV is transmitted primarily by mosquitoes in the genus *Culex*, and more specifically *Culex pipiens* (northern house mosquito) in the Midwest. *Culex pipiens* is ornithophilic, feeding on a variety of avian species throughout its range, and thus WNV is maintained in nature in a mosquito-bird cycle. *Culex pipiens* will, however, "bridge" the virus to people and domestic animals. Recent research has implicated certain species as "super spreaders" of WNV; *C. pipiens* becomes infected with WNV more often by American Robins, Blue Jays, and house finches in the upper Midwest (Hamer *et al.* 2009). The species is peridomestic, and searches out containers with highly organic, stagnant water to lay their egg rafts. Larvae are commonly found in curbside and backyard catch basins, ditches, detention/retention ponds, scrap tires and other man-made containers common to the urban environment. *C. pipiens* is the primary urban mosquito pest in the Midwest, and readily enters houses and will bite indoors. Mated adult females overwinter in damp, well-protected natural and man-made structures, often entering people's homes, and emerge when climatic conditions are favorable for egg laying and larval development.

In 2002, there were 644 human cases and 51 fatalities associated with WNV in Michigan. As of 2 November 2012, there have been 201 human cases of WNV disease reported from 21 Michigan counties in 2012. Of these cases, 143 (71%) were classified as the more serious neuroinvasive disease (e.g., meningitis, encephalitis, acute flacid paralysis). To date there have been 13 fatalities among the reported cases of WNV in Michigan. Survivors of severe, neuroinvasive WNV disease may require long-term rehabilitation. Figure 1 illustrates the temporal and geographic similarities between the 2002 and 2012 Michigan WNV outbreaks.

Several factors influence populations of *C. pipiens* and the potential for WNV outbreaks in the urban environment. These include climate, housing and infrastructure type, mosquito control, and public perception.

The winter of 2011-2012 was the fourth warmest winter since the winter of 1894/1895 in Michigan (2002 was the warmest winter on record). This and record-breaking March temperatures allowed for higher winter survival, and earlier emergence of adult *C. pipiens* in Michigan in 2012. These early mosquito populations were observed in samples collected from Michigan's mosquito control districts and are highlighted against Michigan's 2012 human epidemic curve in Figure 2. WNV develops more quickly in the midgut of infected mosquitoes during warm periods. Mosquito population and infection-rate surveillance date are sound predictors of WNV human risk, and can aid communities in predicting risk areas, and where mosquito control efforts may be best directed.

***Culex pipiens*, the Northern House Mosquito. Photo: Illinois Department of Public Health.**

Hot and wet conditions are favorable for a majority of mosquito species; however significant WNV outbreaks have been associated with hot and dry years as well. In 2012 the U.S. experienced one of the worst drought years in recent history, and also experienced one of the most significant arbovirus outbreaks in history. In drought years, people may let their guard down when it comes to wearing insect repellent or avoiding peak mosquito biting times, because of the perceived lack of biting mosquitoes. This may lead to an increase in the number of people infected with WNV. Many times this year public health officials had to explain that while populations of aggressive spring and summer nuisance species in the genus *Aedes* (*Ochlerotatus*) and *Anopheles* were lower due to drought, that the ecology of *C. pipiens* may be favored by drought years and that from dusk until dawn they are the predominant urban biting species of mosquito. This is counterintuitive to most people, but can be explained by the preference of *Culex* species for highly organic larval habitats. Curbside and backyard catch basins in urban environments collect organic matter and steady amounts of moisture throughout the year (even in drought years; think watering lawns, washing cars, etc.) and when these containers are not routinely flushed out by heavy rains, they create highly attractive larval habitats for *C. pipiens*. The lack of flushing rains also provides for higher survival of larval mosquitoes, bringing potential vectors into close contact with competent avian reservoirs and people.

Historically in Michigan, a majority of WNV activity occurs in the Detroit Metro Area and the Grand Rapids Metro Area. In 2012, 86% of human WNV cases occurred in Wayne, Oakland, Macomb, and Kent Counties (91% of the WNV cases occurred in these counties during the 2002 outbreak). This is due primarily to population density and a relationship between WNV transmission risk and the age of housing, land use, and the concomitant social and natural features. Additionally, the WNV case rate is considerably higher in urban areas associated with the inner suburbs, where 1940–1960 era housing dominates, vegetation cover is moderate, and population density is moderate (Ruiz *et al.* 2007). In short, the 1940's to 1960's suburbs concentrate people in areas where the predominant vector species and reservoir species intersect and provide drainage infrastructure conducive to *Culex* development.. Limited mosquito collection and testing in the Detroit Metro Area indicate that WNV rates are much

higher than in other areas of the state. For example, in 2012 the minimum infection rate (MIR) of *Culex* mosquitoes in Wayne County during weeks 29-31 (July 21 – August 4) was 31 WNV infected mosquitoes/1,000 mosquitoes tested. Conversely, the MIR in the rest of the state (primarily based on data from the mosquito control districts of Bay, Midland, Saginaw, and Tuscola Counties) was 2.25 WNV infected mosquitoes/1000 mosquitoes tested. It should also be noted that none of the counties in the Detroit and Grand Rapids Metro areas have organized mosquito surveillance and control programs.

