NEWSLETTER

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MICHIGAN ENTOMOLOGICAL SOCIETY

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The Purple Loosestrife Project at Michigan State University

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Purple loosestrife (*Lythrum salicaria*) is an exotic invasive plant that has unfortunately become all too common in Michigan wetlands. A native of Eurasia, purple loosestrife has now invaded a variety of wet habitats throughout much of North America, including marshes, swamps, lakes, rivers, streams and ditches. Once established, purple loosestrife can become the dominant vegetation, excluding native plants and the organisms that depend on them. In Europe, purple loosestrife is controlled by a number of insect natural enemies that have become the focus for importation biological control. Among these, two leaf-feeding beetles, *Galerucella calmariensis* and *G. pusilla* (Coleoptera: Chrysomelidae) have been released in Michigan for biological control of purple loosestrife. The *Galerucella* beetles feed on bud, leaf, and stem tissue causing defoliation and prevention of flowering and seed production. Continued defoliation over several seasons favors competition by other plant species and can result in the elimination of purple loosestrife from localized areas.

Initial introductions of *G. calmariensis* and *G. pusilla* in Michigan were made in 1994 by the Michigan Department of Natural Resources-Wildlife Division on three state managed game areas: Crow Island State Game Area, Saginaw Co. (2 releases); Nayanquing

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Beech Bark Disease – Michigan's New Exotic Forest Pest

Deborah G. McCullough[1] and Robert L. Heyd[2]

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American beech (*Fagus grandifolia* Ehrh.) is found throughout most of Michigan (see map, page 8) and is a favorite of many animals, as well as people. Beech nuts are an important source of hard mast for wildlife such as black bears, squirrels, chipmunks, turkey and deer. Large beech trees often accumulate cavities and dead branches over time. Many birds, from hawks to nuthatches, use these big trees for perching, nesting or insect foraging. A variety of mammals including fishers and pine martens use cavities for dens or shelter. Beech wood is used for many products ranging from flooring to veneer to baskets, and it makes great firewood.

Unfortunately, yet another exotic forest pest has made its way into Michigan and the outlook for our American beech trees is gloomy. Beech bark disease was first discovered in Michigan in spring 2000 in Ludington State Park, Mason County, in the Lower Peninsula and soon thereafter in the Bass Lake campground in Luce County in the eastern Upper Peninsula. Additional surveys during the 2000 field season have detected

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Update on Asian Longhorned Beetle Infestations in the US

Dennis A. Haugen
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The Asian longhorned beetle (*Anoplophora glabripennis*) is a non-native pest that poses an enormous threat to the urban and rural forests of the United States. The Asian longhorned beetle (ALB) prefers maples, but also attacks elms, willows, poplars, birches and several other hardwood species. It infests living, healthy trees, and it ultimately kills the tree as successive generations of larvae tunnel in the cambium and wood of the tree; initially in the upper branches and finally the lower bole. ALB likely entered the US in solid wood packing material from China; crates with live larvae have been found at numerous ports across the US in recent years. However, the only known established (i.e., reproducing) populations of this beetle are in the New York City and Chicago areas. The first infestation was detected in Brooklyn, NY, during 1996 (Haack et al. 1996, 1997). In Chicago, infestations were first detected during 1998 (Poland et al. 1998). Eradication projects are in progress in both states.

New York Infestations

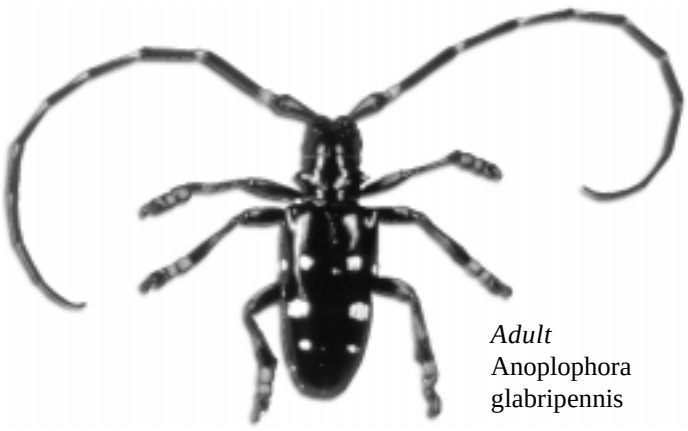
Currently, five ALB infestations are known in the New York area. The Brooklyn-Greenpoint infestation was found in 1996, and more than 2400 infested trees have been found and destroyed in the last 5 years at this location (see Table). About a month after the Brooklyn infestation was found, another infestation was detected in Amityville, about 29 miles east of the Brooklyn infestation. A third infestation was detected in Queens-Bayside during 1998. In 1999, two more infestations were found in Manhattan (4 blocks from Central Park) and in Islip (on Long Island, 11 miles east of the Amityville infestation). These five infestations are likely the result of one introduction into Brooklyn, with infested cut tree material (branches and trunk sections) subsequently being moved from Brooklyn (before ALB was detected) to initiate the other infestations. So far, over 5100 infested trees have been found in New York.

Chicago Infestations

Currently, five ALB infestations are known in the Chicago area. The Ravenswood infestation was found in 1998, and more than 1300 infested trees have been detected so far (Table). Due to the intensive media coverage of the Ravenswood infestation, two additional infestations were reported by the public in 1998 at Addison (18 miles west of Ravenswood) and Summit (14 miles southwest of Ravenswood). These three infestations are thought to be independent, i.e., started from separate shipments from Asia. Two more recent infestations were found, one in Park Ridge in 1999 and one near O'Hare Airport in 2000; these infestations are likely due to movement of infested tree debris from the Ravenswood infestation prior to 1998. So far, more than 1400 infested trees have been found in Chicago.

Eradication Projects

The goal is to eradicate ALB from North America. Quarantine areas have been established around each infestation in New York and Chicago to prevent further movement of infested tree material. Surveys of infested neighborhoods and surrounding areas are conducted each year to find infested trees. Infested tree are cut and chipped. New York has relied on ground survey with binoculars to find infested trees. Chicago has used bucket trucks and tree climbers since early 1999, which has greatly improved their ability to detect infested trees. Systemic insecticide trials were initiated in New York and Chicago during the spring of 2000. Trunk and soil injections of imidacloprid are being evaluated for effectiveness in protecting uninfested trees from beetle attack. Chicago implemented an operational project during 2000 in which more than 11,000 uninfested host trees were treated with imidacloprid to form rings of protected trees around each infestation.



Adult
Anoplophora glabripennis

Officers of MES

President	George Balogh
President-Elect	Mark O'Brien
Immediate Past President	Ron Priest
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Member-at-Large (2000-03)	Gwen Pearson
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Journal Editor	Randy Cooper
Newsletter Editor	Bob Haack
Associate Newsletter Editor	Therese Poland
Webmaster	Mark O'Brien

Current Annual Dues Schedule

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

Additional Information

More information on ALB can be found on the web at: www.na.fs.fed.us/spfo/alb/. This website includes data on each infestation, quarantine maps, identification guides, reports, photos, and link to other ALB sites.

References

Haack RA, Cavey JF, Hoebeke ER, Law K. 1996. *Anoplophora glabripennis*: a new tree-infesting exotic cerambycid invades New York. Newsletter of the Michigan Entomological Society 41(2-3): 1-3.

Haack RA, Law KR, Mastro VC, Ossenbruggen HS, Raimo BJ. 1997. New York's battle with the Asian long-horned beetle. Journal of Forestry 95(12): 11-15.

Poland TM, Haack RA, Petrice TR. 1998. Chicago joins New York in battle with the Asian longhorned beetle. Newsletter of the Michigan Entomological Society 43(4): 15-17.

Number of ALB-infested trees detected by location and year.

Location:	96/97	97/98	98/99	99/00	00/01	Total
			Year*			
New York						
Brooklyn-Greenpoint	766	440	210	787	225	2428
Amityville	454	344	586	242	120	1746
Queens - Bayside	-	-	158	569	139	866
Manhattan	-	-	31	51	82	
Islip	-	-	-	11	0	11
Total						**5133**
Chicago						
Ravenswood	-	-	837	472	39	1348
Addison	-	-	41	15	1	57
Summit	-	-	8	17	0	25
Park Ridge	-	-	-	4	3	7
O'Hare Airport	-	-	-	-	23	23
Total						**1460**

** Year totals for New York are from May 1 to April 30, and for Chicago they are from 1 July to 30 June. Partial data for year 2000/2001 is current through 9 December 2000.*

Mark Your Calendar!

