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The Emerald Ash Borer: A New Exotic Pest in North America

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Yet another new exotic forest pest has been discovered in North America, and this time the infestation is centered in Michigan and Ontario. In May and June 2002, adults of an unidentified buprestid beetle were collected from ash (*Fraxinus*) trees in the Detroit area of southeastern Michigan. Later, in July 2002, after various world experts examined the beetles, they were positively identified as the Asian species *Agrilus planipennis* Fairmaire. This finding was quickly followed by the discovery of *A. planipennis* in neighboring Ontario, Canada. A flurry of activities soon followed, including conducting surveys, establishing quarantines, hosting public meetings and initiating research programs.

Common name. The name "Emerald Ash Borer" was submitted to the Entomological Society of America for consideration as *A. planipennis*' official common name by Richard Westcott (Oregon Department of Agriculture) and Natalia Vandenberg (USDA-ARS Systematic Entomology Laboratory). Discussions on a common name were initiated by several entomologists even before final confirmation was made on the beetle's identity. This was done to preempt the press from choosing their own common name once the presence of this new exotic was made public. Several adjectives were suggested to capture the beetle's color (emerald, green, metallic green), host range (ash), origin (Asian), feeding habits (borer), and taxonomic affiliation (*Agrilus*, buprestid). But when all the votes were counted, "Emerald Ash Borer" was the clear winner.

Adult Emeral Ash Borer and D-shaped exit hole

The discovery trail. In May and June 2002, adults of an unknown buprestid were reared from ash trees from various parts of southeastern Michigan. In June, David Roberts, Michigan State University (MSU) Extension, sent some of the adults to the Entomology Department at Michigan State University, where Gary Parsons identified them to the genus *Agrilus*. There were no similar species in the MSU insect collection and so the beetles were suspected to be exotic. Soon more beetles were collected and either beetles or digital images were sent

Current Annual Dues Schedule

Student (through High School)	$ 5.00
Active	$15.00
Institutional	$35.00
Sustaining	$25.00
Life	$300.00

to five beetle experts in the US: Chuck Bellamy (California Department of Food & Agriculture), Robert Carlson (USDA-ARS Systematic Entomology Laboratory), Henry Hespenheide (University of California at Los Angeles), Natalia Vandenberg and Richard Westcott. Although all agreed that it was exotic, and probably Asian in origin, a positive identification could not be made. On 30 June, Richard Westcott e-mailed a description and digital images of these unknown beetles to Eduard Jendek in Slovakia, an expert on Asian *Agrilus* species. Based on this information, E. Jendek tentatively identified the beetles as *A. planipennis* on 31 June. In the meantime, Robert Carlson mailed some actual specimens to Slovakia, and on 9 July, E. Jendek was able to positively confirm that the beetles were *A. planipennis* Fairmaire (1888).

On 10 July 2002, Canadian forest health specialists Ed Czerwinski (Ontario Ministry of Natural Resources = OMNR), Doug Lawrence (Natural Resources Canada - Canadian Forest Service = NRC-CFS), and Dan Rowlinson (OMNR), found similar looking beetles and dead and dying ash trees in neighboring Windsor, Ontario. The beetles were then forwarded to the NRC-CFS lab in Sault Ste. Marie, ON, and then to Bruce Gill, an insect identifier for the Canadian Food Inspection Agency (CFIA) in Ottawa, ON. Bruce Gill suspected them to be *A. planipennis*, and forwarded some adults to Richard Westcott in Oregon for final confirmation, which came on 7 August 2002.

Taxonomy. *Agrilus planipennis* Fairmaire (1888; type China) has several synonyms, including *A. marcopoli* Obenberger (1930; type China), *A. marcopoli ulmi* Kurosawa (1956; type Japan), and *A. feretrius* Obenberger (1936; type Taiwan) (Jendek 1994). EAB is referred to as *A. marcopoli* in much of the Chinese literature and as *A. marcopoli ulmi* in Japan. Based on the morphology of the scutellum, deep pronotal medial sulcus, and robust body, *A. planipennis* appears most closely related to the Asian species *A. auristermum* Obenberger, *A. cyaneoniger* Saunders, and *A. lubopetri* Jendek.

Native range. EAB is native to northeastern China (Jilin, Liaoning, Heilongjiang, Inner Mongolia, Hebei, and Shandong), Korea, Mongolia, and Japan (Hokkaido, Honshu, Kyushu, Shikoku) (Chinese Academy of Science 1986, Ko 1969, Kurosawa et al. 1985, Sugiura 1999, Yu 1992). It is also native to the Russian Far East (Alexeev 1979) and Taiwan (type locality of junior synonym *A. feretrius*).

Host range. In China, ash (*Fraxinus*) is the only host reported for EAB, including, *F. chinensis* var. *chinensis*, *F. chinensis* var. *rhynchophylla*, and *F. mandshurica* (Chinese Academy of Science 1986, Yu 1992); the above ash taxonomy is based on Wei and Green (1996). In Japan, where *A. planipennis* is considered a subspecies under the name *A. planipennis ulmi* (Kurosawa 1956, Akiyama and Ohmomo 1997), the host range includes *Fraxinus mandshurica* var. *japonica*, *Juglans mandshurica* var. *sieboldiana* and var. *sachalinensis*, *Pterocarya rhoifolia*, and *Ulmus davidiana* var. *japonica*, (Akiyama and Ohmomo 1997, Sugiura 1999). Although these species of *Juglans*, *Pterocarya*, and *Ulmus* occur in China (*Flora of China* at http://flora.huh.harvard.edu/china/), they have not been reported as EAB hosts in China. In Michigan and Ontario, EAB has so far only been found infesting ash trees, including *F. americana*, *F. nigra*, and *F. pennsylvanica*.

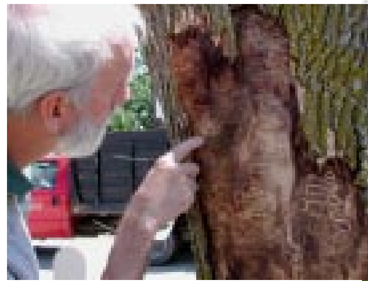
Identification. EAB adults are slender, elongate beetles, 7.5-15 mm long (Yu 1992, Sugiura 1999). Adults are metallic, coppery-green in color. Mature larvae reach 26-32 mm in length (Yu 1992). Larvae are white, flat, slender, and like all *Agrilus*, have a pair of brown, pincer-like appendages (urogomphi) on the last abdominal segment. The larval head is relatively small, brown, and retracted inside the enlarged prothorax. Photos of larvae and adults are available in McCullough and Roberts (2002) and on several internet websites.

Biology. Information on EAB biology in Asia is scarce. To date, we have only found two short articles on EAB: Chinese Academy of Science (1986) and Yu (1992). In general, based on information in these two Chinese references, EAB typically completes one generation per year in northeastern China, although some individuals may require two years. Adults are active from mid-May to July. Adults lay eggs on the bark surface, inside bark cracks and crevices, usually from early June to late July. Larvae actively feed in the cambial region of the trunk from mid-June to mid-October. EAB overwinter as fully grown larvae in pupal cells constructed in the outer sapwood or in the bark. These larvae pupate the following spring during late April and May. For larvae that are not fully grown by fall, they overwinter in the cambial region, initiate feeding again in April, and complete development later in summer.

Field observations in Michigan over the past few months noted EAB adults on ash trees from late May (David Roberts, MSU, pers. comm) to early August (David Cappaert, MSU, pers. comm). Similarly, most larvae were 2nd instars by late July, most were 3rd instars by early August, and most were 4th instars by late August. We first found larvae in pupal cells on 20 August 2002. Most larvae constructed pupal cells in the outer sapwood, but many were also constructed in the thick outer bark (RA Haack et al., unpublished data). Because many other *Agrilus* species have four larval instars (Haack and Benjamin 1982, Loerch and Cameron 1983), we assume that EAB also has four instars, but this needs to be verified.

Again, based on literature from China (Chinese Academy of Science 1986, Yu 1992), adults walk to the crown of their host tree and begin feeding on foliage soon after emergence. Adults eat small amounts of foliage throughout their life, averaging about 0.5 cm^2 per day. Initial flight usually begins within 3 to 4 hours after the first feeding. EAB adults are often active from 6:00 to 17:00 hours, especially when the weather is warm and sunny. Adults typically fly in 8 to 12 meter bursts (Yu 1992), but long distance flight of more than one kilometer is possible (Minemitsu Kaneko, Japan Wildlife Research Center, Tokyo, Japan, personal communication). Adults often rest in bark cracks or on foliage when rainy or very cloudy, and they usually remain on foliage at night. Adult males typically live 2 weeks and females 3 weeks. Females lay 68-90 eggs in their lifetime. Eggs are usually deposited individually on the bark along the trunk and lower portions of major branches. Eggs hatch in about one week. The new larvae tunnel through the bark to the cambial region and feed on the inner bark (phloem) and outer sapwood during the summer and early fall. Larval galleries are typically S-shaped (serpentine), packed with frass, and increase in width as the larvae grow. After pupae transform to adults, it takes 1 to 2 weeks before the new adults chew their way out of the tree. Adult emergence holes are D-shaped and about 3-4 mm in width.

Attack pattern. In China, EAB most often attacks ash trees that are growing in the open or along the forest edge (Chinese Academy of Science 1986), but entire stands can be killed during outbreaks (Yu 1992). Attack densities are highest along the lower trunk in China. In Michigan and Ontario, EAB has infested and killed ash trees in both open settings and inside woodlots. Likewise, in Michigan and Ontario, EAB appears to initiate attack along the upper trunk and lower portions of the main branches, with succeeding years of attack being concentrated along the lower trunk. Tree death usually occurs in 3 years, but trees could die in 1 to 2 years when EAB populations are at outbreak levels. In Michigan and Ontario, EAB has infested apparently healthy ash trees from as small as 4-5 cm in diameter to mature forest



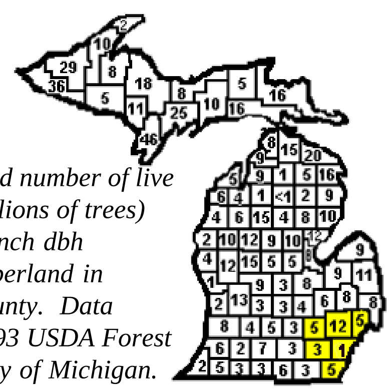
EAB larval galleries

EAB-infested ash showing epicormic branches

trees that are over 1m in diameter.