WNV is now considered an endemic disease in the continental United States. As such, there will be potential for human illnesses and outbreaks each year depending upon environmental conditions and host factors. Individuals and communities can reduce the risk of WNV by using personal protective measures and/or community-level mosquito control. Personal measures to minimize contact with potentially infected vectors include wearing insect repellent, avoiding the peak biting times of *C. pipiens* (dusk and dawn), wearing pants and long-sleeves during peak biting times, draining standing water near the home, and making sure that window/door screens are in good repair. These few safety measures alone can significantly reduce an individual's risk of contracting WNV. These measures, however, do not reduce the number of infected mosquitoes in the environment.

To affect the risk of WNV for a community by reducing the number of infected mosquitoes in the environment, community level mosquito control can be employed. Since the introduction of WNV into Michigan, the municipalities with organized county-level mosquito control have experienced significantly fewer human WNV disease cases. Since 2002, only two cases have been reported from these jurisdictions. Another example of the efficacy of mosquito control resulted during a WNV outbreak that occurred in Sacramento, CA in 2005. To control WNV during the epidemic, aerial mosquito control was conducted targeting *Culex* species using pyrethrin in select areas. Abundance of potentially infected *Culex pipiens* mosquitoes was reduced by 75% in treated areas. Post-treatment, no further human WNV transmission

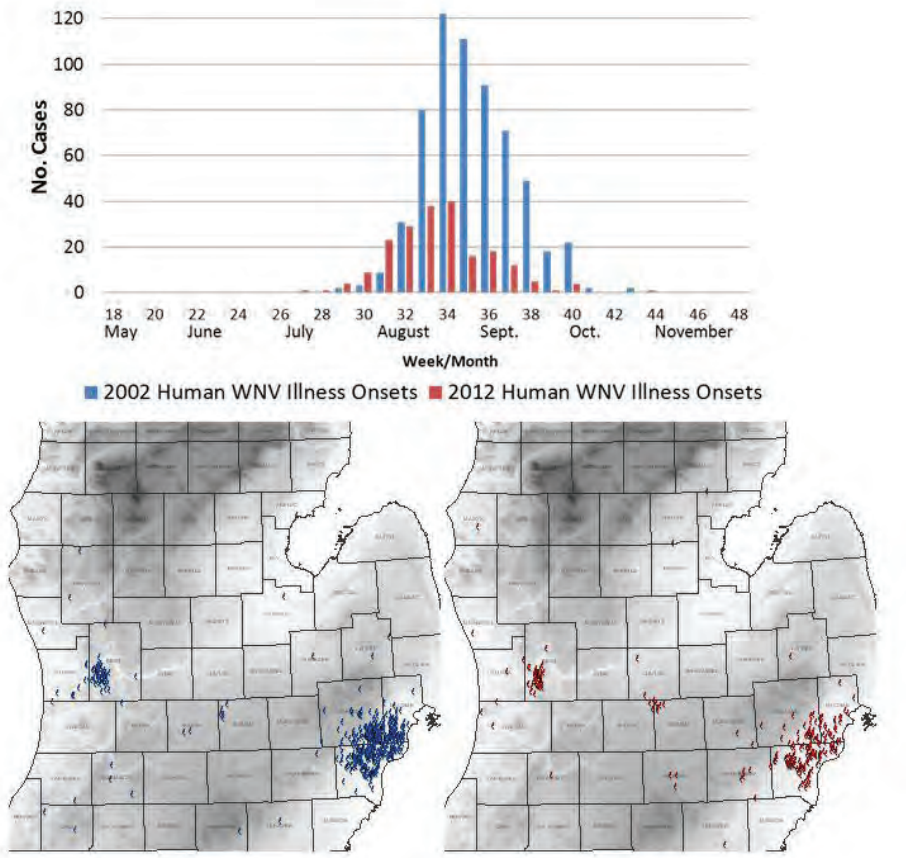

Fig. 1. Comparative epidemiology of the 2002 and 2012 West Nile virus (WNV) outbreaks in Michigan. (Top) Human illness onset dates 2002 (blue) and 2012 (red), the first human WNV illness onset in 2012 was two-weeks earlier than in 2002. (Bottom) Geographic distribution of human cases 2002 (blue) and 2012 (red), significant clustering occurred during both years in the Grand Rapids and Detroit Metro Areas. Data and image: E.Foster, Michigan Department of Community Health.

was documented in treated areas, and the odds of infection after spraying were ≈6× higher in the untreated area than in treated areas. Conclusions of the study indicate that actions taken by the mosquito control district were effective in disrupting the WNV transmission cycle and reducing human illness associated with WNV (Carney *et al.* 2008).

