2007. Proceedings of the Indiana Academy of Science 116(1):42–49

A SYNOPSIS OF INSECT ACTIVITY IN INDIANA DURING 2005

Timothy J. Gibb[1] and **Christopher M.F. Pierce**: Department of Entomology, Purdue University, West Lafayette, Indiana 47907 USA

Robert D. Waltz: Indiana Department of Natural Resources, Division of Entomology & Plant Pathology, 402 West Washington Street, Room W290, Indianapolis, Indiana 46204-2739 USA

ABSTRACT. Most agricultural insect populations remained unchanged during 2005 when compared to previous years. The first generation European corn borer population was negligible, but numbers of the second generation were higher than expected. Populations of western corn rootworm variants declined when compared to the previous year. Soybean aphid feeding exceeded damage thresholds throughout many parts of the state during 2005. Springtime honey production was high considering the varroa mite infestations of the winter months. Summer heat following the August honey harvest stressed the survival of many hives into the fall and winter. Indiana experienced a number of exotic invasive insects of regulatory concern in 2005. Granulate ambrosia beetles and common pine shoot beetles expanded their ranges in Indiana during 2005. Emerald ash borers were found for the first time in LaGrange, Steuben, Adams, and Randolph counties. Overall, the insect damage to fruits and vegetables was normal or slightly below normal throughout most of the state. The number of complaints resulting from carpenter bee activity around homes was higher, but the number of swarming termite complaints was lower than in most years. Numbers of mosquito and tick reports were low. Scale insects in ornamental plantings were generally more common during 2005, as were the common web-making caterpillars (fall webworm, eastern tent caterpillar, and mimosa webworm). Inquiries concerning wood-boring beetles rose again during 2005, but it was difficult to determine whether this was due to increased beetle activity or due to recent media campaigns regarding the emerald ash borer. Scavenger and moisture-related insects in stored grain were common during 2005. For the second year in a row, reports of damage due to turfgrass insect pests were uncommonly few.

Keywords: Granulate ambrosia beetle, common pine shoot beetle, emerald ash borer, insect activity, ornamental pests

A summary of arthropod activity in Indiana during 2005 was compiled based on informal surveys and anecdotal reports by professional entomologists representing several areas of expertise throughout the state. This synopsis has a history of publication in the *Proceedings* of the Indiana Academy of Sciences as early as the 1970s (Meyer 1984) and provides a valuable source for determining the fluctuations of insect populations. General descriptions of insect activity are compared and contrasted with previous years to document insect population trends within the year as well as over multiple years and to determine weather/insect relationship (Gibb & Bledsoe 1990; Gibb 1992). In this study, we report on activity of exotic pest invasions, agriculturally economic pests, nuisance and health-related pests and other urban structural and landscape arthropods.

General weather overview.—In 2005, for the second year in a row, Indiana experienced a comparatively mild winter, posting a stretch of unusually warm temperatures during late winter in most locations. Across the state, 2–8 times the average amount of wintertime precipitation was received. A cold snap returned in March; but even so, accumulated growing degree-days by springtime were higher than normal (National Agricultural Statistics Service 2005). Spring suddenly appeared in early April with rapidly warming air and soil temperatures resulting in significant agricultural activity (planting crops), particularly in northern counties. The spring-like conditions were replaced by cold and damp weather during the last two weeks of the month and into the first few days of May. Scattered snow showers were common across northern Indiana on 2

[1] To whom all correspondence should be addressed.

May. May warmed slowly and agricultural crops struggled to emerge. Corn replanting was common in northern counties. The remainder of the growing season tended to be dry and warm with the temperature exceeding 32 °C on many days. Precipitation was scattered, and some areas received sufficient rain while other areas were exceptionally dry. Above-normal temperatures extended into the fall of 2005, breaking several records in September, October and November. The first light frosts occurred statewide during the last few days of October and the first days of November. Fall vegetation was killed as the first hard freeze of the season occurred on 16–17 November. Bitter cold and snow in northern counties came early and suddenly in December and persisted until the last week of the month.