Signs and Symptoms. For trees that die over a 3-year period, first-year EAB infestations are difficult to detect because eggs are laid deep inside bark cracks, larval feeding occurs under the bark, and oviposition usually begins along the upper trunk. Not until the summer following initial attack are the D-shaped exit holes first evident on the bark surface. However, in the absence of other signs or symptoms, exit holes can easily escape detection when in low numbers. Typically, little crown dieback occurs during the first year of attack. In the second year of attack, (1) less foliage develops and crowns appear thinner, (2) the sapwood forms callus tissue around the larval galleries from the first year, which can result in longitudinal bark splits 5-10 cm long, and (3) epicormic branches ("sprouts") develop along the main trunk and on some major branches. In the latter year's of infestation, if EAB larval populations remain high, foliage on the epicormic branches often turns brown prematurely in late summer. The characteristic frass-filled, S-shaped larval galleries can be seen only after removing the bark, although some galleries can be glimpsed through cracks in the bark. The galleries are most common along the upper trunk in the first year of attack, but can be found throughout the trunk in succeeding years. Typically, by the third year of attack, many branches have died, little foliage is present, bark splits are common, exit holes are present throughout the trunk, and epicormic branches are common, especially along the lower trunk and at groundline.

Resource at risk. There are about 60 species of ash worldwide, including 16 species in North America and 22 in China (Little 1979, Wei and Green 1996). Ash occurs naturally throughout much of eastern North America and along the west coast. Ash is an important timber species, landscape tree, and wildlife food. Based on the 1993 USDA Forest Service forest inventory data for Michigan, there are about 692 million ash trees growing on timberland



Map 1. Estimated number of live ash trees (in millions of trees) greater than 1-inch dbh growing on timberland in Michigan by county. Data based on the 1993 USDA Forest Service inventory of Michigan.

in Michigan, of which about 31 million occur in the six counties that are now infested with EAB (Map 1; http://fia.fs.fed.us/dbrs_setup.htm). These estimates do *not* include urban trees growing in yards and along streets. Ash is a common street tree, often representing 5-20% of all street trees in many midwestern and Canadian cities. The potential loss of ash as an urban street tree greatly reduces the selection of suitable species available to home owners and municipalities and will likely contribute to urban heating.

Map 2. Quarantined counties where Emerald Ash Borer has been detected in Michigan (1-6) and Ontario (A)

Quarantine, survey, and infestation history. On 16 July 2002, the Michigan Department of Agriculture (MDA) enacted an interior quarantine on five Michigan counties where EAB was initially found to occur: Livingston, Macomb, Oakland, Washtenaw, and Wayne (Map 2). Monroe County was added in September 2002. The aim of the quarantine is to stop human-assisted movement of ash products that could harbor EAB. The quarantine regulates movement of live ash trees, limbs, firewood, logs, and untreated ash lumber to areas outside of the six infested counties.

Leading up to the quarantine were a series of surveys conducted primarily by MDA staff . In general, a minimum of 25 sites in each of 13 counties were surveyed for EAB, which resulted at first in 5 positive counties and 8 negative counties (Map 2). Surveys are continuing in Michigan, including eventually all nurseries and sawmills that deal with ash. Aerial surveys for ash suspected to be infested with EAB began in southeastern Michigan in late August 2002. These surveys, along with aerial photography, photo interpretation, and ground-truthing are being coordinated by MDA, the Michigan Department of Natural Resources, and USDA Forest Service and APHIS (Animal and Plant Health Inspection Service).

Ground surveys have also occurred in Ontario. In August 2002, delimitation surveys were conducted by CFIA in the vicinity of the city of Windsor in the western portion of Essex County, Ontario (Map 2). Also, information packages were sent to all major municipalities in Ontario with a request to survey for EAB. At this time, EAB has not been found elsewhere in Canada and the current infestation appears limited to the greater Windsor area of Ontario.

Given the current extent of EAB's distribution in Michigan and Ontario, and the presence of both dead and dying trees, local entomologists now believe that EAB first arrived more than 5 years ago (McCullough and Roberts 2002). Early evidence of EAB infestation was likely masked by general ash decline throughout the East and the presence of a disease known as ash yellows, both of which cause crown dieback in ash trees. It is not known how EAB arrived in North America, but infested crating, dunnage, or pallets from Asia are suspected.

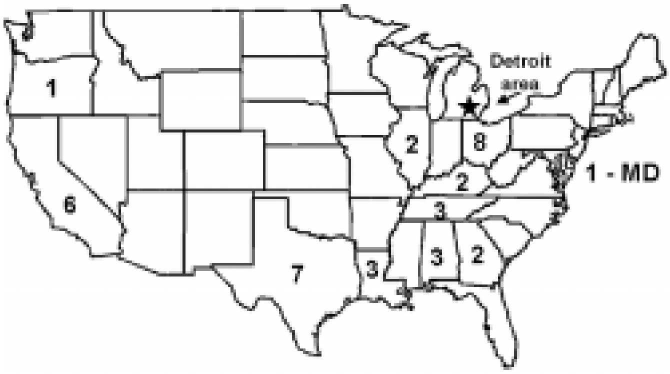
Actions taken and future needs. Many activities have taken place since the discovery of EAB. At the time of announcing the quarantine, MDA sponsored press releases and hosted meetings with several impacted industries. A 1-800 hotline was established by MDA to handle questions from the public. Several EAB websites have been constructed. The two most complete are hosted by MDA (www.michigan.gov/mda using the key words "ash borer"), and the USDA Forest Service (http://www.na.fs.fed.us/spfo/eab/index.html). USDA APHIS organized a New Pest Advisory Group to discuss the EAB situation, and so far two conference calls have taken place. USDA APHIS is now planning to organize an EAB Science Panel to address questions regarding EAB biology and management. In addition, in August and September, field trips were organized for state and federal plant health specialists to visit the EAB-infested sites in the US and Canada. An EAB management plan is now being formulated by various state and federal employees in Michigan.

In Canada, CFIA and OMNR are developing EAB websites; the CFIA website is at www.inspection.gc.ca. CFIA is now in the process of establishing consultative committees to provide science-based guidance on how best to deal with EAB. CFIA expects to impose a ministerial order on the infested area in the very near future that will prohibit the movement of suspect infested materials including ash trees, nursery stock, and firewood. Given that Essex County is one of the least forested counties in southern Canada (with less than 4% forest cover) quarantine action to preclude the movement of possibly infested materials is expected to be effective in slowing the spread of EAB. Few nurseries are located in Essex County and very little nursery stock traditionally moves from this area to either the US or other parts of Canada.

A few research projects have already been initiated by USDA Forest Service and Michigan State University entomologists. They include aspects of seasonal development, within-tree distribution, evaluation of systemic insecticides, survival in cut logs, and natural enemies. Many more scientists, both in the US and Canada, are planning a wide array of studies in both North America and Asia.

Other exotic *Agrilus* in the US. Besides *Agrilus planipennis*, at least six other *Agrilus* species are established in the United States. These are *A. cuprescens* (= *aurichalceus*) on *Rosa* and *Rubus; A. cyanescens* on *Alnus, Betula, Fagus, Quercus,* and others; *A. derasofasciatus* on *Pistacia* and *Vitis, A. hyperici* on St. Johnswort, *Hypericum perforatum; A. pilosovittatus* on *Wisteria,* and *A. sinuatus* on *Pyrus* and other Rosaceae (Campbell and McCaffrey 1991, Hespenheide 1968, Hoebeke 1980, Mattson et al. 1994, Solomon 1995).

Recent *Agrilus* interceptions in the US. USDA APHIS reported 245 interceptions of buprestids at US ports of entry during the period 1985-2000 (Haack 2002). Of these 245 interceptions, there were 38 *Agrilus* interceptions as well as 41 records



Map 3. Interceptions of Agrilus *in the U.S.: 1985-2000*

where the insects were not identified below the family level Buprestidae. Of the 38 *Agrilus* interceptions, 37 were identified to the genus level only and 1 to the species level: *A. sulcicollis*, which was intercepted in dunnage on a shipment from Belgium. The 38 *Agrilus* interceptions were made at US ports in 11 different states (Map 3). It is interesting to note that no *Agrilus* were intercepted in Michigan, although at the nearby port of Toledo, Ohio, *Agrilus* specimens were intercepted on at least 8 occasions. Of the 38 *Agrilus* interceptions, 28 were recovered from dunnage, 4 from crating, 4 from grape leaves, 1 from a cutting, and 1 was at large in the ship hold.

The 38 *Agrilus* interceptions originated from at least 11 countries, including Belgium (16 interceptions), Germany (5), Israel (3), France (2), India (2), Finland (1), Italy (1), Jordan (1), Korea (1), Mexico (1), Russia (1), Europe (1), and unknown (3). Of these countries, EAB is native to only Korea and Russia. Similarly, of the 41 buprestids that were not identified beyond the family level, 6 originated in China and 2 in Japan, which are two additional countries where EAB is native. Given that few *Agrilus* are intercepted and of those very few are identified beyond the genus level, the *Agrilus* interception data provide few clues as to the likely origin of the EAB population now established in North America.

Outlook. The North American ash resource is at risk from EAB. So far, all species of North American ash growing in the infested area have been successfully attacked. A Pest Risk Assessment recently completed by CFIA (Dobesberger 2002) concluded that EAB could potentially spread throughout the range of ash in North America and cause considerable economic and environmental damage. A vigorous research and management program along with harmonized quarantine actions are urgently needed to contain this new exotic tree pest.

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Michigan Entomological Society 2002 Annual Meeting

The 2002 Annual Meeting was held 7-8 June at the Indiana Dunes Environmental Learning Center in the Indiana Dunes National Lakeshore. There were 14 oral presentations, including 3 student presentations and 2 posters presentations. Approximately 35 people attended the meeting. Thanks to James Dunn for organizing this year's meeting.

Keynote Session: Role of Habitat Management in the Conservation of Rare and Endangered Insects

Compatibility of Management Burning With the Conservaton of Insects Within Small Isolated Prairie Reserves

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I examined post-fire insect population response and recovery within small, isolated tallgrass prairie remnants in northern Illinois, northwest Indiana, and southeast Wisconsin. I used a comparative approach to examine species composition and the distribution of species richness within fire-managed and fire-excluded reserve systems. This study was conducted over seven seasons, focused on responses at the species level, distinguished between remnant-dependent and remnant-independent species, and included multiple fire events and sites. Most species (93%) were found to respond consistently to prescribed fires. Post-fire responses ranged from fire-positive (26%) to fire negative (40%) for 151 species representing 33 families and seven orders. Three attributes, remnant-dependence, upland inhabitance and nonvagility were found to be significant predictors of negative post-fire species response. Among negatively impacted populations, 68% were found to recover within one year. All 163 populations tracked to recovery did so in two years or less. The fire attrition hypothesis predicts that fire-excluded sites will support greater species richness, greater mean population densities, and an inordinately large number of species that are absent from fire-managed sites. Comparative studies of leafhoppers and butterflies failed to support these predictions. I conclude that the judiscious use of cool season burning is compatible with the conservation of insect biodiversity within highly fragmented systems.