There are several challenges including cost, methods, and public sentiment that are inherent to establishing a mosquito control program in a community. It is important to have the support of the majority of community members and officials. A recent publication by Dickenson and Paskewitz (2012) highlights an important quandary for public health officials regarding the public's perception of mosquitoes and mosquito-borne disease. In a survey of homeowners in Madison, Wisconsin the researchers used a novel economic valuation method called stated-choice experiments in which respondents to an online survey are given a choice between hypothetical products or programs aimed at reducing mosquito-borne disease or nuisance. By observing the choices that citizens made about costs and benefits dealing with various mosquito control methods and outcomes for disease and nuisance reduction, researchers derived a WTP, or willingness to pay, for each attribute. Broadly, citizens were more apt to value programs that reduced the nuisance from mosquitoes over simply targeted approaches against WNV at the current low levels of risk in Madison. As the hypothetical risk of WNV increased, however, respondents were willing to pay more for programs to reduce disease. Public health officials should emphasize benefits to both disease control and quality of life when considering the establishment of mosquito control programs.

The public may also have concerns over the perceived risk of insecticides used for mosquito control; this is especially true with adult mosquito control. Communities opting to only conduct larval

mosquito control have little to worry about in this regard as the products, a large proportion of which are bacterial or insect growth regulators (IGRs), will rarely come into contact with the public, and are applied in a much more discreet way.

Communities conducting adult mosquito control utilize ultra-low volume (ULV) aerosol applications, generally from the back of a vehicle. ULV applications of insecticides utilize small droplets that have been determined to have the greatest effect on adult mosquitoes "on the wing". This may appear to citizens as an indiscriminant "cloud of poison," but the technology behind current products and the means of application reduce the risk of adverse individual and environmental impact. Applications are timed to coincide with maximum adult mosquito activity (dusk) and often have the added benefit of coinciding with reduced human outdoor activity. The insecticides used are typically a class of synthetic pyrethroids that are in common use today and degrade quickly in the environment. These insecticides are used to treat pets for fleas as well as children for lice. They are available in over-the-counter formulations and are generally very safe and effective when used according to label directions. There have been a number of studies that have assessed the human health risk of pesticides used in adult mosquito control. In one study (Peterson *et al*, 2006), the risk of adulticiding was compared with the risk of WNV disease. They found that the human-health risk of residential exposure to mosquito insecticides was low and not likely to exceed levels of concern. In addition, their analysis found that the risk from WNV disease exceeded the risk from exposure to mosquito insecticides. In another study (Schleier *et al*, 2009), ULV aerosol applications of several insecticides by truck-mounted sprayer were assessed to determine if previous assessments were sufficiently conservative to protect human health. Their findings supported previous studies and concluded that the risks from adult mosquito management are likely negligible.

West Nile virus has been a risk in Michigan since 2002, and will continue to be a risk into the future. Environmental conditions that affect the vector and its hosts such as temperature and precipitation, as well as differences in urban infrastructure will lead to variability in the risk from year to year. Years with above average winter to summer temperatures and average to below average summer rainfall will have higher likelihood of outbreak, especially in the inner-suburbs of Michigan's two largest metro areas. Citizens must remain vigilant and use personal protective measures during peak mosquito season, while communities and public health officials consider the establishment or use of mosquito control when environmental conditions or mosquito surveillance information indicate a risk for WNV transmission.