AGRICULTURAL INSECTS

Field crop insects.—First stage western corn rootworm larvae were initially detected in Tippecanoe County in corn roots on 31 May 2005. It is probable that egg hatch began 2–3 days earlier in central Indiana and a week earlier in southern counties. Corn rootworm adults were first detected in emergence traps in northwest Indiana between 17–24 June. An annual statewide survey conducted in late July and early August indicated that numbers of the adult variant western corn rootworm beetle (*Diabrotica virgifera virgifera* LeConte) had generally declined from populations seen in 2004 (Pest & Crop Newsletter 2005).

Low incidence of first generation European corn borer (*Ostrinia nubilalis* Hübner) infestations followed a pattern that has persisted for the past few years (Pierce et al. 2005). However, second generation larvae were more abundant, and damage was slightly more widespread than has been noted in recent years. The cyclic nature of the soybean aphid (*Aphis glycines* Matsumura) populations (Pest & Crop Newsletter 2005) was once again apparent. Economic damage thresholds by soybean aphids were exceeded in 2005 after very minimal damage in 2004 (Pierce et al. 2005). As a result, 70% of soybeans in northeast Indiana received at least one insecticide treatment, compared to 10% the year previous year. Although as much as 50% of the soybeans in northwest Indiana was treated, many fields probably did not reach economic injury levels.

A statewide soybean survey (Pest & Crop Newsletter 2005) conducted during mid-summer indicated that second generation bean leaf beetle (*Certoma trifurcata* (Forster)) continued its trend of generally low incidence. Highest populations were detected in west central and northwest counties. However, these populations were only a small fraction of the size of those observed during 1999 in northeast and east central counties.

Japanese beetle (*Popillia japonica* Newman) populations in field crops continued a downward trend in 2005, representing roughly one-quarter of the numbers observed in the west central and southeastern counties during 2000 (Pest & Crop Newsletter 2005). Greatest 2005 populations were found in central and east central counties.

Honey bees.—Varroa mite (*Varroa destructor* Anderson & Trueman) was found to be widespread across the state, resulting in the loss of an estimated 50% of honey bee hives during the winter of 2004/05. This was followed by an unexpectedly large honey yield in the late spring of 2005 in many areas, and many Indiana beekeepers reported record honey harvests. The biggest problem for most Indiana beekeepers was a lack of rain in the late summer, leading to the need to artificially feed the bees syrup to avoid starvation. Some beekeepers harvested the honey at the beginning of August, just before weather conditions became most severe. This resulted in a lack of food reserves in the hive during a time when nectar sources were also in limited supply due to the weather. The resulting bee malnutrition increased susceptibility to mite infestations throughout the state.

EXOTIC INVASIVE INSECTS

Old world bollworm.—Old world bollworm (*Helicoverpa armigera* (Hübner)) surveys were initiated in 2005 under the Indiana Cooperative Agricultural Pest Survey (CAPS) program (Old World Bollworm Survey 2005). This bollworm is a highly polyphagous pest of many economically significant crops in Africa, Asia, Australia, and Europe. It feeds on over 180 cultivated and wild species, including several important Indiana crops, such as corn, soybeans, alfalfa, and tomatoes. About 5,900,000 acres (2,387,697 ha) of corn,

5,800,000 million acres (2,347,227 ha) of soybeans, 62,000 acres (25,091 ha) of alfalfa, and 7000 acres (2832 ha) of tomatoes are grown in Indiana each season (National Agricultural Statistics Service 2005). Furthermore, approximately 49% of the continental U.S. provides suitable habitat for this pest (Old World Bollworm Survey 2005). No specimens were collected during the survey in 2005, but surveys will continue during 2006.