The Effect of Prescribed Burning on Epigeic Springtails

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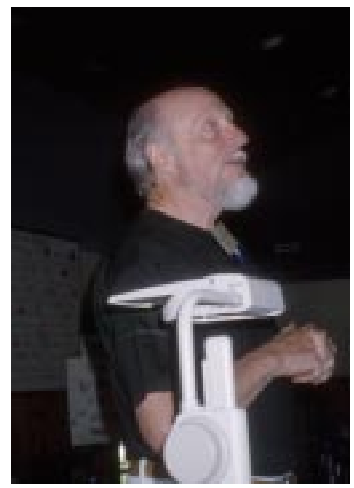

Species richness, frequency, and density of litter-dwelling springtails (Collembola) were analyzed form woodland litter samples collected for 4 years over a 12-year interval, from the East Woods of the Morton Arboretum, Lisle, IL. The 162 samples were divided equally between areas that had been previously burned and areas that had not been burned. There were significantly fewer springtail species in burned areas and 8 of the 10 most common species had lower frequencies in burned areas. The effect of fire varied for the 30 species identified in the study. *Isotoma notablilis*, *Lepidocyrtus* spp., *Neanura muscorum* and *Tomocerus flavescens* had significantly higher frequencies and densities in unburned areas and *Isotoma virdis* and *Xenylla grisea* had significantly higher frequencies and densities in burned areas. The mean dry weight of litter from 126 samples (equal numbers from burned and unburned areas) over 3 years was significantly heavier from the unburned areas. To maintain the richness of forest litter invertebrates in areas where prescribed burning is used, it is proposed that the scheduling of annual fires be changed to once every 2 to 3 years. Before the use of fire, scattered refuge areas should also be established and maintained to enhance invertebrate survival.

Details on this paper will soon be published in: *American Midland Naturalist* Volume 148 Number 2.

Managing Natural Systems for Invertebrate Biodiversity: The Issue of Scaling Ecological Processes in a Fragmented Landscape

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The primary issue surrounding fire management of natural areas and maintaining invertebrate biodiversity isn't fire per say, but rather is an issue of scale. The primary concern is how to apply fire (or any ecological process for that matter) at a scale that is appropriate to the set of conservation targets at a site, especially in highly fragmented ecological systems where remnants of once vast ecosystems are trapped on relatively small preserves.

Conservation has long since moved beyond managing for static reserves that never change. Many of our most imperiled systems represent early successional communities that in the absence of disturbance, move to radically different points of ecological equilibrium. Communities such as prairie, oak savanna, oak barrens and fen meadow represent botanical assemblages that are relatively ephemeral unless an ecological process disrupts the path of succession. Disturbances such as hydrologic fluctuation, drought, fire, or herbivory once acted to maintain these "disclimax" communities at some equilibrium level at a landscape scale. But as humans exerted complete dominance over landscapes we eliminated almost every factor which increased ecological uncertainty at a landscape scale. Especially in the agricultural Midwest, any factor save drought, that is capable of maintaining dynamic and patchy ecosystems has been manipulated to the point that early successional communities are dependant upon human intervention for their survival.

Conservationists today often manage Midwestern ecosystem remnants that are highly fragmented and ecologically biased towards later stages of succession. For example, many reserves which were clearly open oak savanna in the late 1930's (based on aerial photographs from that era) are now oak woodlands. Invertebrates that may have once thrived in the open sunny understory of these habitats are now reduced to roadside edges and powerline rights-of-ways. The net result has been an unbalanced biological inheritance - systems that have been altered such that critical components / communities are on the verge of collapse. Many of the invertebrate that once abounded in such early successional habitats are now among the most imperiled species in the Midwest.

The dilemma facing conservation is how to restore and maintain these early successional habitats using ecological tools that operate at scales that may or may not fit our reserves. There are two basic approaches to solving this scale issue: scaling the process to fit the site, or, scaling the site to fit the process. The goals of both approaches are essentially the same - the maintenance of all remnant-dependant species - but the later approach offers more likelihood of success, albeit at greater cost.

To scale a process such as fire to fit a site is actually quite simple in most cases. A disturbance regime designed to maintain all conservation targets is designed, and then allocated incrementally over the reserve. So for example, a four-year burn cycle designed to maintain botanical vigor is rationed over a prairie such that 25% is burned annually. This creates buffering from ecological fluctuations due to management, decreasing the likelihood that negative impacts to isolated populations will have reserve-wide impacts.

But there are complications. No reserve is a homogeneous swath of uniform habitat, so burn units must be designed such that they include only a portion of each habitat type – a difficult task if some special habitat types are reduced to small isolated patches. Management costs further complicate the issue. Managers are always looking to maximize cost- benefit ratios. The costs of burning a fraction of the site is approximately the same as the cost of burning the entire site. The simple math indicates that a four-year burn rotation may cost four times as much as burning an entire site once every four years. Likewise, there is an opportunity cost associated with increasing the number of burns – there are only so many suitable burn days in a given year, and the typical regional manager almost always has more prescribed fires than suitable burn days.

Scaling sites to better fit ecological processes in the fragmented Midwest is often difficult and expensive. The reality is that "traditional preserves" will almost always be too small to accommodate dynamic processes such as succession, epizootics, fire induced patch dynamics, or hydrology induced patch dynamics. The conservation community must restore / enhance ecological redundancy to assure that ecological change can occur without producing site-extinction for habitat restricted species. In Indiana, our newest generation of preserve designs emphasize "repeating patterns of ecological patches and ecotones" - in other words, we want to support multiple populations of habitat specific species, such that we can expect recolonization if local demes become extinct. By emphasizing internal ecological redundancy within a conservation site, we help insure that most species have patchy- or meta-populations that can withstand a localized negative impact. Unfortunately the reality of conservation in fragmented systems is that we must create internally viable sites for habitat restricted species. Landuse trends in our increasingly fragmented landscape rule out recolonization from nearby habitats.

Development of a Statewide Habitat Conservaton Plan for the Karner Blue Butterfly in Michigan

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A statewide Habitat Conservation Plan (HCP) for the endangered Karner blue butterfly (*Lycaeides melissa samuelis*) in Michigan is being developed. Biological goals for the HCP are to protect occupied sites, increase habitat availability, and increase populations of the butterfly to recovery goal levels.

The conservation strategy is to take a broad, ecosystem approach and use management practices that protect, enhance, or restore savanna, barrens, and other community types upon which the butterfly and other species-at-risk depend. The plan will allow management activities to continue by partners in the HCP while ensuring sustainable and persistent populations of the Karner blue throughout its range in Michigan.

Current information on the distribution and abundance of Karner blue populations and potential habitat is being reviewed. Additional populations and habitat surveys on public and private lands are being conducted and will provide a comprehensive understanding of the species in Michigan. Geographic Information System analyses will be conducted to determine which areas can be protected, enhanced, or restored as suitable habitat as part of the HCP implementation. Because humans are an integral component of the ecosystem and can influence the use and outcome of management practices, a parallel ecosystem-based education and outreach program will be developed. This program will be used to increase awareness of ecosystem processes on the landscape, emphasize proposed conservation efforts, and encourage enrollment of new partners and other levels of participation in the HCP. The Michigan Department of Natural Resource will apply for an incidental take permit in collaboration with a group of partners interested in the conservation needs of the Karner blue and the regulatory assurances provided by the permit.

Biology of a Michigan Endangered Species: Distribution and Host Plant Use of the Great Plains Spittlebug, Lepyronia gibbosa (Homoptera: Cercopidae).

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Distribution, life cycle, and host plant preferences of the great plains spittlebug, *Lepyronia gibbosa*, (Homoptera: Cercopidae) were determined in Southwest and West-central Michigan during the summers of 2000-01. This species is classified as a Michigan threatened species (S1/S2). It is considered a prairie-endemic species that occupies the rare sand prairies and oak savannah of Michigan.

Survey locations were selected from historical collection sites, Manistee National Forest stand maps and reports, aerial photographs, and conversations with Michigan prairie conservationists, and ground search. All sites sampled had dominant stands of little bluestem and sandy loam soils and were located in ten western Michigan counties. Both nymphs and adults were sampled from May to September. Adults were collected by sweep net and vacuum sampler while nymphs were collected by hand upon location of an obvious spittle mass. Results indicated a wide and prominent distribution of *L. gibbosa* in West Michigan. Forty-two of 52 sites sampled had populations of *L. gibbosa*, with 38 new collection records distributed throughout the counties of Lake, Muskegon, Mason, Oceana, and Van Buren. Seasonal distribution of nymphs occured from 17 May until 10 June, and adults occurred from 20 June through 7 September. However, earlier counts and later counts are likely, as 17 May and 7 September were our first and last days of collecting and the first nymphs collected were 2^{nd} and 3^{rd} instars. Host plant records indicate that the nymphs were highly polyphagous with collections upon ten different plant families with species ranging from grasses to forbs to woody plants. In contrast, adults were found to be monophagous with collection records only upon big and little blue stem. In conclusion, it appears that *L. gibbosa* is much more abundant in Michigan than previously thought. Caution still should be exercised when considering the removal of this species from the state threatened category as the habitats that sustain this species and other associated insects are in great decline in Michigan due to among other things the invasion of Pennsylvania sedge, woody plants, and alien plants.

Response of Carabid Beetles Associated with Vernal Pond Ecosystems to Forest Management Practices in Northern Minnesota

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Vernal ponds play an important role in forest ecosystems including recharging ground water and enhancing biodiversity. There is growing concern regarding the impacts of tree harvesting on vernal pond ecosystems and if these impacts can be mitigated using tree buffers. In 2000, we initiated a study in predominantly northern hardwood forest types located in Cass and Aitkin Counties in northern Minnesota (MN), using carabid beetle biodiversity to test the efficacy of tree buffers to protect vernal ponds during harvesting. Our objective was to record carabid beetle diversity within vernal pond ecosystems prior to harvesting and then monitor changes in carabid beetle community structure in subsequent years after harvesting. There were four treatments: 1) clearcut with uncut pond buffers, 2) clearcut with thinned pond buffers, 3) clearcut with no pond buffers and upland residual tree patches, and 4) no harvest (control). In 2000, prior to harvesting, we placed pitfall traps near vernal pond edges and in nearby upland forests. Four pitfall traps were placed around each of 12 ponds (2 traps near pond edge, 2 traps in nearby uplands). Traps were installed on 16 May 2000 and bi-weekly collections were made through 12 July 2000.

Almost 7,000 carabid beetles were collected consisting of 51 species (Table 1). We collected 46 species and 3,991 individuals around pond edges, and 41 species and 2,997 individuals in nearby uplands. Most species were collected with similar frequencies around the pond edges and in nearby uplands, although some species showed a preference for one habitat over the other. Of the 51 species collected, 9 species were new state records for MN: *Agonum trigeminum*, *Bembidion wingatei*, *Clivina fossor*, *Harpalus paratus*, *Patrobus septentrionis*, *Pterostichus adoxus*, *Pterostichus melanarius*, *Pterostichus tenuis* and *Pterostichus tristis*(Bousquet and Larochelle 1993).

Tree harvesting took place in the winter of 2000-2001. Post-harvest sampling of carabids took place from 7 May to 9 July 2002. Carabids from the 2002 collections are now being identified. Results of this study will help land managers determine the efficacy of buffers in preserving vernal pond structure and function, and the importance of pond buffers and upland patches in forest biodiversity.

Table 1. Carabid species and number collected from pitfall traps in Cass County and Aitkin County, Minnesota, 16 May –12 July 2000.