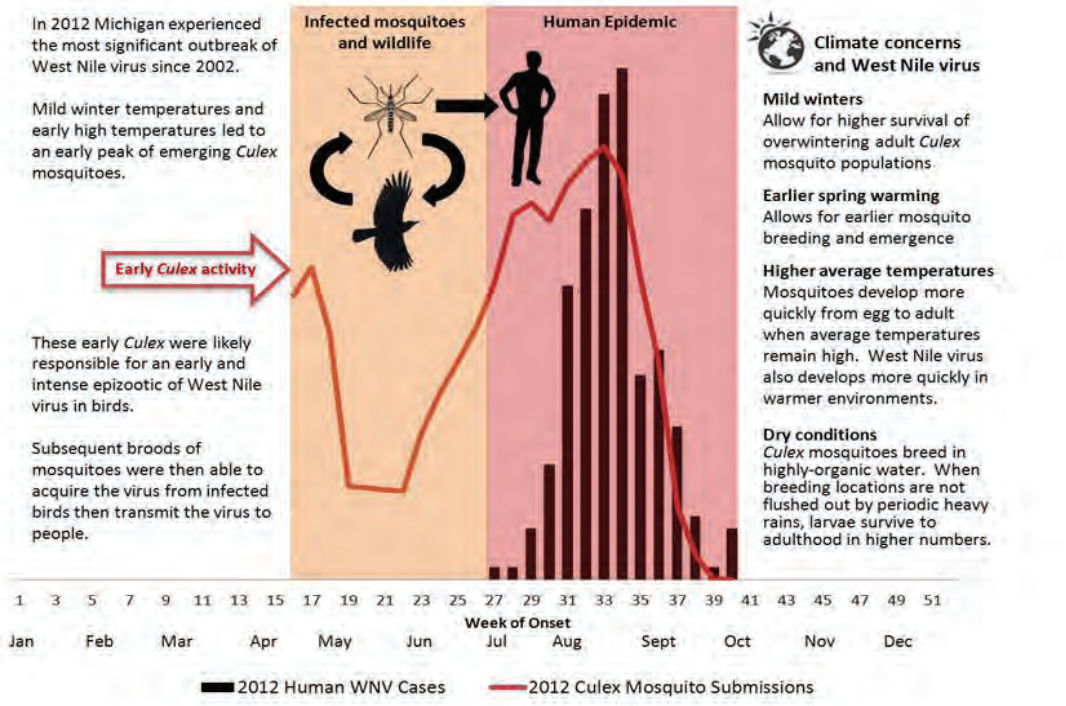

Fig. 2. *Culex* mosquito density (red line graph) measured by submissions to Michigan State Universities' arboviral testing lab. Early adult mosquito activity was observed in 2012 submissions and is hypothesized to have caused an early and intense epizootic (outbreak in wildlife) which subsequently spilled over into the human population (black bar graph). Data: E.Foster, Michigan Department of Community Health; M.Kaufman, Michigan State University. Image: E.Foster, Michigan Department of Community Health.

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Michigan Mosquito Control Association
Annual Meeting
February 6-7, 2013
DoubleTree by Hilton, Bay City, MI 48708
Contact Planning Chair Rebecca Brandt 989-894-4555 or visit www.mimosq.org for further details.

MES 2012 Annual Meeting Minutes – June 23, 2012

58th Annual Meeting
G.H. Gordon Biological Station of Hillsdale College

Present: The General Membership plus Governing Board Members: Toby Petrice, Dave Houghton, Bob Haack, Mark O'Brien, Ted Herig, Ron Priest, Adrienne O'Brien,

Reports:

Secretary: Adrienne O'Brien – Membership is currently at 262 individuals and 96 institutional/subscription members.

Treasurer: Tina Ciaramitaro – current balance - $21,000 after Journal (Vol 45, Numbers 1 & 2) and Newsletter (Vol 57, Numbers 1 & 2) expenses; still waiting for official tax exempt status.

Newsletter: Bob Haack – Bob has been Newsletter Editor for nearly 25 years – looking for anyone interested in taking that on. As always, looking for articles.

Journal: Therese Poland – In 2011, 2 issues of Volume 44 were published – (1&2) – August, 2011 and (3&4) - December, 2011. For 2012, Vol 45 (1&2) is currently at the printer. Vol 45 (3&4) is a special dedicated issue and well underway and scheduled to be printed in November, in time for a special presentation at the ESA meeting. Currently receiving submissions for 2013, Vol 46 (1&2), to be printed in early spring. Keep those papers coming!

Webmaster: Mark O'Brien – no report

Old Business: The topic of changing the constitution to allow Student Membership to apply to full time students through graduate school and to allow students to vote and hold office was introduced to the general membership. It was agreed to mail out a ballot before the 2013 annual meeting.

New Business: The topic of increasing membership was brought up for discussion to the general membership. The following ideas were offered: 1) word of mouth, especially to undergrad and grad students; 2) faculty sponsorships for graduate students – a bargain at $12/year; 3) contact Department Chairs at universities and colleges in the Great Lakes states, with info about the MES.

Elections: Congratulations to our new Member-at-Large, David Cuthrell (2012-15) and President Elect, Martin Andree. Thank you to the other candidates, Julie Craves and Ranger Steve Mueller for agreeing to be on the ballot. And, finally, a huge thank you to Ted Herig, Member-at-Large (2009-12) and Ethan Bright, Immediate Past President, for their service to the MES.

Fall 2012 Governing Board Meeting Minutes – November 8, 2012 at Hillsdale College

Present: Dave Houghton, Martin Andree, David Cuthrell, Toby Petrice, Bob Haack, Ron Priest, Mark O'Brien, Adrienne O'Brien

Reports:

Secretary: Adrienne O'Brien – Minutes from the Annual Meeting were read and accepted with changes made.

Treasurer: Tina Ciaramitaro – MES has regained its tax exempt status – WooHoo! Current balance is close to $23,000.

Newsletter: Bob Haack – Bob hopes to have the newsletter ready to go by early December. He is always looking for short articles for the newsletter.

Journal: Therese Poland – The Great Lakes Entomologist, Volume 45(3&4) will be mailed in a week – it is a special issue dedicated to Jay McPherson and is nearly 3 times the pages of a regular issue. Volume 46(1&2) is filling up and more articles are coming in for the next issue. There was some discussion about page charges and online presence was discussed, but no decisions were made.