Emerald ash borer.—In 2005, trap trees were placed on a 3.25 km grid in 15 counties in northern Indiana to detect populations of emerald ash borer, *Agrilus planipennis* (Fairmaire). Counties surveyed included Lake, Porter, LaPorte, St. Joseph, Elkhart, LaGrange, Nobel, Whitley, Steuben, DeKalb, Allen, Randolph, northern Starke, northern Marshall, and northern Kosciusko. There were 1300 trap trees designated in April and set during May through mid-June. Inspection of the trap trees began the third week in September and ended on 31 October 2005. Of the 1300 proposed trap trees, 1056 trees were set and examined. The first adult emerald ash borer of the season was found emerging from a log in Shipshewana (LaGrange County) on 11 May 2005. This emergence came about a week and a half earlier than in 2004 (Pierce et al. 2005). A visual survey for emerald ash borer, including 860 campgrounds, 386 nurseries (grower), 807 nurseries (retailers), 186 saw mills, and 119 organic dumps was conducted in 2005.

LaGrange County: An emerald ash borer-positive site was reported in Clay Township in LaGrange County, approximately 2 km north of the Clearspring Township line. A new positive site was discovered 1.5 km north of the town of Scott, north of the Pigeon River. The positive trap tree was heavily infested. There are also standing dead ash trees in the area. This site is in Van Buren Township, approximately 6.5 km from the Shipshewana regulatory cuts last year, placing it solidly within the Pigeon River riparian corridor.

Steuben County: Emerald ash borer was detected in a trap tree in Steuben County, near the southeast corner of Lake George in Steuben County, 0.4 km south of the Michigan state line.

Adams County: Emerald ash borer was confirmed at a location in Adams County on 12 October 2005. As a result of the confirmed discovery, the DNR quarantined Root and Washington townships. The Decatur city forester reported finding larvae and an adult on an ash tree. Identifications were confirmed by the U. S. Department of Agriculture. The Decatur site is approximately 14.5 km west of the Ohio border and 32 km south of Fort Wayne. At the Decatur site, DNR personnel conducted a delimiting survey around the new find. To date, live larvae have been removed from 19 of the 77 trees involved in the delimiting survey.

Randolph County: The emerald ash borer was confirmed at a location in Randolph County on 11 November 2005 resulting in the quarantine of White River Township. The U.S. Department of Agriculture confirmed that larvae have been discovered in about seven trees that follow a small drainage ditch about one kilometer from a site where Michigan nursery stock was introduced several years ago, although another source in the area is possible. The site includes the town of Winchester. Indiana DNR personnel and others conducted a delimiting survey of the area around the new find. To date, of the 40 trap trees in Randolph County, larvae have been found in 10 trees.

Gypsy moth.—The 2005 Cooperative Gypsy Moth Survey completed its 18th year of statewide surveys for the European gypsy moth, *Lymantria dispar* Linnaeus. These surveys are part of the Slow-The-Spread (STS) Program and incorporate the STS protocol for their design and operations. Under this protocol, Indiana is divided into three zones: the STS Evaluation Zone, the STS Action Zone, and the State Area. The survey design uses fixed 3 km, fixed 2 km, and rotating 3 km grids, respectively, for the three zones (Slow-The-Spread of the Gypsy Moth Project 2005). Across all zones, the survey set 13,231 detection and 3127 intensive traps, all referenced by GPS. The survey detected 18,222 moths from 44 counties, ranging from 1–4323 moths per county. This is a 2× increase from the 2004 total moth catch of 9034 and falls between the catch totals for 2002 and 2003 (15,569 & 23,090, respectively) (European Gypsy Moth in Indiana 2005).

The results of the 2005 survey found that the majority of the moth catch came in the Action Zone. The Evaluation Zone, which includes the quarantined counties of Steuben,

LaGrange, Elkhart, Noble, Allen, and DeKalb, detected 32.8% of the moths (5980 of 18,222). The northern third of the state falls in the Action Zone, which is below the Evaluation Zone under STS protocol. The Action Zone detected 51.0% of the moth catch (9290 of 18,222). The majority of the moth catch in this zone was located in the eastern part of the state adjacent to the Evaluation Zone. The state survey detected 16.2% of the moths (2953 of 18,222). The Scott County survey included an intensive delimit around a known population which inflated the overall statewide moth capture totals. All positive traps in the state zone are delimited the following year.