Species	No. collected
Agonum gratiosum (Mannerheim 1853)	11
Agonum melanarium Dejean 1828	67
Agonum palustre Goulet 1969	237
Agonum placidum (Say 1823)	8
Agonum propinquum (Gem.& Har. 1868)	2
Agonum retractum LeConte 1848	778
Agonum sordens Kirby 1837	3
Agonum trigeminum Lindroth 1954 [1]	71
Amara sp.	1
Amphasia sericea (T.W. Harris 1828)	1
Badister obtusus LeConte 1878	13
Badister parviceps Ball 1959	30
Bembidion praticola Lindroth 1963	147
Bembidion rapidum (LeConte 1848)	1
Bembidion wingatei Bland 1864 [1]	17
Bradycellus lugubris (LeConte 1848)	5
Calathus ingratus Dejean 1828	126
Calosoma frigidum Kirby 1837	51
Chlaenius emarginatus Say 1823	1
Chlaenius sericeus sericeus (Forster 1771)	1
Clivina fossor (Linne 1758) [1]	248
Cymindis cribricollis Dejean 1831	23
Elaphrus olivaceus LeConte 1863	3
Harpalus fulvilabris Mannerheim 1853	47
Harpalus paratus Casey 1924 [1]	1
Harpalus somnulentus Dejean 1829	13
Loricera pilicornis pilicornis (Fabricius 1775)	9
Myas cyanescens Dejean 1828	47
Notiophilus aeneus (Herbst 1806)	14
Olisthopus sp.	2
Oxypselaphus pusillus (LeConte 1854)	237
Patrobus septentrionis Dejean 1828 [1]	2
Platynus decentis (Say 1823)	2212
Poecilus lucublandus (Say 1823)	28
Pterostichus adoxus (Say 1823) [1]	3
Pterostichus adstrictus Eschscholtz 1823	9
Pterostichus caudicalis (Say 1823)	216
Pterostichus coracinus (Newman 1838)	121
Pterostichus femoralis (Kirby 1837)	2
Pterostichus luctuosus (Dejean 1828)	7
Pterostichus melanarius (Illiger 1798) [1]	68
Pterostichus mutus (Say 1823)	69
Pterostichus novus Straneo 1944	40
Pterostichus patruelis (Dejean 1831)	2
Pterostichus pensylvanicus LeConte 1873	891
Pterostichus tenuis (Casey 1924) [1]	1
Pterostichus tristis (Dejean 1828) [1]	5
Sphaeroderus stenostomus lecontei Dejean 1826	267
Synuchus impunctatus (Say 1823)	800
Trechus apicalis Motschulsky 1845	29
Xestonotus lugubris (Dejean 1829)	1

[1]Species not previously reported from Minnesota.

Reference

Bousquet, Y, and A. Larochelle. 1993. Catalogue of the Geadephaga (Coleoptera: Trachypachidae, Rhysodidae, Carabidae including Cicindelini) of America north of Mexico. Memoirs of the Entomological Society of Canada, No. 167. 397pp.

Asian Longhorned Beetle Detection and Control in the United States

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Since the detection of the Asian longhorned beetle, *Anoplophora glabripennis,* in New York in 1996 and in Chicago in 1998, this invasive forest insect has been regulated by a Federal quarantine and eradication program. Successful eradication is dependent on detection and removal of every infested tree. Currently, visual surveys from the ground or bucket trucks and by tree climbers are the only means for locating infested trees. No management alternatives are available for controlling the beetle other than complete tree removal. Improved means for detecting infested trees and alternative control techniques are required for successful management of this destructive forest pest.

Acoustic detection. Over the past two years, we have conducted a number of studies in collaboration with Cy Smith and Glenn Allgood at the Oak Ridge National Laboratory to identify unique acoustic signal descriptors associated with ALB larval feeding in live trees and wood packing materials. We have recorded feeding sounds from ALB larvae as well as larvae of several native cerambycids, such as the cottonwood borer, linden borer, locust borer, red oak borer, sugar maple borer, and whitespotted sawyer. Overall, feeding sounds of cerambycid larvae are quite similar but ALB feeding sounds do have unique signal descriptors. We have developed real-time filter algorithms that recognize sounds of feeding larvae in both trees and cut logs. In China, we have recorded ALB larvae feeding in infested elm, poplar, and willow trees. Recordings have been of larvae that were feeding at distances of up to 7 m away from the sensor. We have also developed a prototype field-portable ALB acoustic detector which is currently being used by USDA Animal Plant Health Inspection Service (APHIS) for detection surveys in New York.

Systemic insecticides. Over the past two years, we have tested the efficacy of various systemic insecticides to kill ALB larvae and adults. In China, we have injected infested elm, poplar, and willow trees. We have tested imidacloprid (Imicide, J.J. Mauget Co.), azadirachtin (Ornazin, Cleary Chemical Corp.), emamectin benzoate (Shot One, Novartis), and thiacloprid (J.J. Mauget Co.). Overall, mortality rates of the within-tree ALB life stages were highest for imidacloprid. In addition, when dead adult beetles were counted around the base of each test tree, the imidacloprid-treated trees had the highest number of dead ALB adults.

In the laboratory, we reared cottonwood borer larvae (CWB), a surrogate for ALB, on artificial diet treated with various concentrations of imidacloprid and azadirachtin. Both insecticides had strong antifeedant effects, which resulted in larval weight loss. Complete mortality occurred at the highest doses of imidacloprid (160 ppm) and azadirachtin (50 ppm) after 12 weeks of feeding. Some mortality occurred at lower doses (0.16 ppm imidacloprid and 0.5 ppm azadirachtin). After 18 weeks, surviving larvae were able to complete development when placed on untreated diet. These results indicate that high and persistent doses of insecticides are required throughout treated trees otherwise larvae may be able to survive and recover.

Rare Odonata of Indiana

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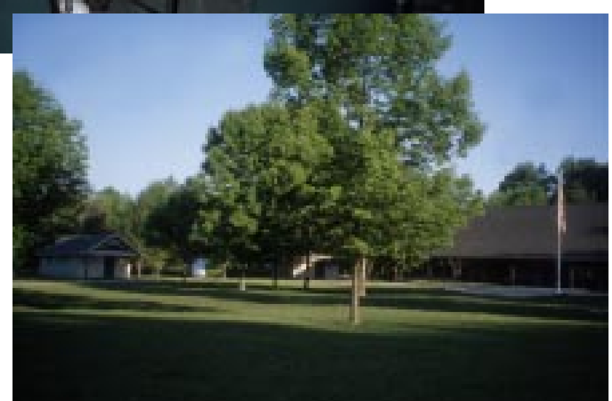
Rare species of dragonflies in Indiana fall into one of three categories: (1) southern species at the northern fringe of their ranges in southern Indiana; (2) northern species at the southern fringe of their ranges in northern Indiana; (3) and species once more common to the state which have apparently become rare due to habitat changes. Most of the species in categories 1 and 2 are common within their ranges and need not be of concern to Indiana conservationists. Those in category 3 apparently need protection if they are to survive. The only way to protect them is through habitat preservation.

Representative southern species (category 1) include *Macromia pacifica, Arigomphus submedianus, Gomphus hybridus,* and *Neurocordulia molesta*. Representative northern species include *Aeshna canadensis, Aeshna tuberculifera, Gomphus ventricosus, Epitheca canis, Libellula julia,* and *Nannothemis bella.*

Species that were once more widespread in Indiana but now have become rare due to habitat change include *Tachopteryx thoryi, Anax longipes, Cordulegaster obliqua,* and perhaps, *Somatochlora hineana.*

It is impossible to know what Odonata species were extirpated from the state before serious studies of Indiana Odonata were begun in the 1890's. By then, most of the original forests had been cleared, the wetlands drained, and the rivers and streams channelized.

Photos From the Annual General Meeting



Winners of the Third Annual

Category I
Behavior and Life History: Photographs that exhibit some aspect of insect life with entries judged based on technical difficulty, rarity, and entomological content as well as overall aesthetic qualities.

First Place:
Gail Stratton:

Title: Black widow takes a Ring-Necked Snake.
Description and Comments: *Latrodecutus mactans* caught the ring-necked snake in its web. The spider alternated between biting the snake and throwing silk over first the head then the tail of the snake. By the morning the snake was dead, within 2 days it had withered. It was not clear how much the spider fed on the snake.
Equipment and film: Nikon N80, 100 mm Sigma Macolens and dedicated flash.

Second Place
Mogens C. Nielsen
Title: Mature larva of *Eacles imperialis* pini feeding on jack pine

Equipment and Film: Pentax, Kodachrome 75

Third Place
Ron Priest
Title: Like Peas in a Pod
Description and Comments: Several early-instar *Fenusa ulmi* leaf miners on American elm, *Ulmus americana*, showing that multiple eggs had been laid along the leaf midrip.

Equpment and Film: Minolta X-700, bellows; 100 mm lens; EliteChrome 100.

Photo Salon Competition

Category II

Insect Portraits: Photographs that depict insects in a static of active state with entries judged on overall aesthetic qualities, technical difficulty, and rarity within the insect or arthropod group.

First Place:
Mogens C. Nielsen
Title: *Boleria frigga* saga nectaring on bog laurel
Equipment and film: Canon, fugichrome

Second Place
William Miller
Title: *Araneus* sp.
Description an dComments: This very large *Araneus* was seen in Everglades Naitonal Park.
Equipment and Film: Photoworks film 200, Nikon N60, 100 mm Sigma Macrolens, dedicated flash

Third Place
Gail Stratton

Title: The Carolina Wolf Spider
Description and Comments: *Hogna carolinensis* (Lycosidae) is the largest wolf spider in the southeastern U.S.

Equipment and film: Nikon N80, 100 mm Sigma Macrolens with dedicated flash. Photoworks print film, 200 ASA

Intercepted Bark- and Wood-Boring Insects in the United States: 1985-2000

Robert A. Haack
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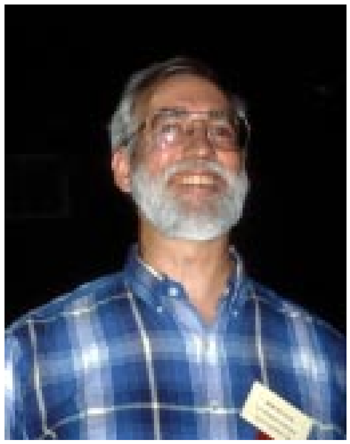
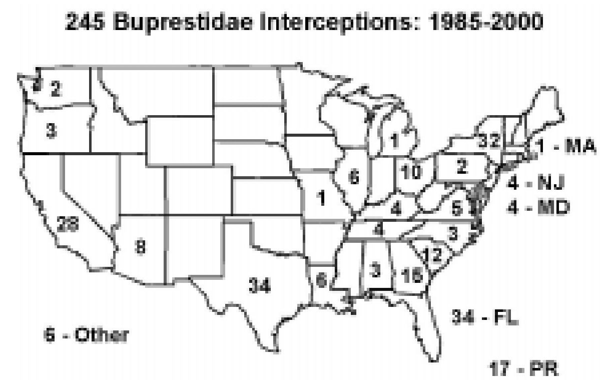


Since 1985, the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) has maintained the "Port Information Network" (PIN) database for plant pests of quarantine significance that were intercepted at US ports of entry. Several data fields are completed for each pest interception, including the pest species name, date of interception, country of origin, US port of entry, and commodity. Pests are intercepted on a wide variety of commodities, such as fresh food, cut flowers, seeds, nursery stock, and wood articles such as crating, dunnage, pallets, lumber, and logs. On average, more than 50,000 pest interceptions are made annually by APHIS inspectors (National Research Council 2002). However, these interceptions represent only a small percentage of the pests that actually enter the US given that APHIS inspects only about 2% of the international cargo that arrives in the US (National Research Council 2002). Nevertheless, the PIN database provides valuable historical information on the types of pests that have entered the US, the most common pathways by which they arrived, countries of origin, and associated products or commodities. In this talk, I briefly summarized the interception data for several families of insects that are typically associated with solid wood packing materials (SWPM) for the years 1985-2000.