Webmaster: Mark O'Brien – all volumes of the journal and all except the first 10 volumes of the newsletter have been scanned and most are on the MES website. The member application form on the website has been updated. After we have PayPal, it will be updated again.

New Business:

1) President-elect Martin Andree researched several sites for the 2013 Annual Meeting before recommending Drummond Island Resort. With its unique habitats and plant communities, the board agreed that it would be an excellent opportunity for some great exploring and collecting. In addition, he hopes to have featured speakers who can lead us on outdoor forays. Because of his keen negotiating skills, we will have exceptional lodging for a reasonable price.
2) Because of our tax-exempt status, we are able to set up a PayPal account at minimum cost, so those members and institutions preferring to renew or pay for journal page charges online can use this option. We hope to get that set up before renewal notices are sent in January.
3) Martin brought up several other issues – recognition of Honorary Members, MES logo update, branding and MES information packets for schools. Ideas were discussed with no decisions made.
4) Breaking Diapause will be held Saturday, March 16, in Ann Arbor at the new UM Biodiversity Research Collections facility.
5) It was agreed to include with the 2013 renewals, a ballot proposal to change the constitution regarding student memberships. Members will vote on the issue of extending the student membership category through grad school and allowing students to vote and hold office.

Proposed Changes to MES Student Membership

At the 2011 Fall Governing Board meeting, officers discussed ways to increase membership in the MES. One idea put forth was to attract more student members by extending Student Membership ($12/year) to full time students through college and graduate school. In addition, students would be granted the opportunity to vote and hold office. However, this requires a change to the MES Constitution, which only can happen after a vote by the general membership. This topic was discussed at the 2012 Annual Meeting. In order to receive more returned ballots, the MES Board decided to send out the proposal with the 2013 membership renewals. Look for it when you renew in 2013 – and don't forget to vote!!

Adrienne O'Brien, MES Secretary

The Great Lakes Entomologist Festschrift Dedicated to Jay McPherson

Therese M. Poland
USDA Forest Service, Northern Research Station, 1407 S. Harrison Rd., Rm. 220, East Lansing, MI 48823
Email:tpoland@fs.fed.us

On Tuesday, 13 November 2012, I had the pleasure of presenting a special issue of *The Great Lakes Entomologist* to Dr. J.E. (Jay) McPherson at the Entomological Society of America Annual Meeting in Knoxville, TN. This Festschrift was dedicated to Jay on the occasion of his retirement.

In fall 2011, Jay's former graduate student, Dr. Robert Sites, contacted me with the idea of publishing a Festschrift in honor of Jay's retirement. Dr. Sites selected *The Great Lakes Entomologist* for the Festschrift because he said it was Jay's favorite journal. Indeed, Jay published a paper in the very first volume of our journal when it was called *The Michigan Entomologist* and went on to publish in the third volume of the journal plus 65 additional papers in *The Great Lakes Entomologist* over the course of his career, representing over a third of his 183 publications. Dr. Sites invited many of Jay's colleagues and former students to contribute papers on various topics dealing with Heteroptera, primarily Pentatomidae, which was the focus of Jay's research. All of the authors very eagerly accepted the invitation and went to work to complete their papers and keep the issue a secret from Jay for over a year.

Jay McPherson receiving the special issue of TGLE from Therese Poland at the ESA Annual Meeting in November 2012

Jay with authors on the Festschrift at 2012 ESA annual meeting: L to R. Richard Packauskas, Al Wheeler, Robert Sites, Jay, Scott Bundy, Diane Wood, Tom Henry.

Jay completed his Ph.D. at Michigan State University, and then took a position at Southern Illinois University, Carbondale, as an Assistant Professor in 1969 where he was quickly promoted to Full Professor by 1979 and where he spent the rest of his career. He taught thousands of students, supervised 3 Ph.D. and 23 Master's students and served on more than 40 thesis committees. In addition to teaching, he contributed immense knowledge to the understanding of the Heteroptera through his outstanding research. He was also very active in university committees and scientific societies, especially the Entomological Society of America where he served as President, Governing Board member, Editorial Board member, Editor of the *American Entomologist*, and as a member on numerous other committees.

Jay has been the most prolific author and a regular and insightful reviewer for our journal for several decades. He has also provided me with much appreciated editorial advice and expertise over the years. The special issue of *The Great Lakes Entomologist* is a testament to the influence Jay has had over his colleagues and students and the esteem they feel for him. We congratulate Jay on his retirement and on his many accomplishments throughout his outstanding career. We wish him the very best in retirement and look forward to seeing his name on the pages of *The Great Lakes Entomologist* for many more years!

MES Financial News

The MES checking account balance was $22,830 as of 25 October 2012. Expenses for the past 6 months have dealt with publishing the latest GLE and newsletter, annual meeting expenses (honorarium, student awards), and reimbursements for postage and mailing supplies, totaling about $8400. Income from journal page charges, membership dues, subscriptions, and misc. totaled about $5600.