Treatments to eradicate and to Slow-The-Spread of gypsy moth were conducted on 33 sites in 11 counties during 2005. Fifteen sites, totaling 3292 ha were treated with *Btk* (*Bacillus thuringiensis kurstaki*) at 12 BIU/ha/application. Eleven sites were treated with two applications of *Btk* (2566 ha). Four sites treated with one *Btk* application (726 ha). Nine sites were ground treated with one application of *Btk* at 30 BIUs. Five sites totaling 1762 ha and four sites totaling 4206 ha received one application of pheromone flakes for mating disruption at 6 and 15 gm, respectively, in June. Delimit surveys to monitor treatment success found that one *Btk* site failed (Arcola) and three had only partial success (Bremen South, Cobb's Corner and Leesburg). This was most likely due to small block sizes and timing of treatments (ground treatments were performed later in the season). These sites have been reevaluated and were treated in 2006.

The aerial survey of the five northeastern counties in the Evaluation Zone and the other counties with treatment sites in the Action Zone did not detect defoliation. Some defoliation was observed from the ground in Scott County, where a sizable population of moths was found. This site had an eradication treatment in 2006.

The moth lines projected for 2005 have remained fairly static across the state with no significant change from the moth lines of 2003 and 2004. The survey and program to manage gypsy moth in Indiana continues to compress the distance between moth lines, thus slowing the spread of gypsy moth in Indiana. Since the 1972 survey, 268,994 moths have been caught in 90 of Indiana's 92 counties. No new county records were established in 2005.

In 2005, USDA APHIS PPQ officers continued the Indiana Asian Gypsy Moth survey program. The survey provides early detection of Asian gypsy moth (*Lymantria dispar dispar* (Linnaeus)) introductions resulting from the international movement of ships and cargo. Ten milk carton traps were placed in Porter County at the Port of Indiana (Burns Harbor) on 30 June 2005 and checked on a bi-weekly basis. Traps were removed on 9 September 2005. No specimens were detected during the course of this survey.

The Asian gypsy moth has more than 250 known host plants but prefers oak. Other hosts include larch, poplar, alder, willow, and some evergreens. The Asian gypsy moth is of great concern due to its potential for rapid establishment and spread. The pest can cause severe damage to trees over a large area; heavy infestations may result in repeated and complete defoliation of trees. Defoliation can kill trees directly or reduce vigor, leading to secondary pest outbreaks, also resulting in tree death. The ability of Asian gypsy moth females to fly long distances (up to 40 km) makes it probable that the Asian gypsy moth could quickly infest and spread throughout the United States. As well as having direct economic effects on commercial forestry and horticulture, Asian gypsy moth has the potential to reduce the aesthetic, recreational, and biodiversity values of park rangelands and wilderness areas.

Granulate ambrosia beetle.—In 2005, granulate ambrosia beetles (a.k.a. Asian ambrosia beetle) (*Xylosandrus crassiusculus* (Motschulsky)), were collected in 25 additional counties during Indiana Department of Natural Resources (IDNR) nursery inspections and in Hot Zone survey traps in Indiana. Those counties are: Brown, Clark, Clay, Dubois, Fountain, Henry, Jennings, Lawrence, Marion, Montgomery, Parke, Perry, Porter, Posey, Putnam, Randolph, Spencer, Sullivan, Tippecanoe, Vanderburgh, Vigo, Wabash, Warren, Wayne, and White. In 2004, Asian ambrosia beetles occurred in six counties in Indiana: Bartholomew, Boone, Hendricks, Jackson, Johnson, and Monroe.