Saturday 10 March 2001
9 AM until mid-afternoon
Breaking Diapause

Come and meet informally with fellow entomologists. Bring along insects to identify or any insect displays you may have.

Refreshments will be provided. Tour the MSU insect Collection, Bug House and the new Insect Emporium.

Natural Science Building
Room 244
East Circle Drive, MSU

More details and map to follow in the next MES Newsletter.

Saturday 9 June 2001
9 AM - 4 PM
Annual MES Meeting

The upcoming Annual General Meeting will be held at the Leelanau School in Glen Arbor, MI. There are a variety of tourist attractions in the area. Accomodations are available Friday and Satruday night at the school dorm for $52.00 double/person/day or $64 single/person/day with all meals, linens and bedding provided. On site registration is $15/person.

This year's meeting will include a student paper competition, photo salon competition, and door prizes. the theme will be: Ecology, Bionomics, and Distribution of Great Lakes Endemic and Invasive Insects. In addition, The Michigan Odonata Survey will hold a field trip in the Glen Arbor area on 10 June.

More details in the next MES Newsletter.

Purple Loosestrife continued from page 1

Point Wildlife Area, Bay Co. (2 releases); and Shiawassee River State Game Area, Saginaw Co. (1 release). Large populations of *G. calmariensis* have developed at each of these three game areas, while *G. pusilla* apparently failed to establish. The resulting populations of *G. calmariensis* have caused complete defoliation of purple loosestrife over hundreds of hectares and beetles have spread 3-10 kilometers from the original release sites. Field monitoring by our group in 2000 showed that *L. salicaria* stem height was reduced by 73-85% and percent cover was lowered by 61-95% from its 1995 level. In four out of five sites, non-target plant species richness increased significantly during the same time frame.

Having observed the initial success of these biological control agents, we initiated the "Purple Loosestrife Project" at Michigan State University (MSU) in 1997. The project aims to restore the biological diversity, integrity, and ecological function of Michigan wetlands degraded by purple loosestrife and offer a unique opportunity to enhance science and environmental education for Michigan youth by actively engaging local communities in both processes. Since 1997, MSU personnel have reared over 300,000 *G. calmariensis* and made major releases (>5000 insects/site) at 45 sites statewide. *Galerucella calmariensis* became established at each of 19 sites that we monitored for one to three years during 1997-1999. To date, *G. calmariensis* populations have generated severe damage to *L. salicaria* at two sites. At one site, *G. calmariensis* damage in 2000 completely prevented flowering of *L. salicaria* within a 200-m radius of the release site. While at a second study site, intense feeding by *G. calmariensis* has eliminated *L. salicaria* from seven of the nine quadrats where the plant originally occurred in 1997. Where purple loosestrife is still present, average stem density has fallen from 35.8 to 0.3 stems/m^2.

In addition to these research sites, we have developed a network of trained volunteers to rear, release and evaluate the impacts of *G. calmariensis* throughout Michigan. To date, we have trained over 100 K-12 classroom teachers and collaborated with 25 additional communities to develop purple loosestrife biological control projects in their local areas. These volunteers are trained during our March workshop, which is held annually on the MSU campus during "Agriculture and Natural Resources Week." Participants rear *L. salicaria* plants in sleeve cages and receive about 20 *G. calmariensis* adults to infest the plants from our collaborators at the USDA APHIS Plant Protection Center in Niles, MI. Each infested plant can produce up to 2,000 new adults for later release in a wetland adopted by the volunteers.

We now have evidence that *G. calmariensis* alone can produce significant reductions in purple loosestrife density, however, additional natural enemies and restoration efforts may be needed to restore wetland function degraded by purple loosestrife. Perhaps more importantly, we hope that the project will educate Michigan citizens about the potential benefits of biological control by insects and inspire a new generation of citizens to make a difference in their local communities. The Purple Loosestrife Project has received funding from Michigan State University, Michigan Sea Grant, Michigan Department of Agriculture, Michigan Department of Natural Resources, Michigan Department of Environmental Quality, the USDA National Biological Control Institute, and the US Environmental Protection Agency. Additional details about the project can be found at the Purple Loosestrife Project website (http://www.msue.msu.edu/seagrant/pp/).

MES Newsletters of Old

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

At least once a year, we plan to return to MES Newsletters of yesteryear and discuss what was going on in MES at that time or perhaps reprint a story or two. We've decided to go back 25 years and 50 years. So we'll start with 1975 and 1950.

1975. In early 1975, Robert Husband was the MES President, David Gosling was President-Elect, Mo Nielsen was Executive Secretary, and dues were $4 per year. The MES Governing Board position of Member-at-Large was approved in 1975. On 16 May 1975, the 21st MES Annual Meeting was held at the Glen Oaks Community College in Centreville, MI. The guest speaker was Dr. Vincent Dethier of Princeton University who presented a paper entitled "How Insects Choose Their Diet." During the post-meeting collecting trip, a new state record was made for the scarab *Phyllophaga borda* (Hom). In 1975, there was a request to MES to nominate rare and endangered insects species that could potentially be added to the federal list of Threatened and Endangered Species. Justin Leonard was born in 1909 and died in 1975. He was a very active MES member with a keen interest in aquatic insects. One of his many publications was the book "Mayflies of Michigan Trout Streams."

1950 and earlier. MES grew out of the Detroit Entomological Society (DES), which began in 1942. Little information exists on DES that we're aware of. In our MES files, we have the DES meeting minutes from 1947 to May 1951, and a few letters dating back to 1942. There were two talks at the January 1950 DES meeting: one on *Calephelis* metalmark butterflies by Wilbur McAlpine and another on *Gymnoscirtetes* grasshoppers by Irving Cantrall. At the March meeting, Kurt Bottnsack spoke on soil fauna of the George Reserve and George Byers spoke on *Dolichopeza* tipulids. At the October meeting the discussion focused on concerns for the future of the DES and the Andrews' Collection of over 100,000 specimens. Arthur Andrews (1867-1950), was an art furniture maker by trade in Highland Park, and was an active DES member who specialized in butterflies and beetles.

In May 1951, the need to change from DES to MES was discussed. However, our next entry is from 4 November 1954 when MES was formally initiated. Does anyone know if DES was active during 1951-1954?

Michigan Entomological Society Officers: 1955-2000: MES was founded in 1954 and in 1955 the first Governing Board officers were elected: a "President" and an "Executive Secretary." These were the only two Governing Board positions until 1966 when the "Journal Editor" was added along with MES' first journal: *The Michigan Entomologist*, which was renamed to *The Great Lakes Entomologist*, beginning with Vol. 5 in 1972. The position of "Newsletter Editor" was created in 1972 although the *Newsletter of the Michigan Entomological Society* had been published since 1956. Although not formally recognized in the MES Constitution and Bylaws, there has been an "Associate Newsletter Editor" position since 1979. The position of "Member-at-Large" was created in 1976. This position has a 3-year term. Three Members-at-Large were filled in 1976, with Roger Bland elected for 1 year, Ron Priest for 2 years, and John Witter for 3 years. In 1992, the Executive Secretary position was split into two positions: "Treasurer" and "Secretary." The MES webpage went on-line in 1995, and Mark O'Brien has served as the MES Webmaster since its creation. Later in 2001, there will be a vote to make several changes to the MES Constitution and Bylaws, including formal recognition of the "Associate Newsletter Editor," "Associate Journal Editor," and "Webmaster." **Robert A. Haack,** USDA Forest Service, 1407 S. Harrison Road, E. Lansing, MI 48823. E-mail: rhaack@fs.fed.us