Watch for a new payment option in 2013 - PayPal! MES members will have the convenient option of making payments through PayPal. Payments for annual dues, annual meeting fees, GLE page charges, etc. will be accepted. For those with a personal PayPal account, just login and send money to <michentsoc@gmail.com>. Or watch for a PayPal payment button on our MES website!

Tina Ciaramitaro, MES Treasurer

Prairie Biotic Research Grants Available. Prairie Biotic Research, Inc. (PBR) is an all-volunteer nonprofit established in 2000 to foster basic biotic research in prairies and savannas. We offer grants up to $1000 to individuals for the study of any grassland taxon anywhere in the USA. Since 2002, we've awarded 136 grants worth over $130,000 to people in 30 states. In 2013, we expect to fund at least 10 grants of up to $1000 each. Visit our website (www.prairiebioticresearch.org) to learn more, to download our proposal forms. **We must receive your proposal through the mail before 6 January 2013.** Send your proposal directly to me (Andrew Williams) at 831 Ridgewood Ave., Ames, IA 50010. We also welcome donations of any size. Your gifts are fully tax-deductible. Thank you, Andrew H. Williams

Midwest Invasive Species Information Network (MISIN)

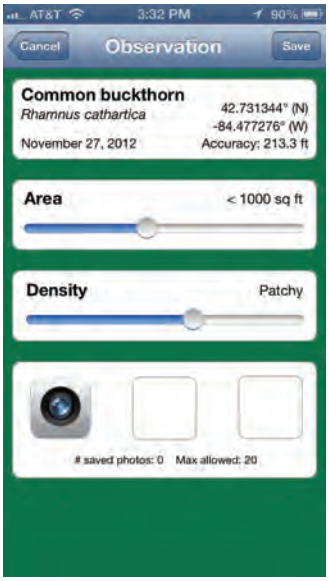
Amos Ziegler

Department of Entomology, Michigan State University, East Lansing, MI 48824. Email: ziegler2@msu.edu

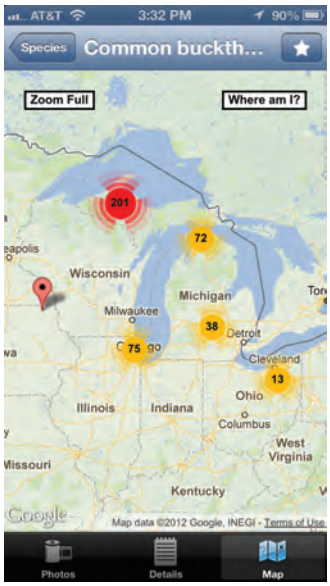
"The Great Lakes Region has long been a focal point for exotic species invasions. Even an abbreviated list of those species for which their North American invasion started or is centered in the region such as sea lamprey, emerald ash borer, and soybean aphid, speaks volumes about their impacts in our lakes, forests and agricultural ecosystems" (Landis et al. 2008).

"While a large number of individuals, groups and agencies are active in invasive species education, prevention and management efforts, their actions and overall impact are frequently disjointed and less effective than desired" (Landis et al. 2008). A main reason for this situation is the lack of real time tools to allow individuals, institutions, non-governmental organizations (NGO), and state/federal agencies to exchange information and work in concert to achieve shared goals. The Midwest Invasive Species Information Network (MISIN) was established with the goal of addressing this problem through the development of an education, training, and early detection system centered on a spatially explicit database of invasive species occurrences.