The granulate ambrosia beetle is capable of breeding in a wide variety of hosts. Known hosts in the U.S. include azalea, Bradford pear, Chinese elm, dogwood, fig, golden rain

tree, magnolia, ornamental cherry, peach, pecan, persimmon, plum, redbud, red maple, Shumard oak, stryax, sweetgum, and sweet potato. This beetle, a pest of woody ornamental, fruit, and nut trees throughout Indiana, can cause significant damage in nursery and orchard settings. It spreads by natural distribution and shipment of contaminated plant material. No regulatory action has been taken for this pest. Females bore into plant trunks and inoculate the tunnel with fungal spores. The females then produce a brood. The larvae and the females feed on the fungus, not the host. Heavily-infested plants usually die from the inoculated fungus or a secondary disease.

Common pine shoot beetle.—Common pine shoot beetle (*Tomicus piniperda* (Linnaeus)) was first reported in the U.S. in 1992. These beetles require live or very recently killed pine trees in order to feed and reproduce. They do not harm sawed timber. The beetles can kill already stressed trees and may weaken and kill healthy trees when populations get very high. On 14 January 2005, USDA APHIS PPQ officers set 80 delimiting traps for common pine shoot beetle in 10 southern counties in Indiana (eight traps per county). Lindgren funnel traps, baited with alpha-pinene were used. Surveyed counties included: Clay, Dearborn, Greene, Jackson, Jefferson, Lawrence, Ohio, Scott, Sullivan, and Switzerland. The traps were placed in locations with high concentrations of potential host plants and checked on a bi-weekly basis. Dearborn County was regulated for common pine shoot beetle due to the confirmed find, on 20 May, of a single common pine shoot beetle.

Bark and wood-boring beetles.—A "Hot Zone" survey between the USDA APHIS PPQ and the Indiana CAPS program targeted invasive Solid Wood Packing Material (SWPM) pests at 51 sites continued in Indiana in 2005 (Solid Wood Packing Material Survey 2005). No pests targeted in the SWPM survey were collected even though traps were set at sites with high risk for the introduction of exotic invasive bark, jewel, and wood-boring beetles. Twenty exotic invasive bark, jewel, and wood-boring beetles that threaten Indiana natural resources were targeted in this survey which will continue in 2006 (Table 1).

Table 1.—List of target bark, jewel, and wood-boring beetles surveyed for in the "Hot Zone" survey in 2005.

Scientific Name:	Common Name:
Agrilus planipennis Fairmaire	Emerald ash borer
Anoplophora chinensis (Forster)	Citrus longhorned beetle
Anolplophora glabripennis (Motschulsky)	Asian longhorned beetle
Callidiellum rufipenne (Motschulsky)	Small Japanese cedar longhorned beetle
Chlorophorus annularis Fabricius	Bamboo/Tiger bamboo longhorned beetle
Hesperophanes (Trichoferus) campestris (Faldermann)	Chinese longhorned beetle
Hylurgops (Hylurgus) palliatus Gyllenhal	Exotic bark beetle
Hylurgus ligniperda (Fabricius)	Golden-haired bark beetle
Ips sexdentatus (Boerner)	Six-spined engraver beetle
Ips typographus (Linneaus)	European spruce bark beetle
Monochamus alternatus Hope	Japanese pine sawyer beetle
Orthotomicus erosus (Wollaston)	Mediterranean pine engraver beetle
Pityogenes chalcographus (Linnaeus)	Six-toothed spruce engraver
Tetropium castaneum Linnaeus	Black spruce beetle
Tetropium fuscum (Fabricius)	Brown spruce longhorned beetle
Tomicus minor (Hartig)	Lesser pine shoot beetle
Tomicus piniperda (Linnaeus)	Common pine shoot beetle
Trypodendron domesticum (Linnaeus)	European hardwood ambrosia beetle
Xyleborus spp.	Exotic bark beetles
Xylotrechus spp.	Exotic longhorned beetles

The purpose of this survey, conducted at selected businesses and warehouses in Indiana that receive solid wood packing material, is to document pest movement of invasive bark and wood-boring beetles into Indiana. This activity is implemented in warehouses in conjunction with USDA APHIS PPQ officers. In Indiana, over 4.3 million acres (1.7 million ha) of high-quality hardwood forests support an industry which employs 47,000 Hoosiers. These forests are at risk of attack by exotic

invasive bark and wood-boring beetles (Solid Wood Packing Material Survey 2005). The Indiana CAPS program in conjunction with USDA APHIS PPQ seeks to conduct a cooperative agricultural pest survey program that is expected to result in the detection or absence of exotic invasive bark and wood-boring beetles in Indiana via solid wood packing material. Early detection and outreach education are the goals of this survey (Solid Wood Packing Material Survey 2005).