Year	President	Executive Secretary	Journal Editor	Member-at-Large	Newsletter Editor	& Associate
1955	George Steyskal	Roland Fischer	-	-	-	-
1956	Ray Hutson	Roland Fischer	-	-	-	-
1957	Dominic DeGiusti	Roland Fischer	-	-	-	-
1958	Irving Cantrall	Roland Fischer	-	-	-	-
1959	Roland Fischer	Stanley Gangwere	-	-	-	-
1960	Warren Wagner	Stanley Gangwere	-	-	-	-
1961	David Cook	Theodore Cohn	-	-	-	-
1962	Robert Dreisbach	Theodore Cohn	-	-	-	-
1963	Stanley Gangwere	Theodore Cohn	-	-	-	-
1964	Mogens Nielsen	Julian Donahue	-	-	-	-
1965	Henry Townes	Julian Donahue	-	-	-	-
1966	John Newman	Julian Donahue	Julian Donahue	-	-	-
1967	Fred Knight	Julian Donahue	Ronald Wilkinson	-	-	-
1968	T. Wayne Porter	Mogens Nielsen	Ronald Wilkinson	-	-	-
1969	Louis Wilson	Mogens Nielsen	Ronald Wilkinson	-	-	-
1970	Julian Donahue	Mogens Nielsen	Ronald Wilkinson	-	-	-
1971	Richard Snider	Mogens Nielsen	Irving Cantrall	-	-	-
1972	Dean Dillery	Mogens Nielsen	Irving Cantrall	-	Louis Wilson	-
1973	Richard Fleming	Mogens Nielsen	Irving Cantrall	-	Louis Wilson	-
1974	Robert Husband	Mogens Nielsen	Irving Cantrall	-	Louis Wilson	-
1975	David Gosling	Mogens Nielsen	Irving Cantrall	-	Louis Wilson	-
1976	Donald Cress	Mogens Nielsen	David Gosling	R. Bland, R. Priest, J. Witter	Louis Wilson	
1977	Al Bratt	Mogens Nielsen	David Gosling	David Evans	Louis Wilson	-
1978	Roger Bland	Mogens Nielsen	David Gosling	Don Mosher	Louis Wilson	-
1979	Daniel Young	Mogens Nielsen	David Gosling	David Evans	Louis Wilson	George Heaton
1980	Gary Simmons	Mogens Nielsen	David Gosling	Glen Belyea	Louis Wilson	George Heaton
1981	John Witter	Mogens Nielsen	David Gosling	Ed Voss	Louis Wilson	George Heaton
1982	Ron Priest	Mogens Nielsen	David Gosling	Fred Stehr	Louis Wilson	George Heaton
1983	Gary Dunn	Mogens Nielsen	David Gosling	Glen Belyea	Louis Wilson	George Heaton
1984	Dave Evans	Mogens Nielsen	David Gosling	Gary Simmons	Louis Wilson	George Heaton
1985	David Cowan	Mogens Nielsen	David Gosling	Robert Husband	Louis Wilson	George Heaton
1986	Mark O'Brien	Mogens Nielsen	David Gosling	Dick Fleming	Louis Wilson	George Heaton
1987	Ken Kraft	Mogens Nielsen	Mark O'Brien	Gary Dunn	Louis Wilson	George Heaton
1988	Phil Watson	Mogens Nielsen	Mark O'Brien	Mark Scriber	Robert Haack	George Heaton
1989	Richard Snider	Mogens Nielsen	Mark O'Brien	Leah Bauer	Robert Haack	George Heaton
1990	Eugene Kenaga	Mogens Nielsen	Mark O'Brien	Cathy Bristow	Robert Haack	George Heaton
1991	Fred Stehr*	Mogens Nielsen	Mark O'Brien	Ron Priest	Robert Haack	George Heaton

Year	President	Treasurer	Secretary	Journal Editor	Member-at-Large	Newsletter Editor & Associate Editor		Webmaster
1992	Fred Stehr	Mogens Nielsen	Ned Walker	Mark O'Brien	Dan Herms	Robert Haack	George Heaton	
1993	Cathy Bach	Mogens Nielsen	Ned Walker	Mark O'Brien	Bill Westrate	Robert Haack	George Heaton	
1994	Dave Gosling	Mogens Nielsen	Ned Walker	Mark O'Brien	Karin Grimnes	Robert Haack	George Heaton	
1995	Richard Roeper	Mogens Nielsen	Ned Walker	Mark O'Brien	George Balogh	Robert Haack	George Heaton	Mark O'Brien
1996	Cathy Bristow	Mogens Nielsen	Ned Walker	Mark O'Brien	Tom Wallenmaier	Robert Haack	George Heaton	Mark O'Brien
1997	Dan Herms	Mogens Nielsen	Bob Kriegel	Mark O'Brien	Chip Franke	Robert Haack	George Heaton	Mark O'Brien
1998	Leah Bauer	Mogens Nielsen	Bob Kriegel	Mark O'Brien	Dave Cuthrell	Robert Haack	Therese Poland	Mark O'Brien
1999	Ron Priest	Mogens Nielsen	Bob Kriegel	Randy Cooper	Owen Perkins	Robert Haack	Therese Poland	Mark O'Brien
2000	George Balogh	Mogens Nielsen	Bob Kriegel	Randy Cooper	Gwen Pearson	Robert Haack	Therese Poland	Mark O'Brien

*Fred Stehr served two consecutive terms as President given the untimely death of President-Elect Roland Fischer in 1992.

The West Nile Virus Outbreak

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The current epizootic of West Nile viral encephalitis has been hard to miss in the past year, given the intensive media attention on the subject and the fact that New York City has been the focus of activity. This brief article summarizes the outbreak and provides general information on the current attempts to understand the phenomenon, control the spread of the virus, and predict where the virus may move next in North America. There are many web sites with information on the topic. A simple search with the words 'West Nile' will yield several hits.

Viruses of medical and veterinary importance that are transmitted by mosquitoes or other blood-feeding arthropods belong to one of four groups: the flaviviruses, the alphaviruses, the bunyaviruses, and the phleboviruses. All are positively-stranded RNA viruses that are capable of infecting both invertebrates (i.e., their arthropod vectors) and vertebrates. West Nile virus is a mosquito-borne flavivirus, and thus a cousin of the flaviviruses that cause yellow fever and dengue. It belongs to the Japanese encephalitis virus complex within the flavivirus grouping. The viruses in this complex are very similar genetically; all are associated with mosquitoes in the genus *Culex*, and all have birds as their native (or enzootic) hosts. The viruses will also infect mammals in some cases, including humans, when they are bitten by infected mosquitoes.

Until 1999, the only representatives of the Japanese encephalitis complex in the western hemisphere were St. Louis encephalitis, which is widespread in North, Central, and South America, and the Caribbean basin; and Rocio virus, which was documented in a single epidemic in Brazil. The others are Japanese encephalitis (Asia, Philippines, New Guinea); Murray Valley and Kunjin (Australia); and West Nile (Africa, Middle East to India and western China, and Europe). Medical experts agree that the most dangerous and historically important of these viruses is Japanese encephalitis, which annually causes epidemics of serious neurologic disease, often leading to death, among people and swine in broad expanses of Asia where rice culture exists such as Nepal, China, Vietnam, and the Philippines. A vaccine was recently developed for Japanese encephalitis, and has been licensed for use by US travelers to Asia. There are no vaccines for the other viruses in the complex. It is important to emphasize that these viruses are natural infections of birds, whereas infections in humans, horses, swine, and other mammalian hosts are 'dead-end' infections and not part of the normal virus ecological cycle.

St. Louis encephalitis has occurred from time to time in epidemics or 'outbreaks' in the United States since 1933. Human cases occur nearly every year in peninsular Florida, Louisiana (especially New Orleans), and Texas, and there is evidence of virus activity in many areas of the US every summer in mosquito and bird populations, even when there are no human cases. Although St. Louis encephalitis has occurred from time to time in northern US states, it is rare. The last major outbreak in the northern US occurred in 1975, involving nearly 2,000 confirmed human cases. At that time, there were 93 cases in Michigan and 5 deaths due to this disease, mostly concentrated in the southeastern urban areas.

This was the first report of West Nile virus in the Western Hemisphere. Ultimately, it was determined that there had been a total of 61 human cases in the New York City area, including 7 deaths.