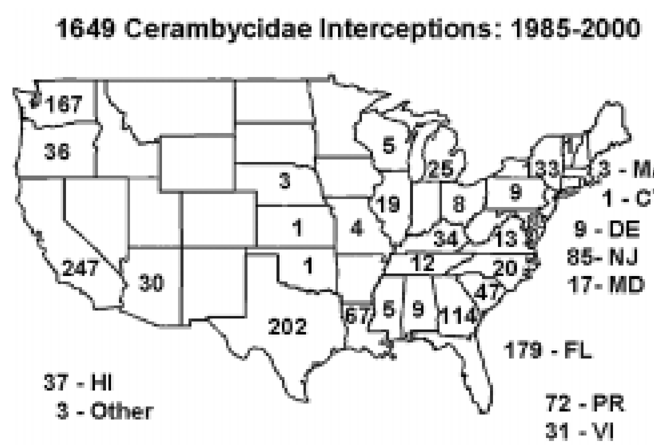
When I queried the PIN database in August 2001, there were 577,829 insect interception records, representing 11 orders and 210 families of insects, for the period 1985 to August 2001. The 11 orders, in decreasing order of interceptions, were Homoptera (210,621 interceptions, 38 families), Lepidoptera (119,555 and 75), Diptera (117,515 and 11), Coleoptera (73,649 and 20), Thysanoptera (25,517 and 4), Heteroptera (22,405 and 31), Orthoptera (5,213 and 11), Hymenoptera (2,124 and 14), Collembola (167 and 1), Phasmida (6 and 1), and 486 unidentified insects.

There were 416 records of intercepted Bostrichidae (Coleoptera) during 1985-2000, including 17 genera. The five most commonly intercepted bostrichid genera were *Sinoxylon* (131 interceptions), *Stephanopachys* (87), *Heterobostrychus* (40), *Micrapate* (24), and *Melalgus* (18). The 416 bostrichid interceptions originated from 47 countries, with the top five being: India (76 interceptions), Spain (68), Chile (34), Thailand (28), and Mexico (20). The bostrichids were typically found in SWPM that were most commonly associated with imports of tiles (89 interceptions), woodenware (18), melons (13), machinery (10), and marble (10).

There were 245 records of intercepted Buprestidae (Coleoptera) during 1985-2000, including 16 genera. The five most commonly intercepted buprestid genera were *Melanophila* (44), *Buprestis* (39), *Chrysobothris* (39), *Agrilus* (38), and *Anthaxia* (19). The 245 buprestid interceptions originated from 42 countries, with the top five being: Spain (40 interceptions), Turkey (31), Mexico (21), Belgium (18), and Italy (17). The buprestids were typically found in SWPM that were most commonly associated with imports of tiles (53 interceptions), marble (15), machinery (7), steel (6), and raspberries (5).



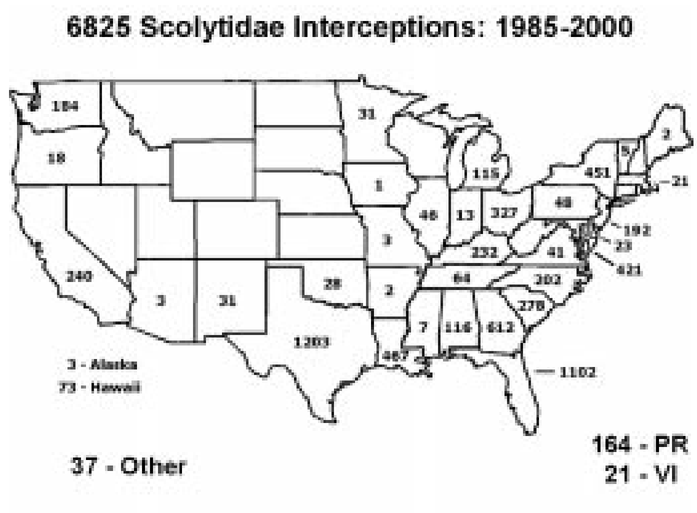
There were 1649 records of intercepted Cerambycidae (Coleoptera) during 1985-2000, including 81 genera. The seven most commonly intercepted cerambycid genera were *Monochamus* (433), *Xylotrechus* (125), *Ceresium* (114), *Hesperophanes* (51), *Tetropium* (45), *Phymatodes* (44), and *Anoplophora* (33). The 1649 cerambycid interceptions originated from 94 countries, with the top five being: China (497 interceptions), Italy (130), Russia (116), Mexico (114), and Belgium (43). The cerambycids were typically found in SWPM that were most commonly associated with imports of iron (124 interceptions), tiles (117), household goods (44), machinery (43), and marble (40).



There were 100 records of intercepted Lyctidae (Coleoptera) during 1985-2000, including 3 genera: *Lyctus* (12 interceptions), *Minthea* (12), and *Trogoxylon* (4). Most lyctids were identified to only the family level. The 100 lyctid interceptions originated from 19 countries, with the top five being Brazil (62 interceptions), Colombia (8), India (6), Italy (3), and Chile (2). The lyctids were typically found in SWPM that were most commonly associated with imports of doors (25 interceptions), tiles (6), artware (3), and bamboo (2).

There were 55 records of intercepted Platypodidae (Coleoptera) during 1985-2000, including 2 genera: *Platypus* (34 interceptions) and *Tesserocerus* (2). The 55 platypodid interceptions originated from 17 countries, with the top five being Costa Rica (20 interceptions), Mexico (8), Guatemala (4), Brazil (2), and Colombia (2). The platypodids were typically found in SWPM that were commonly associated with imports of pineapple (6 interceptions), banana (4), woodenware (3), and melons (1), as well as inside live plants such as imports of *Dracaena* plants (8).

There were 6825 records of intercepted Scolytidae (Coleoptera) during 1985-2000, including 49 genera (Haack 2002). The 10 most common genera were *Hypothenemus* (821 interceptions), *Pityogenes* (662), *Ips* (544), *Coccotrypes* (520), *Orthotomicus* (461), *Hylurgops* (327), *Hylurgus* (266), *Tomicus* (194), *Dryocoetes* (166), and *Hylastes* (142). The 6825 scolytid interceptions originated from 117 different countries of which the top 12 countries were Italy (1090 interceptions), Germany (756), Spain (457), Mexico (425), Jamaica (398), Belgium (352), France (261), China (255), Russia (247), India (224), United Kingdom (151), and Portugal (150). The intercepted scolytids were found in SWPM, food products, and live plants. The top 12 associated products were tiles (856 interceptions), machinery (311), steel (276), parts (199), ironware (178), nutmeg (177), granite (171), *Chamaedorea* palms (152), coffee (78), aluminum (76), cola nuts (74), and melons (56).



There were 99 records of intercepted Siricidae (Hymenoptera) during 1985-2000. All individuals identified to the genus or species level belonged to the genus *Sirex*. The intercepted siricids originated from 17 countries, with the top five being Germany (39 interceptions), Italy (23), China (8), Spain (7), and France (3). The siricids were typically found in SWPM that were commonly associated with imports of machinery (26 interceptions), tiles (10), iron (5), marble (2), and steel (2).

I ended my presentation with an update to the talk I gave at the 2001 MES annual meeting, which was entitled "Exotic Scolytids of the Great Lakes Region" (Haack 2001). In that talk, I presented information on more than 40 exotic scolytids that are now established in the United States. So far in 2002, three new scolytids and one new buprestid have been reported for the first time in the US. They are: *Xyleborus glabratus* was detected in Georgia, *Xyleborus similis* was detected in Texas, *Xlosandrus mutilatus* was detected in Mississippi, and *Agrilus planipennis* was detected in Michigan. In addition, in 2001, the scolytid *Hylurgops palliatus* was first detected in Erie, PA. Additional specimens of *H. palliatus* were collected in several locations around Erie in 2002 confirming establishment.

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Haack RA. 2001. Exotic scolytids of the Great Lakes region. Newsletter ofthe Michigan Entomological Society 46(3): 6-7.

Haack RA. 2002. Intercepted Scolytidae (Coleoptera) at United States portsof entry: 1985 - 2000. Integrated Pest Management Reviews (in press).

New Asian Longhorned Beetle Publication

Revision of the Genus *Anoplophora* (Coleoptera: Cerambycidae)

Steven Lingafelter of the Systematic Entomology Lab and E. Richard Hoebeke at Cornell University have produced a new book that will allow anyone to identify this species and all its relatives in the genus. Accurate identification of species in this group is the first step in preventing other introductions. The hardcover book of 236 pages is well illustrated with over 50 full color plates showing adults of all 36 species in the genus. Full data are presented on known biology and distribution. The book is available through the Entomological Society of Washington.

Send Orders for Revision of Anoplophora to:

Michael Pogue, Treasurer, The Entomological Society of Washington, Systematic Entomology Lab, USDA Smithsonian Institution, PO Box 37012, Natural History Museum, Washington, DC 20013-7012, Email: mpogue@sel.barc.usda.gov

US$30 + $5 shipping for delivery outside the US. Checks, cash, money orders in US funds.

Winners of the Third Annual Student Paper Competition

First Place

Presence of Long-Lasting Peripheral Adaptation in the Obliquebanded Leafroller, Choristoneura rosaceana (Harris) and Absence of Such Adaptation in the Redbanded Leafroller, Argyrotaenia velutinana (Walker): Adaptation as a Mechanism for Reduced Susceptibility to Pheromone-Based Mating Disruption?

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Pre-exposure of male obliquebanded leafrollers, *Chroristoneura rosaceana* (Harris) (Lepidoptera: Tortricidae), to the main component of their pheromone blend and traces of its geometric isomer ((Z)11-14:Ac and (E)11-14:Ac, respectively) at 36 ± 12 ng / ml air for durations of 15 and 60 min in sealed Teflon chambers with continuous air exchange significantly reduced peripheral sensory responses to these compounds as measured by electroantennograms (EAGs). The EAG responses of *C. rosaceana* to all tested dosages of pheromonal stimuli and blank controls were lowered by 55-58 % and made a linear recovery to 70-100% of the pre-exposure amplitude within 12.5 min at a rate of 3-4 % / min. Exposures of 5 min were insufficient to maximally adapt *C. rosaceana*; however, exposures of 15 and 60 min reduced sensory responsiveness to the same minimum. In contrast, EAG responses of redbanded leafroller, *Argyrotaenia velutinana*, after identical pheromone exposure for 5 and 60 min yielded no long-lasting peripheral sensory adaptation as measured by EAGs, even though this species shares the same main pheromone components with *C. rosaceana.* We postulate that the long-lasting peripheral adaptation observed for *C. rosaceana* is a mechanism that impedes central nervous system habituation in this species. In contrast, *A. velutinana* may be more susceptible to central nervous system habituation because it lacks the capacity for minutes-long adaptation. We propose that long-lasting adaptation may be a mechanism explaining some of the variation in efficacy of pheromone-based mating disruption across taxa.