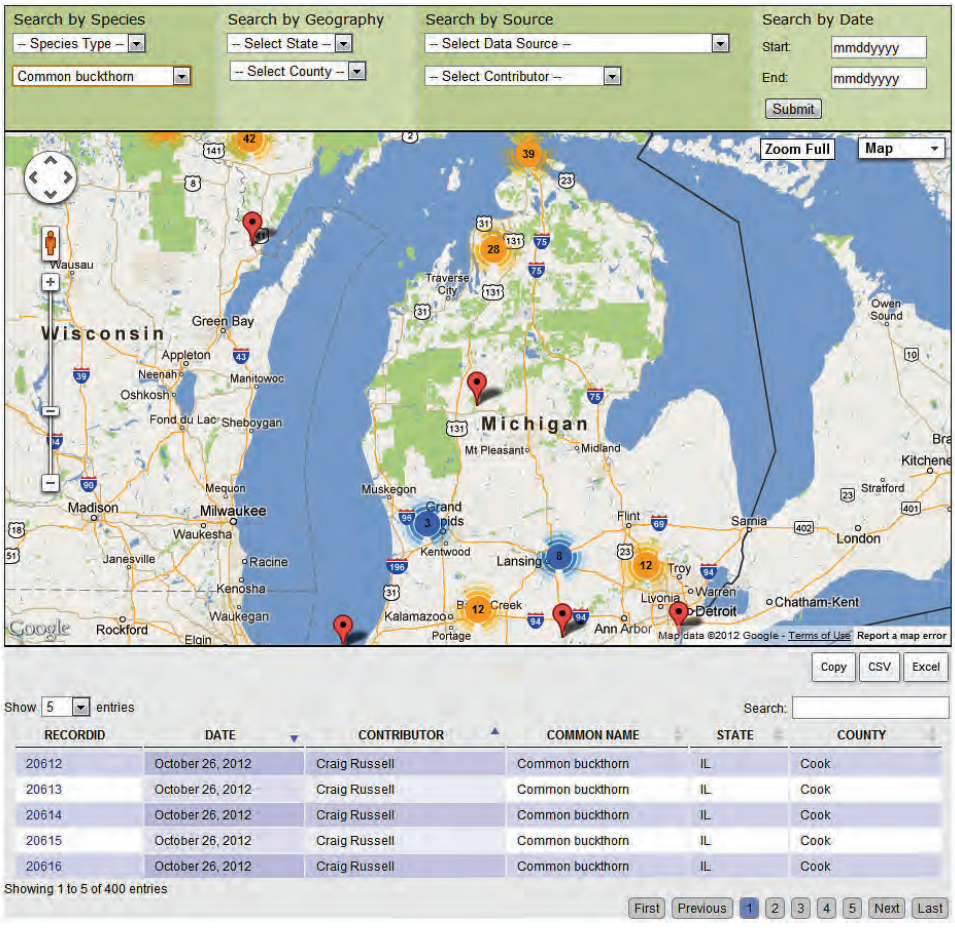
The MISIN invasive species observation crowdsourcing effort has been largely focused on non-indigenous terrestrial and aquatic plants, but during 2011-2012 it has established partnerships to facilitate the monitoring of Asian longhorned beetle (*Anoplophora glabripennis*), spotted wing drosophila (*Drosophila suzukii*) and brown marmorated stink bug (*Halyomorpha halys)* in the state of Michigan. All reportable species are profiled in a growing series of factsheets (currently numbering 184) that provide photographic references, identification characteristics, monitoring and rapid response information. Observation data are crowdsourced from contributors via three data pathways – the MISIN website, smartphone and bulk data contribution.



Smartphone data recording



Smartphone species map



MISIN data browsing application

The MISIN website is the primary tool for citizen scientists to report a sighting of an invasive species. Annually, the MISIN website receives over 1 million hits from over 30,000 unique visitors originating in over 100 different countries and all 50 U.S. states. Users are required to register and log into the website in order to report a sighting. Currently, there are over 600 registered users. The reporting process is a simple three step sequence consisting of 1) login, 2) verification and 3) record observation data. During Step-2, users are encouraged to use the over 180 factsheets to assist in confirming the identity of the species they wish to report. Additionally, the website contains over 40 online e-learning identification modules for high profile species. These training modules take the average user 15-20 minutes to complete and include a 10 question assessment that reinforces the identification information provided in the module.

Step-3 of the reporting process uses an embedded Google map which assists users in determining the latitude and longitude coordinates of the observation. Additionally, users are required to specify the common name, date and estimated area and density associated with the observation. Most importantly, users are able to attach two digital photos to the observation record to aid in further identification and verification of the reported species.

MISIN has recently released a new smartphone application for the Apple iPhone (http://www.misin.msu.edu/apps) which allows users to submit field observations

and associated digital pictures (see screen captures on pg. 38). These observations are stored on the smartphone and either uploaded from the field or when connected to Wi-Fi for faster data transfer. Also available within the application are all the species information factsheets provided on the website and real-time species distribution maps.

Bulk data submission represents the final mechanism for contributing data to the MISIN database and is most often used by our federal, state and NGO partners. Bulk observations are generally season long surveys of invasive species with observation data being collected using standardized MISIN protocols developed in cooperation with a consortium of statewide stakeholders.

The MISIN project continues to expand the tools available to users for the exploration and extraction of observation data. We recently published a new data browsing application which allows users to query observation data by species, geography, contributor or date. Results are displayed both spatially and in a tabular data grid. A familiar Google map serves as a background to clustered observation markers. Clicking on a marker cluster will zoom and expand the cluster to show either additional clusters or individual markers. Users can click on individual markers to display the associated observation data.

Finally, the data grid provides users a tabular view of their current search results. The columns of the data grid can be sorted and individual records can be zoomed to within the map by clicking the hyper-linked record id value contained in the first column. The data grid also provides users with the ability to export the current search results to the local operating system clipboard or CSV and MS Excel formats.

Looking towards the future – we are currently working on several new efforts including an Android version of our smartphone application and email alerts. There is no estimated release date for the Android application, but watch our website (http://www.misin.msu.edu) for updates. Email alerts will soon be available to provide users with notifications of first occurrence species observations and new observations based on user-defined geographic area. Alerts will be a new feature of the MISIN user profile when completed. We are always working to develop data partnerships with similar invasive species monitoring efforts and will continue to work to incorporate observations from other networks into the MISIN database in order to provide the most complete picture of invasive species in the region.