In 1999, an infectious-disease physician attended a case in Queens, New York City, in late August, where the person suffered from a severe neurologic disease. The same physician attended a similar case soon thereafter and then astutely contacted the New York City Health Department because encephalitis of unknown origin can signal an outbreak of disease on a community level. These events occurred during the week before Labor Day in 1999. The New York City Health Department responded rapidly to this information by obtaining blood samples and forwarding them to state and federal agencies for rapid diagnosis, which indicated St. Louis encephalitis (SLE). The Health Department authorities then concluded that there was a local outbreak of SLE in New York City, which was the first time this had ever been known to occur. An interagency network involving local to federal governmental agencies, including the New York City Mayor's Office of Emergency Management became involved. Simultaneously, workers at the Bronx Zoo, and other local people observed unusual deaths in exotic and native birds, especially crows. Eventually, it was determined that a common infectious agent had infected these two people, local mosquitoes, and the birds, as well as horses on Long Island; and that the infectious agent was not the SLE virus, but rather West Nile virus.

This was the first report of West Nile virus in the Western Hemisphere. Ultimately, it was determined that there had been a total of 61 human cases in the New York City area, including 7 deaths. Most were elderly people. The first human case was traced to the first week of August 1999, and the last human case was documented to begin during the third week of September 1999. West Nile virus infection was confirmed in 194 dead birds of 14 species, and was isolated from local *Culex* mosquitoes. Dead birds were found in New York State, New Jersey, Connecticut, and Maryland. Anti-mosquito and public health prevention and education programs were created in early September. A serosurvey performed in November 1999 among people in Queens indicated that approximately 1,256 persons had been infected, and 239

(19%) actually experienced symptoms of infection. The age-specific seroprevalence data indicated a novel and recent introduction of the virus, as opposed to the possibility that the virus had been in the area for some time.

Simultaneously, outbreaks of West Nile virus were occurring in southern Europe, the former Soviet Union, and the Middle East. The West Nile virus isolates from Queens, New York, were genetically identical to viruses isolated from a dead domestic goose in Israel in 1998.

An important question was whether this virus would overwinter and re-emerge in 2000. In January 2000, a dead red-tailed hawk found north of New York City was confirmed to have West Nile viral infection, and overwintering female *Culex* mosquitoes in the sewers of Queens were found to be infected in February. By June 2000, dead and virus-positive birds were found in Rochester and Rockland Counties, north of New York City. By November 2000, West Nile virus-positive dead birds had been found in most counties of New York State, and in Connecticut, Massachusetts, New Hampshire, New Jersey, Delaware, and Pennsylvania. Virus-positive mosquitoes were detected in most of these states as well, but the virus was found not only in *Culex* mosquitoes but in mammal biting *Aedes* mosquitoes as well. Even though birds in the family Corvidae (common crows, fish crows, ravens, and blue jays) were the ones most commonly observed to be infected, there were about 4,000 birds confirmed to have West Nile virus infection at the time of death, among 55 species. Because most of these birds were found by citizens and delivered to authorities for further study, the actual number of infected and dead birds is likely much larger. The farthest west in the US that West Nile virus was detected was in the three westernmost counties of New York where positive birds were found, and in Erie, Pennsylvania, where two virus detections occurred in locally collected *Aedes* mosquitoes. There were 18 human cases in 2000: 14 in Staten Island, 3 in New Jersey including one death, and one case in Connecticut.

What will happen next? The outbreak of West Nile virus appears to be a matter of biological invasion of this exotic pathogen into mosquito vectors and bird hosts in its new geographic territory of North America. Some birds appear to be more negatively affected than others for unknown reasons. The North American mosquitoes appear to be as competent in transmitting this virus as are their congeners in the Old World. Given the rate of spread westward from the initial outbreak in Queens to western Pennsylvania in about 1 year, a logical prediction is that the virus will continue to spread toward the Great Lakes region of the upper Midwest, as well as along the Atlantic seashore. Likely spreading mechanisms are bird and mosquito movement, either passively, during migration, or with human commercial activity. The connection of the outbreak to the Middle East is intriguing and has led some authorities to speculate that the occurrence of this disease in the US represents an example of bioterrorism, although unproven. However, what is more likely, is that the virus was introduced to New York by an infected mosquito that hitchhiked on an airplane from Israel or other nearby country in the Middle East, or possibly even an infected bird that arrived in the US either legally or illegally through smuggling.

WANTED!

Reviewers are needed for manuscripts submitted to *The Great Lakes Entomologist*. If you would like to be added to a formal list of potential reviewers, please write or E-mail:

Randall Cooper, Editor

The Great Lakes Entomologist
16672 152nd Avenue
Spring Lake, MI 49456
Phone: 616-846-4789
E-mail: Renzie@aol.com

Please provide your name, contact information including E-mail address, and areas of expertise.

Note: Authors, please keep your papers coming in. High quality papers and prompt reviews are needed to ensure timely publication of the journal!

The MES Newsletter Needs Stories.

As your Newsletter Editors, we (Bob Haack and Therese Poland), would like to remind you that we are always looking for new stories, short or long.

Newsletters are published in 4-page multiples. Because we are often short a story or two to complete 4 pages, we typically fill the space with our own work, and therefore there is a bias towards forest entomology issues. We would much rather publish *your* stories!

Remember this is *your* Newsletter. Submit stories, Entomolgy Notes, news, research requests, new species records, season summaries, etc. to:

Robert Haack (rhaack@fs.fed.us) or
Therese Poland (tpoland@fs,fed.us) or
write us at: US Forest Service,
1407 South Harrison Road
East Lansing, MI 48823

Beech bark disease continued from page 1

beech bark disease in Oceana, Mason and Newaygo counties in Michigan's Lower Peninsula and in Alger, Luce and Chippewa counties in the Upper Peninsula (see map). Surveys will continue in 2001 and more stands with beech bark disease will probably be discovered in Michigan.

What is it? Beech bark disease involves two exotic organisms - a sap-feeding scale insect and various fungal pathogens in the genus *Nectria*. Beech bark disease begins when a beech tree becomes infested with beech scale (*Cryptococcus fagisuga* Lind.; Eriococcidae). The tiny scale insects, found on the tree trunk and branches, feed on sap in the tree's inner bark. White wax covers the bodies of the scales. When trees are heavily infested, they appear to be covered by white wool.

Minute wounds and injuries caused by the feeding activities of the scale insects eventually enable *Nectria* fungi to enter the tree. It may take anywhere from 2 to 10 years before a tree infested with scale is invaded by *Nectria*. A native *Nectria* species, such as *N. galligena*, may infect the tree first but eventually a European species, such as *N. coccinea* var. *faginata*, moves in. The exotic pathogen kills areas of woody tissue, sometimes creating cankers on the tree stem and large branches. If enough tissue is killed, the tree becomes girdled and will die. Some infected trees will linger for several years, but eventually succumb to *Nectria* or other pathogens. Trees dying from *Nectria* infection usually have a distinct appearance. Leaves that emerge in spring do not fully expand, so crowns appear thin or raggedy. Leaves remain on the trees but become yellowish later in the summer. Branches and trunks of some infected trees will break off in heavy winds – a condition called "beech snap."

Where did it come from? It was only a matter of time before beech scale and beech bark disease reached Michigan. Beech scale was accidentally introduced into Nova Scotia in 1890 on ornamental beech imported from Europe. By the early 1930s, the scale and associated *Nectria* fungi were found throughout much of eastern Canada and Maine. Much of New England, New York and northeastern Pennsylvania were affected by 1975. Beech bark disease has continued to spread through Quebec, Pennsylvania and most recently, northeastern West Virginia. Localized beech scale infestations have been found in Virginia, North Carolina, Tennessee, Ohio and Ontario.

How did It arrive? Beech scale was probably present at the Ludington and Bass Lake sites for at least 10 years before they were discovered. It was a matter of the right people being in the right place to recognize what was happening. We don't know how these areas first became infested. The immature stage of the beech scale and the spores of the *Nectria* fungus are carried in the wind. Birds may help spread the pests too. It is also possible that tourists may have accidentally transported the pests on infested firewood.

Impact of beech bark disease. We expect that beech bark disease will continue to spread through Michigan - a process that may take 10 to 20 years. The impact of this exotic pest will be profound. Large, old trees are generally more likely to be infested by the scale and are usually more vulnerable to the pathogen than younger trees. Based on what has happened in other states, we expect that about 50% of the large beech trees in Michigan will be killed during the first wave of beech bark disease. Inventory data collected in 1993 suggests that roughly 7.5 million beech trees (with a dbh greater than 9 inches) will be killed in the first wave. This represents about 800 million board feet of wood. Another 25% of the large beech trees will become infected but survive as weak, defective trees.