Second Place

Three Dimensional Distribution of Grape Berry Moth, Endopiza viteana Clemens (Lepidoptera: Tortricidae), within Vineyards and Adjacent Habitats

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The grape berry moth is the most important pest of commercial grapes throughout Eastern North America. The species is highly host specific on *Vitis* spp. In Michigan, vineyards are frequently bordered by woods containing wild grape, which therefore provide food and shelter to grape berry moths. To gain knowledge of this pest's distribution in these agroecosystems and improve management procedures, we tried to determine its relative abundance and distribution in vineyards and adjacent woods. Moths were sampled at five locations along a horizontal transect, from inside the woods to inside the vineyard, at eight sites. Because canopy height is also an important consideration, traps were placed at 1.5, 3.0, 6.0, and 9.0 m above the ground at each location. Data were recorded form mid-April to mid-October 2001. Overall, more moths were trapped in the woods, the relative abundance in both the woods and vineyards varied with seasonality, and capture increased with trap height in the woods. However, moth abundance declined sharply with trapping height above the vineyard canopy. Our results indicate the distribution of *E. viteana* (an extreme specialist) is stongly influenced by the location of its host plant.

Thrid Place

Evaluating the "Representative Reach" Component of Rapid Bioassessment Protocol:

Variation Among Candidate Stream Reaches

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Rapid Bioassessment Protocol (RBP) is a set of guidelines developed by the USEPA to standardize the practice of using rapid assessment techniques to monitor stream health. One component of RBP involves selecting a small section of a stream, known as a "representative reach," which is supposed to represent the conditions found over a larger area of the stream. Our study was conducted to examine the variability between candidate representative reaches in close proximity to each other, and to determine the importance of site selection in research using RBP methods. This study also looked at whether anthropogenic disturbance within a stream's watershed influenced the degree of site-to-site variation present. Four candidate "representative reaches" were sampled in each of three separate Michigan streams with varying anthropogenic disturbance. Differences among reaches were then evaluated using three common indices: The number of Ephemeroptera, Plecoptera, and Trichoptera (EPT), the Sequential Comparison Index (SCI), and the Michigan Department of Environmental Quality "Procedures-51" biotic index. Results indicate little variation between reaches in streams with little impact, but much greater variability between reaches in streams impacted by development. This suggests that monitoring programs for impacted streams may need to sample more reaches to fully describe conditions compared to streams with little anthropogenic impact.

Poster Presentation

Effect of Cultural Practices on Japanese Beetle in Michigan Blueberries

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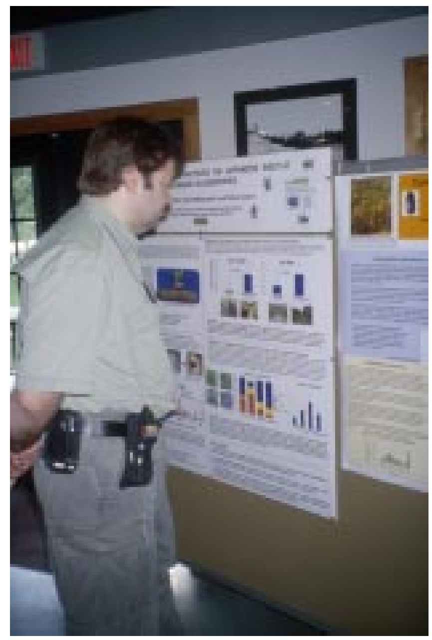

The Japanese beetle, *Popillia japonica* Newman (Coleoptera: Scarabidae), has recently become the primary insect pest of blueberries in Michigan. As part of an integrated response to this pest, cultural practices and cover crops were investigated to determine their impact on its abundance. Soil samples were taken from 15 blueberry fields in Michigan, in spring and fall 2001. Fields had either a grass-weed mix or clean cultivation between the blueberry rows and on the headlands. Japanese beetle larval abundance was measured within and around blueberry fields. Fields with rotovated row middles had significantly fewer larvae than those with permanent sod, and larval abundance was significantly lower on the inside, compared to the perimeter of the sampled fields. Effect of three cover crop species on female ovipositon behavior was also evaluated. The results from this study will provide a basis for the recommendations to help blueberry growers reduce Japanese beetle abundance.

Poster Presentation
Tomicus piniperda (Scolytidae): A Serious Pest of Yunnan pine in Southwestern China

Hui Ye[1], Robert Haack[2], and Jun Lu[1]
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[2]USDA Forest Service, North Central Research Station, 1407 S. Harrison Road, East Lansing, MI 48823;
Email:Yehui1@public.km.yn.cn

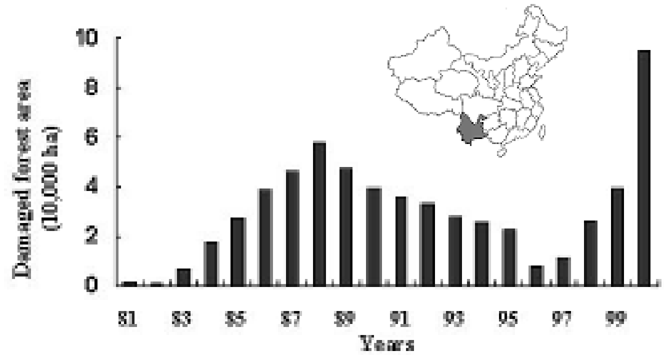

Figure 1. *Area of Yunnan pine forests severely affected by* Tomicus piniperda *in Yunnan during 1981-2000. The shaded area in the outline map of China indicates the location of Yunnan Province.*

The pine shoot beetle, *Tomicus piniperda*, is native to the pine growing regions of Europe, Asia, and northern Africa, and is now established in the United States and Canada as well (Haack and Poland 2001). *Tomicus piniperda* occurs throughout China, but has been most destructive in in Yunnan Province in southwestern China (see Figure 1; Haack et al. 1999), where it primarily attacks Yunnan pine, *Pinus yunnanensis* (Ye 1998, 1999). The first reports of *T. piniperda* causing widespread mortality of Yunnan pine began in the early 1980s, and since then more than 200,000 ha. of Yunnan pine forests have been nearly completely killed (Ye 1991, 1999). In 2001, more than 100,000 ha of Yunnan pine forests were seriously infested with *T. piniperda* in Yunnan.

Tomicus piniperda completes one generation per year throughout its entire range. In the Yunnan pine growing regions of Yunnan, where temperatures are usually above freezing year-round, adults can be found shoot feeding at any time of the year (Ye and Li 1994, Ye 1996). After 60-90% of the shoots on individual trees have been attacked and killed, *T. piniperda* will infest the trunks of these weakened trees and reproduce under the bark (Hui and Lieutier 1997). *Tomicus piniperda* breeding begins in November in Yunnan, peaks in February and March, and ends in May.

In Yunnan, *T. piniperda* is found at elevations between 600-3000 m, with the highest populations occurring at about 2000 m. The average annual precipitation throughout most of *T. piniperda*'s Yunnan range is 700 to 1100 mm/year. About 20% of the annual precipitation falls from November to early May – the time when *T. piniperda* adults typically attack and reproduce in the trunks of live pine trees. Drought stress may be a key factor that increases tree susceptibility to *T. piniperda* attack (Ye 1999).

The pathogenic fungus, *Leptographium yunnanense*, was first reported from galleries of *T. piniperda* in Yunnan in 2000 (Ye and Zhou 2000, Zhou et al. 2000). This bluestain fungus can kill Yunnan pines when artificially inoculated into the trunk, suggesting that this fungus aids *T. piniperda* in overcoming tree resistance.

The predator *Thanasimus formicarius* (Cleridae: Coleoptera) oviposits in trees that have been attacked by *T. piniperda* (Ye and Bakke 1996). The clerid larvae eat immature stages of *T. piniperda* along with other organisms living under the bark. In Yunnan, *T. formicarius* usually completes one generation per year. Populations of *T. formicarius* are relatively low in Yunnan and do not appear to have a strong influence on *Tomicus* populations (Ye and Zhao 1995). The period of larval development is much longer for *T. formicarius* than it is for *T. piniperda*. Thus, once the *T. piniperda* brood exits the tree there remains little food for *T. formicarius* larvae. In addition, rapid salvage of recently killed pines would kill many *T. formicarius* larvae, which are still developing under the bark. Plans are now underway to mass rear and release *T. formicarius* in Yunnan's pine forests.

The major approach used to control *T. piniperda* in Yunnan is through removal of trunk-infested trees. Most trunk-infested trees are cut in April before the new generation of *T. piniperda* have completed their development and exited the trees. However, 3-4 sanitation cuts per year are often needed because of the extended period of trunk attack and the production of sister broods by *T. piniperda*. Another long-term control strategy is to plant more fir, cypress and other pine species such as *Pinus armandii* after removal of Yunnan pine. It is hoped that *T. piniperda* outbreaks will be reduced in these mixed forests as a result increased habitat diversity and abundance of natural enemies.

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Notices

Interesting websites
Using a digicam with a spotting scope:
http://www.digi-sight.com/digi-sight.html

Moths of North America:
http://www.npwrc.usgs.gov/resource/distr/lepid/moths/mothsusa.htm

Butterflies of North America:
http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/bflyusa.htm

Aerieal photographs on the WWW. The Michigan Department of Natural Resources (MDNR) has aerial photograph archives for the state of Michigan available on their website. To find the aerial photographs online begin at the MDNR homepage at http://www.michigan.gov/dnr. From the menu select "Publications & Maps" then select "Aerial Imagery Archive". Follow instructions carefully. To view and print the maps follow the link to LizardTech and download the browser and photoshop plugins for viewing the MrSid format images.

Position Announcement: Habitat Conservation Plan Coordinator (Resource Analyst 12) with the State of Michigan. Main responsibility will be to coordinate the development of an ecosystem-based, state-wide Habitat Conservation Plan (HCP) for the Karner blue butterfly. The position description is posted at: http://www.michigan.gov/mdcs/. Click on "State of Michigan Vacancy Postings" on the right hand side of the page and look for Resource Analyst 12 included in the Natural Resource postings. Closing date September 30, 2002. For additional information, contact Pat Lederle at 517-373-9338 or lederlep@michigan.gov.

MES Governing Board Nominees Wanted for 2003

Make your mark in the Society!

Run for one of the openings in 2003.