In conjunction with Indiana USDA APHIS PPQ Officers and the Indiana CAPS program, 50 sites were selected for survey following guidelines from the Exotic Wood Borer Bark Beetle Field manual 2004 (Exotic Wood Borer Bark Beetle National Survey Field Manual 2004). The Indiana CAPS program was responsible for conducting survey at seven sites in central Indiana. Three Lindgren funnel traps were placed and serviced in each of the seven selected sites. Traps contained one of the following lures: UHR ethanol, UHR ethanol/alpha-pinene, and Ips lure. Traps were placed in mid-March and serviced bi-weekly until mid-October (approximately 30 sampling dates). Visual surveys for invasive wood-boring beetles and metallic wood-boring beetles occurred bi-weekly.

HOME, YARD, AND GARDEN INSECTS

Fruit and vegetable insects.—Overall, insect and mite activity in fruits and vegetables was normal or slightly below normal throughout most of the state during 2005 (Vegetable Crops Hotline 2005). No notable outbreaks were reported. Even though the springtime temperatures were higher than normal and the development of insects and plants was accelerated, no significant mite outbreaks occurred. Codling moth (*Cydia pomonella* (Linnaeus)) numbers were lower than normal. The number of Japanese beetles in fruits varied with geographical location. Asian lady beetles (*Harmonia axyridis* (Pallas)) in grapes and apples were higher compared to 2004 (Pierce et al. 2005) but not as high as they were during 2003.

First generation corn borer (*Ostrinia nubilalis* Hübner) populations were an insignificant threat to vegetables as well as row crops. *Bt* corn may be the cause of this decline. The only vegetable pest that caused real concern during 2005 was the corn earworm (*Heliothis zea* (Boddie)). This pest occurred in high numbers on late sweet corn and tomatoes (tomato fruitworm) possibly as a result of a storm condition that stalled over the state during the dispersal period of the pest. The development of insecticidal resistance also may be contributing to the build-up of this pest.

Household insects.—Major changes in control techniques and the availability of new control options, primarily termite baiting systems, have resulted in many general termite calls to the department in recent years. In the year 2005, numbers of questions regarding termite control remained consistent with the past few years even though many professional pest managers reported that their termite control business was down this year. Eastern subterranean termite (*Reticulitermes flavipes* (Kollar)) swarming behavior observed by homeowners is the most common trigger for a call to professional pest control. Unseasonably warm temperatures at the end of winter in 2005 and into the early spring may have initiated an early swarming behavior that was quickly interrupted by the onset of very cool temperatures again. Termite experts at Purdue University have noted that the termite-swarming season tends to be more persistent (prolonged) when consistently warm temperatures follow cold temperatures during February and March.

Typically, powder-post bostrichid beetles (Bostrichidae) tend to be an under-reported pest group. Most Plant & Pest Diagnostic Laboratory (P&PDL) inquiries about bostrichids come from log home owners or people using barn siding in homes. These beetles and their damage often go undetected for long periods of time in crawl spaces, basements, or attics, but are readily seen by log home owners and people using old wood or ornamental "pieces" in their homes. Weather tends to have less of an effect on these insects than it does on swarming or social insects. The number of complaints about powder-post beetles in newly constructed homes increased in 2005. It appears that the hardwood trim, baseboards, and cabinetry have been infested prior to installation.