Resistant beech trees The remaining 25% of the trees will escape infection during the first wave. Some of these trees, however, may be at least partially resistant to beech scale. Research in the northeast indicates that perhaps 1% of trees are truly resistant. Therefore, identification and conservation of potentially resistant trees will be an important part of beech bark disease management in Michigan. This low rate of resistance, however, also means that it will take a long, long time before we can expect to see any notable recovery in the beech resource.

Learn about beech bark disease.If you have beech trees on your property, make a point of learning about beech bark disease. A new extension bulletin will be ready for distribution in January 2001 and can be ordered through your county MSU-Extension office. This bulletin includes lots of information, color photos and management recommendations for a wide variety of situations. Information from this bulletin is also available on the web at: http://forestry.msu.edu/msaf/.

Don't confuse aphids with beech scale. During fall 2000, several residents in southern Michigan became concerned about white woolly insects feeding on beech trees. It turned out, however, that their trees were infested with aphids – a minor pest – and not with beech scale. There are several white, woolly aphids that feed on beech. Aphids will be found up in the canopy of the tree, on leaves, twigs or small branches. In contrast,a beech scale infestation usually begins on the tree trunk. Aphids are relatively mobile and may have filaments that appear to wave or sway in the wind, while beech scale is immobile during most of its life. Also, aphids excrete honeydew while beech scales do not.

Don't cut all your beeches. If you manage property that includes beech trees, especially if beech comprises a major component of the overstory (e.g., 40% or more),

you should be thinking about beech bark disease, especially if you are planning thinning or harvest activities. It may be wise to consider increasing diversity of overstory species in these stands. It is not necessary to eliminate beech – this will not reduce the spread or impact of beech bark disease. Beech trees provide important wildlife habitat –dead, standing trees and fallen trees are used by many animals.

Beech bark disease won't be the last exotic pest. Granted, beech bark disease was going to arrive in Michigan eventually. But this situation is a good example of the ecological havoc that can result when exotic insects and pathogens become established in our forests. These pests typically have few natural enemies and our trees have not evolved resistance to these exotic species. One downside of our global economy is the tremendous increase in the opportunities for exotic pests to arrive in North America. Burgeoning trade with China, Russia and other countries will likely increase the risk of invasion by new forest pests.

Justification for Yes-No Vote on Upcoming Constitution/Bylaws Proposed Changes

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It has now been a year and a half since the MES Governing Board initiated proposed changes to our Constitution and Bylaws. That effort resulted in six major areas for change and the first major rewrite in more than 30 years. These changes were summarized and the proposed changes published in the March 2000 MES Newsletter. Along with those proposals was a request to the membership for comment. No written comments were received although one person did raise a concern at the June 2000 Annual Business Meeting. Quite simply the idea raised was, with such extensive changes a simple yes or no vote could easily mask objections to individual issues. As I recall, the alternative suggestion was to vote separately on each of the six main issues.

The MES Governing Board has made no change to its original decision to solicit a single yes/no vote for the entire revision. Had there been more specific concerns raised by the membership, then a vote on each issue would have been justified. Since there was only one person raising a concern, and that of procedure, it appears that voting on six separate issues would not be useful. If any member does have concerns there is always a viable option. Identify specific concerns with justification and a practical alternative. Present those concerns, in writing, to the MES Governing Board for review. Once approved they can then be placed on the next ballot for membership vote. That said, don't forget to vote this coming spring on the original proposed changes!

Range Expansion of Tomicus piniperda Since 1992 and Notes on Other New Exotics

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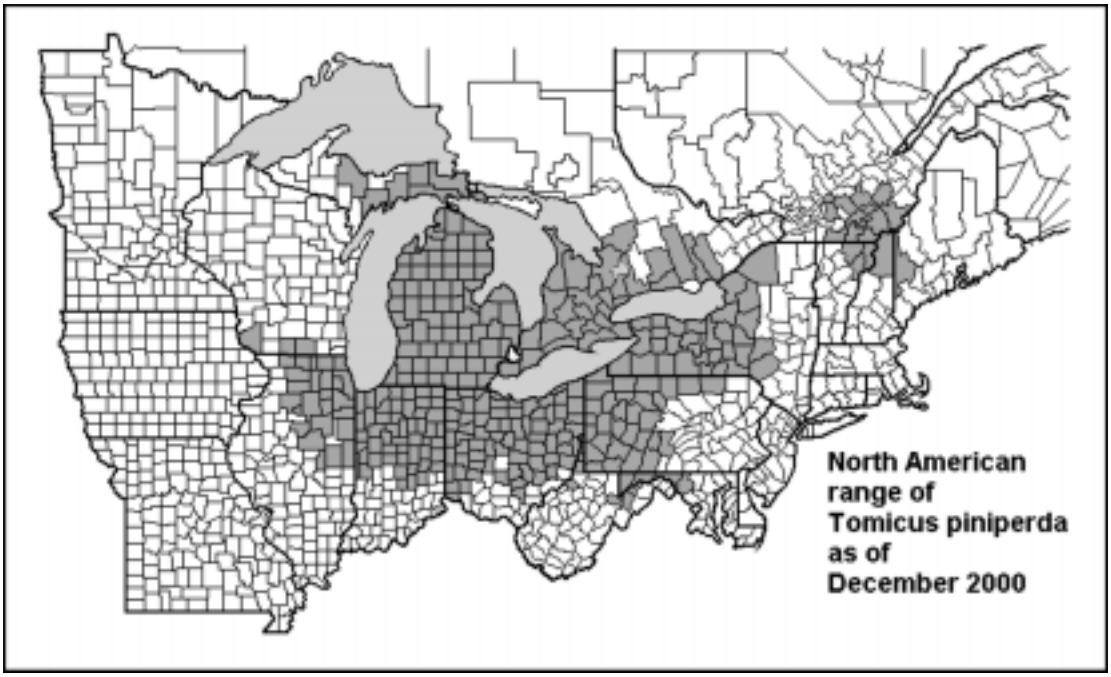
In July 1992, established populations of the pine shoot beetle, *Tomicus piniperda* (L.) (Coleoptera: Scolytidae), were first discovered in Ohio. By the end of 1992, this Eurasian bark beetle was known to occur in 43 counties in 6 US states (Illinois, Indiana, Michigan, New York, Ohio, Pennsylvania; Haack 1997, Haack et al. 1997). Federal quarantines remain in both the US and Canada that regulate movement of pine logs, pine Christmas trees, and pine nursery stock from infested counties to uninfested counties.

Since 1992, the pine shoot beetle has been found in more US counties each year. By the close of 2000, the range of *T. piniperda* extended from the Mississippi River to Maine (see Map and Table): Maryland and West Virginia were added in 1995, Wisconsin in 1997, New Hampshire and Vermont in 1999, and Maine in 2000. All infested states and most border states trap every year for *T. piniperda*; however, trapping methods and the extent of trapping vary among states. The range of *T. piniperda* in the US now borders the states of Iowa, Kentucky, and Virginia. The pine shoot beetle will likely be found in one of these 3 states in 2001, assuming that thorough detection surveys are conducted.

Number of *Tomicus piniperda*-infested counties and states in the US as of December 1992 through December 2000.

Year	Number of counties	Number of states
1992	43	6
1993	92	6
1994	118	6
1995	147	8
1996	187	8
1997	220	9
1998	238	9
1999	271	11
2000*	303	12

*As of December 2000, there were 27 infested counties in IL, 51 in IN, 4 in MD, 1 in ME, 74 in MI, 1 in NH, 32 in NY, 71 in OH, 30 in PA, 3 in VT, 6 in WV, and 3 in WI.



In Canada, *T. piniperda* was first reported in 1993, and by the end of that year, *T. piniperda* was found in 7 counties in Ontario. The next province to become infested was Quebec in 1999. At the close of 2000, *T. piniperda* was reported to occur in 43 counties in Canada, with 30 counties in Ontario and 13 in Quebec (http://www.cfia-acia.agr.ca/english/plaveg/protect/dir/psbe.shtml).