Board positions coming available are:

.... President-elect (3-year term)

.... Member-at-large (3 year term)

If you do not want to nominate yourself consider nominating someone else. The only requirement of a nominee is to be a current MES member. The Governing Board meets once during late fall and, if needed, again at the annual meeting. All member nominees willing to run are considered candidates and their names appear on the next ballot.

While you are thinking of it, send your list of nominees with their names, phone numbers and Email addresses to James Dunn at dunnj@gvsu.edu

Deep Into the Night

By P. Aweme (Lyman, 1908)

We sit and discuss them deep into the night,
the differences of each tiny moth that we've taken at the light.

We point out the features that make each one unique,
for they all are distinctly different and practiced in the art of deceit.

The shading is subtle and the nuance is ever so slight,
so we labor through keys to be sure we have them all named just right.

To know each and every Latin binomial is our own private game,
but deep into the night, we secretly admit to ourselves…
they might just all look the same.

Submitted by Martin Andree

MOUNTING PROBLEMS

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I enjoy most of the varied facets of entomology: collecting, rearing, photography, etc, but specimen preparation has always been a personal favorite of mine. Fortunately I have been able to see some progress since I spread my first Cabbage White butterfly at age eight. Sometimes, however, no matter how carefully I work at it, some specimens still occasionally look like they've been spread by an eight year old. This bothers me.

If any of you have ever read the introductory note to first fascicle of The Moths of America North of Mexico, (Fascicle 21, Sphingoidea, Ronald W. Hodges1971. E.W. Classey Limited & RBD Publications Inc.) written by Richard B. Dominick and Charles R. Edwards (Research Associates, The Charleston Museum, Charleston South Carolina, 17 September, 1970) you'd find it is full of humor, goodwill, great photos and a wonderful account of just how talented some people really are at spreading Lepidoptera. I often think about that introduction when I really screw up a particularly nice specimen.

On page six the authors write, "Ron Hodges merits special introduction. His specialty of course is the Microlepidoptera, but his talents have enabled him to write this fascicle with complete authority. It is a never-ending source of fascination to watch Ron at work spreading his minute creatures, using implements some of which are of a size befitting a stone mason. The outcome nonetheless is a board upon which stands a forest of setting needles which he then turns upside down. By a dint of a sharp rap with his fist he extracts all of the setting needles in a shower onto the table beneath while one shudders with dread, and yet not a single antenna falls out of place."

I shudder with dread just thinking about pulling a stunt like that. I'm sure my results would be roughly analogous to the time I tried, as 10-year-old magician, to pull the table cloth out from under my mother's fully set table. It was more than antennae that hit the bricks. Ron probably knows how to do that trick as well.

For hours I sit at my spreading bench in the basement surrounded by legions of gooseneck lamps, thoroughly enjoying myself. Sometimes small miracles happen. As if by accident, a perfect specimen becomes perfectly spread. I can't explain the phenomena, but it usually starts when I begin to pull the first forewing into position. This is the magical part, the hind wing, as if welded to the trailing edge of the forewing, follows in perfect symmetry. Holding my breath I start to pull the remaining forewing up and as if they are members of a finely tuned marching band at The Rose Bowl, both wings march perfectly into position. I gasp and then sigh as I look at yet another beautifully pinned, crappy old, dirt common moth, of which I already have dozens. One of the miracles within miracles here is that this never happens with one of a kind beauties. Never.

What usually happens is much less then miraculous. I call it pinners remorse. To begin with I must make a confession. I have willingly participated in deliberate limb removal. Those bothersome, unruly appendages always seem to be getting in the way. I secretly tell myself that, "No one will notice and if they do, they'll just think, 'Hey isn't that interesting, an entire drawer brimming with three to zero legged moths. Wait until those systematic guys get a load of this!'" Who cares about a few missing and quite possibly diagnostic tibia or tarsi anyway? It's a moth mounter's confession that is seldom spoken of and I may be the first to publicly mention it. I'm quite sure there are others. You know who you are.

When it comes to moths, many antennae just don't behave very well. I refer to these as "The Anti-Antennae." This wrestling match usually begins with one of them just giving up and falling off. I never even get to lay my clumsy paws on them. They just fall off and either drift onto the No-man's Land at my feet or lay tantalizingly on the bottom of the groove of the spreading board. Like that old Milton Bradley game, Operation, I try to grab the fallen body part with my forceps and remove it from under the perfectly pinned antennae above it. I have to accomplish this mission without touching or ruining any other part of the moth. I was never very good at that dumb game.

Like a uni-browed Neanderthal, I have to be content with a specimen with only one antenna. In the mid 1960's my parents took in an exchange student from Taiwan. His name was Shin. On a sleeting Sunday afternoon in January my family took him to the Veteran's Home. They always had a good sized gathering of wild ducks and when it froze we used to go down there and watch the ducks try and land on the ice. It didn't take much to keep us entertained back then, although I've often wondered what Shin thought about it. The rain was freezing on the windshield as we pointed and howled at the latest skidding duck. Suddenly one windshield wiper on the old Chevy gave up the ghost and moved no more. My father, frantic that Shin might miss the best crash landing yet jumped out of the car and began a futile attempt to resuscitate the wiper. He was obviously distraught when he finally got back in and apologized to Shin for technical difficulties with the show. Shin respectfully looked at my father and in his mysterious and stoic way uttered these words, "Better to have one windshield wiper than no windshield wiper at all." My thoughts exactly, better to have one antenna than no antenna at all.

If it isn't antennae trouble it's the whole darn head. This usually isn't a problem, unless I've put the specimen in an envelope intending to spread it later. The heads can get hopelessly crooked and virtually impossible to straighten. I refer to this problem as "Envelope Head." Like the exhumed, ash covered victims of Pompeii, with legs and heads akimbo, the specimens have dried in confused and contorted positions. Occasionally, as I struggle to set things right, the head just plumb falls off. This can be a blessing in disguise. I once heard of a macabre trick practiced by unscrupulous undertakers. If they, for instance make a boo boo and mistakenly put the gray pin strip suit on corpse "A" and the dark blue flannel on corpse

"B", when they should have done the opposite, they found that it was much easier to correct the situation, not by switching suits, but by switching heads. That being said, if I am working on spreading a series of specimens and I happen to have a perfectly spread specimen with a uni-brow and then a tattered one with a nicely matched rack of antennae, well…then Shin is full of bologna and nothing less then a full compliment of wipers will do.

Like an old carnival game, inserting the pin into the exact middle of the thorax of some of the smaller butterflies can be a bit of a challenge. With each successive attempt to stab the bull's eye, the pin fakes to one side of the middle and then to the other. It simply can't be helped and usually results in a tenderized specimen that sooner or later ends up sliding down to the bottom of the pin. When it comes to pining some moths there is the meddlesome problem of scalping or balding. One too many attempts for the perfect pin angle and the thorax will shine like a Lake Superior agate. I'm no rock hound, but by looking at some of my moths you might be inclined to think so. I recently hatched a fine scheme to erase this embarrassing scrounge from my cabinet. I once read about a hair product for men with receding hair lines that held great promise. It was hair colored spray paint. I decided that what was good enough for me was good enough for my prematurely bald *Catocala*. I mixed up a few oil pigments to match and gave them toupees. Works great and only their hairdresser knows for sure.

Except for the nasty habit of the hind wing constantly sneaking out in front of the trailing edge of the forewing, wings in general usually are not too much of a problem. We use smug tricks like jabbing our minuten spreading needles into only the white areas of the wing. This means the exit wound of the spreading needle is disguised by the white pinning surface of the drawer bottom. We think we're so cleaver sometimes. Clearly a perfectly spread *Pieridae* is no example of craftsmanship, as we all know the trick. Finely spread dark *Noctuids* however show the mark of a true artist. The only time that wings are a real issue is with two groups. The first of these are the *Hesperiidae*. Their strong wing muscles make them difficult to spread. I think that after a few specimens are thoroughly shredded, most of us would just as soon skip the Skippers. They're strictly for qualified professionals. The second group of notorious trouble makers is the Hair Streaks. My friend Bob Kriegel refers to these as, "The Tear Streaks." No further comment necessary.

As my collection grows and matures I always enjoy looking over a long series and admiring my progress as a curator. Most of the time I can see steady improvement. The rest of the time I can see why so many Lepidopterists love to collect the *Sphingidea*. Spreading a sphinx moth is about as easy as pouring sand out of a boot when the instructions are written on the bottom of the heel. I wish it was that easy to figure out how Ron Hodges knocks all of those pins out with a rap of his fist.

New Editorial Team Needed for The Great Lakes Entomologist

After four years of dedicated service, Randy Cooper has decided to pass on the duties of Editorship of *The Great Lakes Entomologist*. Recently, the Governing Board approved the creation of a second position to assist in editing the journal. Currently there are two editorial positions: Acquisitions Editor and Managing Editor. The Acquisitions Editor is responsible for obtaining manuscripts and reviews and the Managing Editor is responsible for accepting manuscripts and for getting issues of the journal to the type-setter and printer. Gwen Pearson has served temporarily as the Acquisitions Editor. However, replacements are needed for both editorial positions.

We are seeking a dedicated editorial team to fill the two positions. Therese Poland and Robert Haack, the Newsletter editors, have agreed to assist Randy Cooper on an interim basis and will also assist during the transition to the new editorial team.

There is no long list of requirements to be met by potential editors – only that the team make an honest effort to produce a quality journal that represents the interests of the Michigan Entomological Society. Of course, good communication between the editorial team is essential, as are good organizational skills, command of the English language, basic editing skills and attention to detail. There is a lot of on the job training involved and the interim editors will assist in all aspects of production from manuscript review to final printing, including electronic aspects of production.

Our Society offers a regional journal of high quality, excellent subject matter and provides a real service to the membership. The editorial team will face the challenge of maintaining the high standards of the journal and bringing the production schedule up to date.

If you are interested in filling one of the Editor positions for *The Great Lakes Entomologist* (or wish to nominate someone), please contact James Dunn, President, Michigan Entomological Society at Phone: (616) 895-3439, Email: dunnj@gvsu.edu.

Michigan Entomological Society 2003 Annual Meeting

The 2003 Annual Meeting will be held on Saturday, June 7, 2003 at the MSU Tollgate Conference Center in Novi, Michigan.

Cereal Stem Moth, Ochsenheimeria vaculella: First Recovery in Michigan

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When the Cereal Stem Moth was first identified this mid-August it gave some of us pause.

Now what do we have? Its history in homeland Russia is not good. It causes significant damage to both winter wheat and winter rye and now it's in Michigan!

Ochsenheimeria vacculella F. v. Roselerstamm, is native to Eurasia known from Great Britain east to southern Finland and south-central Russia. It feeds on various wild and cultivated grasses such as winter wheat, winter rye, upright brome, quackgrass, ryegrass, timothy, and meadow fescue among others.

The Cereal Stem Moth was first found in North America in Geauga County, Ohio in 1964 though probably introduced earlier. By 1975 it had also been recovered in western Pennsylvania and central New York. More recently it has also been found in Minnesota and Oregon.