So, how can you get involved with this early detection and rapid response effort to invasive species? First, start by registering with the MISIN web site (http://www.misin.msu.edu) and becoming familiar with the reporting process. Then find a local conservation district office or cooperative weed management group and get involved in their activities. Remember to use the resources available on the MISIN website to locate invasive species observations in your local area and think about organizing your own grassroots management efforts.

References

Landis D, R Ahern, A Ziegler, P Higman and E Schools. 2008. The Michigan Invasive Species Information Network (MISIN): engaging stakeholders in invasive species detection and management. A proposal to the Sustainable Michigan Endowed Project Integrative Grants Program. Michigan State University.

The Edward Voss Insect Collection Moves to MSU

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It was a delightfully sunny day in August as Gary Parsons and I drove to Mackinaw City to pick up Ed Voss' insect collection. Gary, Arthropod Collection Manager at MSU, had been making arrangements with Dr. Brian Scholtens for some weeks prior to our trip. Brian was quite a friend of Dr. Voss. Both had taught together at the U. of M. Biological Station and both were interested in Lepidoptera. Though Ed's botanical work took him to most places in Michigan, his insect collection focused primarily on the two counties at the northern tip of Michigan's Lower Peninsula, Cheboygan and Emmet. Ed spent much of his summer months at the family cottage in Mackinaw City. It was near the UM Bio-Station and so it was a naturally convenient location for Ed to collect moths and butterflies.

Gary Parsons loading the Voss Collection

Gary and Brian had agreed to meet in the early afternoon of 15 August 2012 at the Voss cottage. So off Gary and I went that day in Gary's small Nissan Xterra SUV, which we hoped would be big enough to hold all of Ed's collection, which we had never seen. After lunch in Indian River, we arrived at the cottage shortly after 1 P.M. There was Brain waiting for us with Ed's nephew Andy Hendricks. After getting acquainted, Gary, Brian, and I climbed the steep staircase to Ed's second floor study where his boxes of insects were stored. Within half an hour we had them packed away in Gary's SUV. We took a couple of photos of our group and a few hours later we're back at MSU and off loaded the collection into the museum.

Once placed on the sorting table in the Lepidoptera room, Ed's collection is quite impressive. His insects are contained in 123 Schmidt and others boxes. Gary later totaled the insects by family and number of specimens. In all there are 33 families of Lepidoptera totaling over 6,000 specimens with Noctuidae, Hesperiidae, Geometridae, and Nymphalidae being the most numerous. Additionally, the collection contains 15 other insect orders.

Mo Nielsen working on the Voss Collection

Now the work begins! First to jump in is none other than Mo Nielsen! He's almost completed placing the hesperiids into the main collection. I suspect he'll soon be perusing the noctuids too for unexpected finds! Frank West and I are working on the microleps.

For additional information on Ed Voss, see his obituary in the last MES Newsletter.

Haack RA. 2012 Edward G. Voss: 1929-2012. Newsletter of the Michigan Entomological Society 57: 16.

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Seeking New First State Arthropod Reports

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IT'S TIME AGAIN TO SET THE RECORD STRAIGHT! Have you recovered an arthropod species not before recorded from your state? Perhaps you've recovered one a few years ago which has not yet been reported in print. That information is important to document distribution. Publishing new state records significantly adds to our understanding of a species' range as well as their expansion.

Submit your new record(s) in early 2013 for our next newsletter. If you're not sure of the identity of your specimens, that is a great reason to attend our next Breaking Diapause on the UM campus, **Saturday, 16 March 2013**. (See the announcement in this issue.) The more information you have regarding your recovery the better. Include as many of the following points as you have: species, common name (if there is one), family; date, location of recovery; method of recovery; identifier; photograph; habitat; current specimen(s) location. Of course, you will be credited for all your information!

Send your information to Ron Priest, using the contact information. If you have questions, do contact me by Email, phone (517-353-7294), or U.S. mail. I look forward to hearing from you, learning what's new, and seeing your records in print.

Holiday Open House at the MSU Bug House: 27 XII 12

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With the holiday season just around the corner, mark your calendars for the MSU Bug House Holiday Party on 27 December 2012 from 10am-3pm. We have some great activities and prizes planned. The Bug House is located in Room 147 Natural Science Bldg on the MSU campus. You can find more information and a map to the Bug House at <http://www.ent.msu.edu/BugHouse/tabid/70/Default.aspx>.

Invasion-festation

You crawl on my walls,
you crawl on my ceiling,
you fly through my halls
in the warmth you are feeling,

milkweed bugs on my table,
wasps buzzing the gable,
green flies on my windows
and red ladybugs in windrows!

How did you get in here?
My house is sealed tight!
It's that time of year
bugs should be out of sight.

What you're up to I know,
for soon it will snow,
and then a hard freeze—
but I'm up to my knees!

I don't think I can win,
in fact it's a rout—
more of you are getting in
than I can throw out!

Ken Tennessen, 2012
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