It is not clear how the somewhat disjunct infestation in Quebec and New England occurred. Some possible scenarios include: (a) infested logs or other plant material were transported from the main infestation to the Northeast, (b) beetles flew there on their own or were carried by the wind, (c) there has been a new introduction from Eurasia, or (d) several of the uninfested counties that lie between the two infested areas are actually infested but at very low levels. A DNA analysis of *T. piniperda* from across the North American range could help explain how the disjunct infestation originated.

Other Exotics. Two new exotics to North America were mentioned in the news in 2000. First, a single adult specimen of the lesser pine shoot beetle, *Tomicus minor* (Hartig) (Scolytidae), was reported in Canada. This adult was collected from inside a Scotch pine shoot in a nursery near Alliston in Simcoe County, Ontario which is north of Toronto. Bruce Gill, Center for Plant Quarantine Pests, in Ottawa made the identification.

Second, an infestation of the Eurasian brown spruce longhorned beetle, *Tetropium fuscum* (Fabricius) (Cerambycidae), was first reported in Point Pleasant Park, Halifax, Nova Scotia, in 2000, although some adults had been collected in 1999 (http://www.cfia-acia.agr.ca/english/ppc/science/pps/datasheets/tetfuse.shtml). Moreover, once this new exotic had been identified, other specimens that had been collected at Point Pleasant Park in 1990 and identified then as the native cerambycid *Tetropium cinnamopterum*, were reexamined and found to actually be *T. fuscum*. This beetle attacks primarily spruce (*Picea*), but will occasionally attack fir (*Abies*), pine (*Pinus*), and larch (*Larix*). Surveys in Point Pleasant Park in 2000 found thousands of attacked spruce trees, primarily red spruce (*Picea rubens*), with many of the trees already dead. This beetle is attacking and killing apparently healthy trees. Surveys will continue in 2001 to better delimit the range of *T. fuscum* in Nova Scotia.

In addition, the smaller Japanese cedar longhorned beetle, *Callidiellum rufipenne* (Motschulsky) (Coleoptera: Cerambycidae) continues to be found in more northeastern US states. This beetle was found first in North Carolina in 1997 (Haack 1998) and then in Connecticut in 1998 (Maier and Lemmon 2000). Additional surveys conducted in 1999 and 2000 have found *C. rufipenne* in New Jersey (http://www.ceris.purdue.edu/napis/pests/celb/index.html) as well as in Massachusetts, New York, and Rhode Island (C. Maier, Connecticut Agricultural Experiment Station, New Haven, CT, unpublished data). This beetle has been found to attack live, but stressed, conifers in the genera *Chamaecyparis*, *Juniperus*, and *Thuja* in the US.

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Summer Field Day Barry State Game Area: 26 August 2000

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Saturday, 26 August 2000, turned out to be a pretty neat day. It was the first summer field day that MES has held in many years. Dave Cuthrell, MES Member-at-Large and entomologist with the Michigan Natural Features Inventory, led us to several hidden sites at the Barry State Game Area. Located west of Hastings in Barry County, MI, this state land covers parts of 45 square miles. The DNR Regional Headquarters served as our meeting point. Our first stop was at Shaw Lake with its bordering prairie fen and marl flats. Its entrance is an unmarked gravel trail off Shaw Lake Road. Native buckthorn, pitcher plant, poison sumac (easily avoided), and a variety of other wet habitat plants provided plenty of interesting hosts for a wide variety of insects. This habitat covers several acres with a stream flowing into the lake. The surrounding area is somewhat hilly with oaks and open fields. By early noon, we took a lunch break in the shade before heading to another site.

Our second stop was also a fen but this time it bordered Turner Creek and is a very open grass/sedge site. It was in this area that the first egg laying of Mitchel saytr has been observed. Dave pointed out flagged locations where actual egg laying had been seen. This site had a very different plant complement than at Shaw Lake.

Our third site was a coastal plain marsh bordering Dragget Lake. Its entrance was obscured. Parking on McKibben Road at the north east corner of Section 1, we followed a trail east then headed down a slope to the lake. The area surrounding Dragget Lake was covered with a variety of plants in flower and an even wider variety of insects attracted to them.

Bug hounds photographed (left to right) are: Jay Goss, Adrienne O'Brien, Anneka Goss, Mark O'Brien, Marjorie O'Brien, and Dave Cuthrell (Ron Priest behind the camera).

By early evening we took a break and went into Hastings for dinner. We returned to our meeting site to await anyone else that planned to venture out for the evening black lighting. George Balogh arrived, a bundle of energy and enthusiasm! We found a promising open area just off Bowens Mill Road. A large sheet was set up and as dusk set in the UV light was turned on and the bugs came flying in. George made an especially interesting recovery, a tortricid moth (*Aethes patricia* Metzler) recently described by Eric Metzler in *The Great Lakes Entomologist* 32(3): 185-197, 1999.

We all had a great time together and the collecting turned out to be quite productive for each of us. Some of the more interesting specimens recovered were:

Odonata

Coenagrionidae

Argia fumipennis violacea, A. *sedula* (a new county record), *Schnura verticalis, I. posita.*

Lestidae

Lestes vigilax

Aeshnidae

Anax junius, Aeshna umbrosa

Libellulidae

Celithemis elisa, Libellula incesta, Sympetrum obtrusum

Coleoptera

Buprestidae

Pachyscelus laevigatus, leaf miner reared from Beggar's tick, *Desmodium canadense*

Lepidoptera

Gracillariidae

Phyllocnistis insignis, reared from its mine on the composite, *Erechtites hieracifolia*.

Tortricidae

Aethes patricia, recovered at black light.

Hymenoptera

Sphecidae

Glenostictia pictifrons; this little colorful wasp has previously been reported from only Berrien and Livingston counties, in Michigan.

Karner Blue Found in Kent County, Michigan

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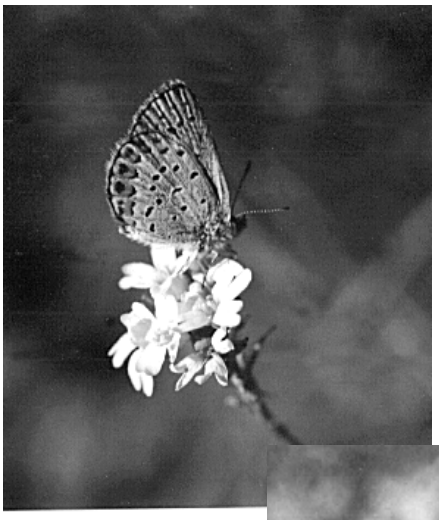
The Karner blue butterfly, *Lycaeides melissa samuelis* Nabokov (Lepidoptera: Lycaenidae), which is on the Federal list of endangered species, has previously been reported from 13 Michigan counties (Nielsen 1999). We can now report this species from Algoma Township in Kent County, north of Rockford. The Karner blue had been detected earlier in 2000 in Algoma Township by Kathy Bowler. I inspected the site on 11 July 2000 to confirm the record, and found several male Karner blue adults in an area of approximately 20 acres in size. The site was typical Karner blue habitat, i.e., a dry prairie-like area with associated grasses and forbs, including wild lupine, *Lupinus perennis*, the sole larval host plant of the Karner blue. On my first visit, the adult males were nectaring on spotted knapweed (*Centaurea maculosa*) and peppergrass (*Lepidium virginicum*). On 27 July, more females than males were observed; these adults were in fresh to worn condition and were nectaring on spotted knapweed. Voucher photographs were taken on each visit.

The property is currently privately owned by a land developer. Discussions with the owner indicated there are no immediate plans to develop the site. The site is presently surrounded by small home sites and a residential subdivision. It is hoped that the property, approximately 29 acres in all, can be purchased by some public or private entity, and managed into the future for the benefit of the Karner Blue and other prairie-associated plants and animals.

Reference

Nielsen, M.C. 1999. Michigan Butterflies and Skippers: A Field Guide and Reference. Michigan State University Extension, E. Lansing, MI, 248 pp.



Karner blue nectaring on peppergrass

Karner blue nectaring on spotted knapweed

Another "Michigan" Monarch Recovered in Mexico.

C. J. Meitner,
Monarch Butterfly Project, c/o USDA Forest Service, 8181 Highway 2, Rapid River, MI 49878. E-mail: cjmeitner@bigfoot.com.