So far it has not shown itself to be a damaging species in North America. Most of its Eurasian range is between 45-60 degrees north Latitudes where, in North America, significant wheat and rye production occurs.

O. vacculella has only one generation per year. Eggs are usually deposited on hosts though spring hatching larvae can disperse by "ballooning". Young larvae begin feeding as leaf miners. After 8-12 days they exit the mine and complete feeding as a stem borer. Larvae move among stems and can damage as many as nine stems before pupating. Larvae pupate in a white cocoon between leaves. Adults appear in late summer and oviposit during August and September.

The cereal stem borer, *O.vacculella*, is one of 23 species of grass stem boring Lepidoptera in the family Ochsenheimeriidae. It is the only species in this family known to occur in North America. The adult (see photo) has a wing spread of 11-14 mm. The head is covered with dense long slender scales that are fork tipped. The wings are mottled brown. The thorax and abdomen are brown with the venter of the abdomen tan. The sixth abdominal segment is pale yellow. It is quite a weak day-flier.

Adult female Ochsenheimeria vacculella

This recovery as with another exotic species, gypsy moth, was made by a homeowner. This species was found indoors. Similar to other accounts *O. vacculella* does frequently enter homes. Once identified I thought it important to see the setting since it could have already caused some field damage. On site it was apparent that no field crops were growing in the immediate area though the home is surrounded by grassy fields. By that date too the flight period had ended and no specimens were found. This Sanilac County site should be monitored next year to determine if it will become a field crop pest.

Literature consulted

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Davis, D.R. Ochsenheimeriidae (Tineoidea) In, Stehr, FR editor. Immature Insects, Part1.Kendall/Hunt Pub. Co.; 1987. p.370.

MES Historical Notes

Robert A. Haack and Therese M. Poland
MES Newsletter Editors

1977. In early 1977, 25 years ago, Donald Cress was the MES President; Al Bratt was President-Elect; David Gosling was the Immediate Past President; Mo Nielsen was Executive Secretary; John Witter, Ronald Priest, and David Evans were the three Members-at-Large; David Gosling was the Journal Editor; and Louie Wilson was the Newsletter Editor. On 17 June 1977, 60 people attended the 23rd MES Annual Meeting that was held on the Calvin College campus in Grand Rapids, MI. The guest speaker was Dr. Clifford Berg of Cornell University, a sciomyzid fly expert. He presented a paper entitled "Snail-killing flies: Their possibility in the biological control of snail-borne diseases." In addition, a workshop on insect photography was presented by Larry West and John Shaw. At the start of 1977, MES had about 500 active members and 180 institutional members. Page charges for publishing in The Great lakes Entomologist were raised to $30 per page in 1977 (compared with $35/page today). Annual dues for Active Members were $4 per year in 1977 ($15/yr today). Wilbur McAlpine was born in 1888 and died in 1977. "Mac" (as he was known to friends), was an active member of both MES and the Detroit Entomological Society before that. Mac had a keen interest in Lepidoptera, especially the *Calephelis, Callophrys, Erynnis, Hyalophora*. Also of note for 1977 was the release of the first insect stamps by the US Postal Service: four butterflies – the dogface sulphur, orange tip, checkerspot, and a swallowtail.

1952. In 1952, 50 years ago, MES did not yet exist. MES began in 1954, growing out of the Detroit Entomological Society (DES), which was initiated in 1942. The only information we have found for 1952 is that several DES members met on 7 November 1952, including Frank Ammermann, Irving Cantrall, Theodore Hubbell, Dennis Hynes, Paul Kannowski, Kornelius Lems, Wilbur McAlpine, Ada Olson, Mr. and Mrs. J. Speed Rogers, Mr. and Mrs. Ernest Stanton, George Steyskal, and Edward Voss.

Request for Comments on Forest Service Sensitive Species in Michigan

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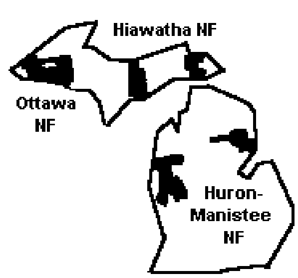
Email: rhaack@fs.fed.us

The three National Forests in Michigan (Hiawatha, Huron-Manistee, and Ottawa) are now collecting data to be used in revising their Forest Plans. As part of this process, they are conducting a "Species Viability Evaluation," which is aimed at (1) identifying plant and animal species at risk, (2) collecting key data on these species, and (3) evaluating these species and information with respect to the Forest Plans. Besides species that are federally listed as Threatened (T) or Endangered (E), each US National Forest also produces a list of "Sensitive Species" (S). When planning management activities, Forest Service personnel must complete "Biological Evaluations" for all TES species known to occur on each particular National Forest. In situations where TES species could be impacted by proposed management activities, the Forest Service must incorporate conservation measures to eliminate or mitigate any adverse effects. For a plant or animal species to be listed as a sensitive species on any given National Forest, there must be at least one known population of that species on that particular Forest. More details on Forest Service Sensitive Species can be found on-line (http://www.fs.fed.us/r9/wildlife/tes/tes_lists.htm).

Following is a list of the current Sensitive Species on the three National Forests in Michigan. An earlier list was published in 1994 (Haack 1994). If you wish to provide input on any of these insects species, or suggest additional species, please contact Cheri Ford at 906-932-1330 ext. 314 or by e-mail (caford@fs.fed.us). Species viability evaluation forms are available on-line (http://www.fs.fed.us/r9/wildlife/tes/docs/Risk-Evaluation-Form.pdf).

Common name	Species	Forest (Ranking)*
Coleoptera		
Hungerford's crawling water beetle	*Brychius* hungerfordi	HM (E)
Douglas stenelmis riffle beetle	*Steneimis douglasensis*	HM (S)
Lepidoptera		
Dusted skipper	*Atrytonopsis hianna*	HM (S)
Imperial moth	*Eacles imperialis pini*	HM (S)
Red-disked alpine	*Erebia discoidalis*	O (C)
Mottled duskywing	*Erynnis martialis*	O (C)
Persius duskywinged	*Erynnis persius*	HM (S)
Olympia marble	*Euchloe olympia*	O (C)
Ottoe skipper	*Hesperia ottoe*	HM (S)
Henry's elfin	*Incisalia henrici*	HM (S)
Frosted Elfin	*Incisalia irus*	HM (S)
Karner blue	*Lycaeides melissa samuelis*	HM (E)
Nabokov's blue	*Lycaeides idas nabokovi*	H (S), O (S)
Doll's merolonche	*Merolonche dolli*	HM (S)
Powershiek skipper	*Oarisma powesheik*	HM (S)
Culver's root borer	*Papaipema sciata*	HM (C)
West Virginia white	*Pieris virginiensis*	O (C)
Sprague's pygarctic	*Pygarctia spaguei*	HM (S)
Southern grizzled skipper	*Pyrgus wyandot*	HM (S)
Phlox moth	*Schinia indiana*	HM (S)
Spartina borer moth	*Spartiniphaga inops*	HM (S)
Regal fritillary	*Speyeria idalia*	HM (S)
Tawny crescent	*Phyciodes batesii*	O (C)
Homoptera		
Hill-prairie spittlebug	*Lepyronia gibbosa*	HM (S)
Odonata		
Green-faced clubtail	*Gomphus viridifrons*	O (C)
Rapids clubtail	*Gomphus quadricolor*	O (C)
Extra-striped snaketail	*Ophiogomphus anomalus*	O (C)
Pygmy snaketail	*Ophiogomphus howei*	O (C)
Forcipate emerald	*Somatochlora forcipata*	O (C)
Hine's emerald dragonfly	*Somatochlora hineana*	H (C)
Warpaint emerald dragonfly	*Stomatochlora incurvata*	H (S)
Ocellated emerald	*Somatochlora minor*	O (C)
Elusive snaketail	*Strylurus notatus*	O (C)
Ebony boghaunter	*Willimsenia fletcheri*	O (C)
Orthoptera		
Michigan bog grasshopper	*Appalachia arcana*	HM (S)
Pine katydid	*Scudderia fasciata*	HM (C)
Lake Huron locust	*Trimerotropis huroniana*	HM (S)

* H = Hiawatha National Forest, HM = Huron-Manistee National Forest, and O = Ottawa National Forest, S = Sensitive species, C = Candidate for listing as a Sensitive species, E = Endangered.



Reference

Haack RA. 1994. Insects listed as sensitive species in the Eastern Region of the U.S. Forest Service. Newsletter of the Michigan Entomological Society 39 (2-3): 1-3.

MICHIGAN ENTOMOLOGICAL SOCIETY
FINANCIAL STATEMENT-12 MONTHS ENDING DECEMBER 2001

RECEIPTS

Dues	$ 6,535.00
Subscriptions, THE GREAT LAKES ENTOMOLOGIST	2,235.00
Sale of separates to authors	1,235.00
Sale of back issues, journal, newsletter, entomology notes	66.00
Subsidies (page costs)	4,486.00
Donations, decals, misc. income	263.00
Annual Meeting-Registration fee	2,225.00
TOTAL RECEIPTS	$17,701.00
(2000 receipts	20,744.00)

DISBURSEMENTS

Publication expenses:	
Newsletter, print, mail	$ 3,922.00
Journal, compose, print, mail	8,777.00
Postage, mailing permit fee	233.00
Misc. printing/ mailing	549.00
MI Lepidoptera Survey (2000-2001	1,184.00
Annual Meeting, "Breaking Diapause" meeting	2,443.00
Misc. expenses (copyrights, insurance, etc)	173.00
TOTAL DISBURSEMENTS	$17,281.00
(2000 disbursements	20,050.00)

MICHIGAN ENTOMOLOGICAL SOCIETY
STATEMENT OF FINANCIAL CONDITION
AS OF 31 DECEMBER 2001

ASSETS

CURRENT ASSETS:	
Cash on hand	$19,019.00
Accounts receivable	453.00
Prepayment/ postal fee	125.00
Inventories:	
Postage	40.00
Supplies/ equipment	300.00
Newsletters (est.)	500.00
Journals (est.)	3,000.00
TOTAL CURRENT ASSETS	$23,437.00

LIABILITIES

CURRENT LIABILITIES:	
Life memberships (24)	$9,000.00
Prepaid subscriptions	1,665.00
Prepaid dues	285.00
Dues in arrears	885.00
Subscriptions in arrears	875.00
TOTAL CURRENT LIABILITIES	$12,710.00
SURPLUS	$10,727.00

MONEYS OF MES AS OF 31 DECEMBER 2001:	
Petty cash	$141.00
Checking account	8,641.00
Savings account (CD)	10,237.00
TOTAL	$19,019.00

MONEYS OF MES AS OF 31 DECEMBER 2000 .... $18,422.00

MEMBERSHIP: As of 31 December 2001, the Society had 372 members in good standing compared to 365 on 31 December 2000.

SUBSCRIPTIONS: As of 31 December 2001 there were 135 paid subscriptions to THE GREAT LAKES ENTOMOLOGIST, compared with 200 in 2000.

Mogens C. Nielsen, Treasurer, 8 May 2000

MICHIGAN ENTOMOLOGICAL SOCIETY

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