Monarch Tag No. 314GA was recovered in El Rosario, Michoacan, Mexico on 14 January 2000. This monarch was tagged by Ginny Foreman in Marquette, MI, on 26 August 1999. The distance between Marquette and El Rosario is about 2000 miles.

Notices

Ground Beetle Identifications. Carabidae of eastern United States (agricultural, forest, wetlands) determined for a reasonable rate. Contact: Foster Purrington at Department of Entomology, The Ohio State University, 1735 Neil Avenue, Columbus, OH 43210; Phone: 614-292-5965; Email: purrington.1@osu.edu.

Meeting. The Michigan Mosquito Control Association will hold its annual meeting on 1-2 February 2001 at Holiday Inn North Campus, 3600 Plymouth Road, Ann Arbor, MI 48105, (734) 769-9800. For additional information contact: Charles Dinsmore, Midland County Mosquito Control, 2180 N Meridian Rd, Sanford, MI 48657, Phone (517) 687-5044, FAX (517) 687-7914, mosquito@midlandcounty.org. See program at: www.mimosq.org

New Book. The Butterflies and Moths (Lepidoptera) of Kentucky by Charles van Orden Covell. 220 pages, 1999. $15. Make check payable to: **LEPBOOK.** Mail to: LEPBOOK, Kentucky State Nature Preserves Commission, 801 Schenkel LN, Frankfort, KY 40601-1403.

New Book. Damselflies and Dragonflies (Odonata) of Ontario by P.M. Catling and V.R. Brownell. 198 pages, 2000. $28. Write authors at 2326 Scrivens Drive, R.R. 3, Metcalfe, Ontario K0A 2P0, Canada. Shipping $6 inside Ontario, $10 outside.

New Book. Dragonflies Through Binoculars: A Field guide to Dragonflies of North America by Sidney Dunkle. 266 pages, 2000. $29.95. You can order via the web (http://www.oup-usa.org/) or write: Oxford University Press, 2001 Evans Road, Cary, NC 27513

Southern Pine Beetle Outbreak in Belize

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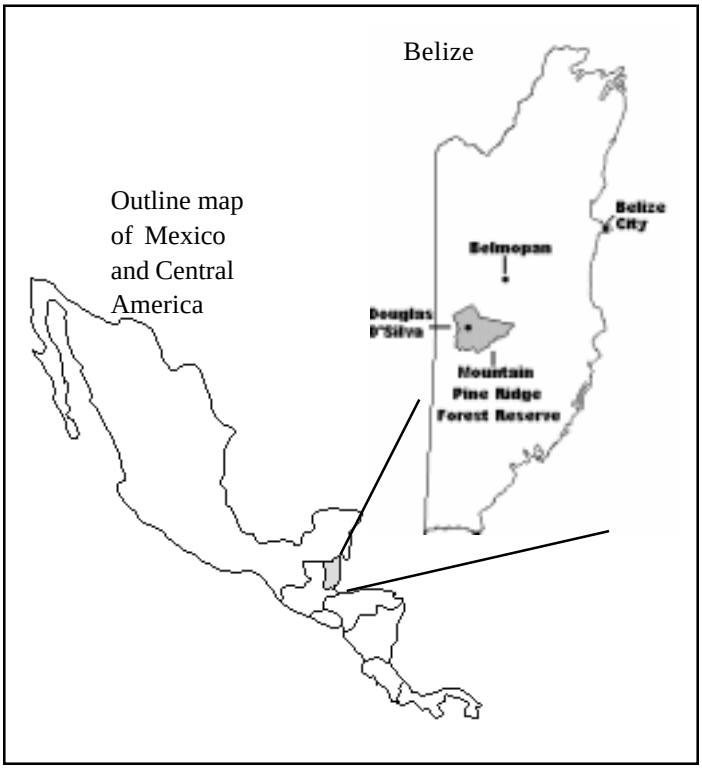
In November 2000, the first author was asked to assist in evaluating a bark beetle (Scolytidae) outbreak in the Mountain Pine Ridge Forest Reserve in western Belize. The invitation was made on behalf of FAO (Food and Agriculture Organization) and the Forest Department of Belize.

Belize is a Central American country that borders Mexico, Guatemala, and the Caribbean Sea (see Map). Belize, formerly called British Honduras from 1862 until 1973, is about 23,000 square kilometers in size, which is about the area of Massachusetts. Elevation varies from sea level to 1120 meters. The major vegetation types include mangrove swamp, broadleaf jungle, savanna, and pine forest. The Maya Mountains occur in western Belize and include an area known as the Mountain Pine Ridge Forest Reserve (see Map).

The Mountain Pine Ridge Forest Reserve (= Forest Reserve) is 41,647 ha in size, of which is 30,417 ha are in pine. Two pine species dominate the Forest Reserve: *Pinus caribaea* occupies about 80% of the pine area while *Pinus patula* subsp. *tecunumanii* (or *P. tecunumanii* according to some authorities) occupies about 20% of the area.



Claus Eckelmann (left) and Earl Green (right) indicating outbreak extent on map.

Preparing to conduct aerial survey of the outbreak

The current bark beetle outbreak in Belize was apparently triggered by a severe drought during 2000. In the area of the Forest Reserve the dry season typically occurs between February and May and the wet season from June to January. Local foresters reported that very little rain fell during the 2000 wet season, except in early October when Hurricane Keith crossed the country. Drought has triggered outbreaks of bark beetles throughout the world (Mattson and Haack 1987), including outbreaks nearby in the Dominican Republic (Haack et al. 1989) and Guatemala (Haack and Paiz-Schwartz 1997).

There are three common pine bark beetles that are native to Belize: *Dendroctonus frontalis* Zimmermann, *Ips calligraphus* (Germar), and *Ips grandicollis* (Eichhoff). These same bark beetles are native to the southern United States (US). In the US, *D. frontalis* is called the southern pine beetle, *I. calligraphus* the six-spined engraver, and *I. grandicollis* the southern pine engraver. In Belize, where temperatures are warm year-round, pine bark beetles likely complete one generation every 4 to 5 weeks.

Six multiple-funnel traps were baited with bark beetle pheromones and placed in the pine forests near Douglas D'Silva (formerly called Augustine and is the location of the Belize Forest Department's field headquarters in the Forest Reserve). Two traps were baited with frontalin to attract primarily *D. frontalis*, two with ipsdienol to attract *I. calligraphus*, and two with ipsenol to attract *I. grandicollis*. After the first day in the field, the six traps had captured 1,934 *D. frontalis*, 153 *I. grandicollis*, and six *I. calligraphus* adults. These results along with an inspection of bark beetle galleries along the trunks of several beetle-killed pine trees indicated that *D. frontalis* was the primary mortality agent involved in the outbreak. The traps will be monitored for several more weeks by Forest Department staff to assess changes in the community structure of the bark beetles and their natural enemies, especially predators such as clerid beetles.

Outbreak history. Small pockets of dead pine trees were first seen in the Forest Reserve in February 2000. However, instead of stopping to grow soon after there were a few dead trees, as has always happened in the past, these "spots" (= pockets of dead and infested trees) continued to grow and coalesce during summer and fall 2000. We conducted an aerial survey in November 2000 and noted that the central outbreak zone covered about 20,000 ha, with hundreds of new spots developing around the periphery (see photos). Some of the new infestations were on private land outside the Forest Reserve.

Southern pine beetle outbreak on mountain ridges (light colored trees along ridgetops have died and are red in color.)

This was the first outbreak of pine bark beetles reported in the history of the Forest Reserve and perhaps in all of Belize. In fact, staff within the Belize Forest Department had never seen a bark beetle outbreak prior to 2000. The Forest Reserve was officially established in 1944 and it has suffered other natural disasters such as widespread fires in 1949 and 1991, and severe windthrow as a result of Hurricane Hattie in 1961. The current bark beetle outbreak has caused more tree mortality than any of these earlier natural disasters. So far, more than 60% of the pine area in the Forest Reserve has been infested, with nearly complete mortality occurring in most stands. It is estimated that the current volume of beetle-killed pines in the Forest Reserve is 30 times greater than the entire annual demand for timber in all of Belize.

Control practices in the US. *Dendroctonus frontalis* is the most destructive bark beetle in the southern US. When spots are detected early, there is a good chance that they can be controlled (See links at: http://www.barkbeetles.org/). The two most common practices used in the US include "cut-and-leave" and "cut-and-salvage." The cut-and-leave method is best used for small spots (10 to 50 infested trees) where tree removal is not practical. This method involves felling the infested trees and a buffer of uninfested trees and leaving them in the woods. This method somehow disrupts spot growth by causing the new emerging adults to disperse further into the forest and thereby the beetles are not able to congregate in sufficient numbers to mass attack and kill individual trees. Typically, the buffer width is as wide as the average height of the trees in the spot. The cut-and-salvage method is similar to the above method with the exception that the cut trees are removed from the forest.

At times insecticides are used to protect individual high-value trees from bark beetle attack, especially in urban settings. However, chemical control is costly, subject to environmental constraints, and requires special equipment to obtain good coverage of the entire trunk.

Verbenone, which received US EPA registration in 1999, is an anti-aggregation pheromone for *D. frontalis*. In recent years, much work has been conducted on verbenone deployment strategies to protect pine trees from *D. frontalis* attack (Clarke et al. 1999). All of the above control methods are best used when infestations are detected early. To do this, aerial surveys are conducted on a 2 to 4 week schedule in the southern US.

Actions taken in Belize and future prospects. By early fall 2000, the Belize Forest Department recognized that they needed technical assistance. Mr. Vincente Mendoza, a forest entomologist from Honduras where *D. frontalis* is also a severe pest, visited the Forest Reserve in October 2000. He identified the principal pest as *D. frontalis* and advised the forestry staff on control options. The Belize Forest Department cut several 50-m-wide buffers around the active fronts of the outbreak using the cut and leave method. However, the beetles jumped the buffer and continued to attack and kill trees, probably because of the huge numbers of beetles present. When beetle populations are this high, buffers that are at least 100-m-wide may be more effective, along with active surveillance and rapid treatment of any spots that jump the buffer line.

Given that the *D. frontalis* populations are already so high and that the traditional dry season will start again in February 2001, it appears likely that the outbreak will continue. Given this outlook, the Belize Forest Department decided to focus its limited resources on salvaging beetle-killed pine trees but doing so in a manner that will also create fire lanes. With so many dead standing trees, the risk of fire will be very high in 2001. If additional emergency funds are made available to the Forest Department then they will attempt to treat some of the spots along the leading edge of the outbreak, after the salvage operation is underway. Attempts will also be made to initiate regular aerial surveys in 2001 so that bark beetle infestations can be detected early. Plans are also underway to collect pine seed to initiate a large-scale reforestation program.

Ecotourism. The Mountain Pine Ridge area of Belize is a major tourist destination. This area offers whitewater rafting, waterfalls, caves, Maya ruins, hiking, horseback riding, and much more. There are several tourist lodges on the periphery of the Forest Reserve and most of them were built among the pines. In November, *D. frontalis* was already attacking pines on the properties of two lodges. The Forest Department is working with the tourist lodges to educate them about the bark beetle and control options. Two of the lodges have already initiated control programs on their lands.

No one knows when or where the current outbreak will stop. However, staff of the Belize Forest Department are now well aware of what short-term and long-term actions they need to take to reduce the chances of future outbreaks of *D. frontalis*.

A river in the Mountain Pine Ridge area of Belize

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Haack RA, Billings RF and Richter AM. 1989. Life history parameters of bark beetles (Coleoptera: Scolytidae) attacking West Indian pine in the Dominican Republic. The Florida Entomologist 72: 591-603.

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MES Entomology Notes: Notice and Request

From time to time the Michigan Entomological Society publishes an insert in the MES Newsletter entitled "Entomology Notes." These publications have covered a variety of topics over the years. Below is a complete list of the 26 Entomology Notes that have been published so far. The MES Governing Board has decided to offer for sale all of the Entomology Notes as a single bound publication later in 2001. Therefore, if you have been thinking of preparing an Entomology Note, now is the time to do so to ensure that your entry gets included in the bound version. Submit your stories to Bob Haack (rhaack@fs.fed.us) or Therese Poland (tpoland@fs.fed.us) as soon as possible. Almost all of the MES Entomology Notes can be viewed on the Web at: http://insects.ummz.lsa.umich.edu/MES/notes/noteslist.html

No. 1 Lions and Tigers in the Sand
No. 2 Insect Galls
No. 3 Rearing and Experimenting with Isopods
No. 4 Drawings Insects Directly from a Stereo Microscope
No. 5 Collecting Aquatic Insects
No. 6 Ladybeetles
No. 7 "Sugaring" for Moths
No. 8 Clowns of the Insect World
No. 9 Collecting Giant Silkmoths
No.10 Flight of the Bumblebee
No. 11 Wanderers on the Sand — the Velvet Ants
No. 12 Headlighting for Spiders
No. 13 The Insect Collecting Tent
No. 14 Net-spinning Caddisflies
No.15 Rearing Insects Indoors
No.16 Pseudoscorpions
No.17 Investigating an Insect's Life History
No.18 Leaf Beetles — The Beetle Botanists
No.19 Flying Tigers
No.20 Acorn Insects
No.21 Earwigs in Michigan
No.22 The Honeybee Waggle Dance: An Active Participation, Role-Playing Game
No.23 Studying Butterflies in Urban Areas
No. 24 Detecting Noctuid Borers
No. 25 Reading the Lines Under Bark
No. 26 Collecting Odonata Exuviae

MICHIGAN ENTOMOLOGICAL SOCIETY
FINANCIAL STATEMENT-12 MONTHS ENDING DECEMBER 1999

RECEIPTS

Savings account interest	$548.00
Dues	4,631.00
Subscriptions, THE GREAT LAKES ENTOMOLOGIST	3,330.00
Sale of separates to authors	1,715.00
Sale of back issues, journal, newsletter, entomology notes	494.00
Subsidies (page costs)	5,073.00
NFI/MDNR-Boloria-Bog Survey Grant	2,100.00
Donations, decals, misc. income	85.00
Annual Meeting-Registration fee	1,957.00
TOTAL RECEIPTS	$19,933.00
(1998 receipts	19,997.00)

DISBURSEMENTS

Publication expenses:	
Newsletter, print, mail	$ 4,714.00
Journal, compose, print, mail	5,256.00
Postage, mailing permit fee	289.00
Misc. printing/ mailing	359.00
NFI/MDNR-Boloria-Bog Survey	1,616.00
Annual Meeting, "Breaking Diapause" meeting	3,027.00
Misc. (4-H foundation, copyrights, insurance, etc)	957.00
TOTAL DISBURSEMENTS	$16,218.00
(1998 disbursements	20,323.00)

MICHIGAN ENTOMOLOGICAL SOCIETY
STATEMENT OF FINANCIAL CONDITION
AS OF 31 DECEMBER 1999

ASSETS

CURRENT ASSETS:	
Cash on hand	$15,503.00
Accounts receivable	165.00
Prepayment/ postal fee	100.00
Inventories:	
Postage	62.00
Supplies/ equipment	300.00
Newsletters (est.)	500.00
Journals (est.)	3,500.00
TOTAL CURRENT ASSETS	$20,130.00

LIABILITIES

CURRENT LIABILITIES:	
Life memberships (20)	$8,250.00
Prepaid subscriptions	2,600.00
Prepaid dues	1,010.00
Dues in arrears	1,240.00
Subscriptions in arrears	450.00
TOTAL CURRENT LIABILITIES	$13,550.00
SURPLUS	$6,580.00

MONEYS OF MES AS OF 31 DECEMBER 1999:

Petty cash	$37.00
Checking account	8,701.00
Savings account (CD)	6,765.00
TOTAL	$15,503.00

MONEYS OF MES AS OF 31 DECEMBER 1998 ..... $11,909.00

MEMBERSHIP: As of 31 December 1999, the Society had 354 members in good standing compared to 348 on 31 December 1998.

SUBSCRIPTIONS: As of 31 December 1998 there were 199 paid subscriptions to THE GREAT LAKES ENTOMOLOGIST, compared with 198 in 1998.

Mogens C. Nielsen, Treasurer, 8 May 2000

MICHIGAN ENTOMOLOGICAL SOCIETY

DEPARTMENT OF ENTOMOLOGY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN 48824

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