Carpenter ants (especially *Campanotus pennsylvanicus* (De Geer)) and carpenter bees (*Xylocopa virginica* (Linnaeus)) have been reported more frequently because more and more neighborhoods have maturing trees and

structural timbers that attract these insects and serve as nesting habitats for them. Calls regarding these pests increased again in 2005 following a trend of slightly increasing complaints over the last few years.

Landscape and ornamental insects.—Reports from the Plant & Pest Diagnostic Laboratory (P&PDL) concerning ornamental and public health-related pest submissions indicated that overall pest activity was average with a few exceptions (P&PDL newsletter 2005). The numbers of armored and soft scales, including the euonymous scale, (*Unaspis euonymi* (Comstock)), were generally elevated during 2005. Japanese beetle emerged during the second week of June in central Indiana, approximately one week earlier than usual. Adult feeding damage seemed to be higher when compared to the previous year.

Elm flea weevils (*Orchestes alni* (Linnaeus)) were first detected in the U.S. during 2000 and first found in Indiana during 2003. These insects mine the leaves of elm trees and seem to be occupying the niche of the elm leaf beetles that were a serious problem a few years ago but that have nearly disappeared in recent years.

Reports of mimosa webworm (*Homadaula anisocentra* Meyrick) fall webworm, (*Hyphantria cunea* (Drury) and eastern tent caterpillar (*Malacosoma americanum* Fabricius) were more frequent during 2005. Evergreen bagworms (*Thyridopteryx ephemeraeformis* (Haworth) continued to be quite prevalent around the state during 2005, as they have been during the last 2–3 years.

Spider mite (Tetranychidae) infestations on ornamental plants remained higher than most years but not as high as in 2004 (Pierce et al. 2005).

Numbers of bark beetles and wood-borers generally increased during 2005 over last year. Dead or stressed trees from the prior year's drought may be providing unlimited food and habitat resources to these insects. The news media blitz regarding exotic wood borers and their potential damage has also undoubtedly caused an increase in the number of bark beetles and wood borer samples submitted to the P&PDL, as well as an increase in questions to the department of entomology.

Public health pests.—The rainfall pattern and limited amount of rain during summer of 2005 in Indiana resulted in relatively few nuisance mosquitoes and vector mosquitoes. Indiana specialists reported fewer habitats that supported development of larvae of floodwater mosquitoes during 2005 when compared to previous years. In most cases, streams did not overflow and rain water that collected in soil depressions dried up before eggs of *Aedes* and *Psorophora* mosquitoes hatched. Survey of habitats that supported the development of *Culex* mosquito larvae in recent years either were dry or didn't have larvae throughout most of the summer. The number of West Nile virus incidences likewise decreased again in Indiana during 2005. Collections of both adult nuisance and vector mosquitoes were relatively very low throughout the summer. The number of nuisance mosquito complaints to the Department was down this year, which validated this finding. The numbers of tick-related complaints were also comparatively low during 2005.

Stored food and grain insects.—An increase in the number of complaints involving scavenger insects such as larder beetles, (*Dermestes lardarius* Linnaeus), and other carpet beetles (*Dermestes* sp.) was noted in 2005. Some infestations may relate to unsanitary conditions, but others seem to stem from an increase of shipments containing infested materials. Moisture-related insects such as psocids (Psocidae), springtails (*Orchesella* sp.), foreign grain beetles (*Ahasverus advena* (Waltl)), and flat grain beetles (*Chryptolestes pusillus* (Schonherr)) were more common in 2005.

Turfgrass insects.—Turfgrass insects were infrequently reported as pests during 2005 (Turf Tips 2005). Japanese beetle populations were spotty in urban areas. Some areas reported locally heavy populations and damage to ornamental plants due to the adult beetle feeding, while others reported a conspicuous lack of Japanese beetles in 2005. Grub populations generally followed this spotty distribution as well. Some turfgrass areas in the state were damaged by grubs. Many were treated preventively.

Billbugs (*Sphenophorus parvulus* Gyllenhal) continued to be common during survey work in turfgrass, but were under-reported as a turfgrass pest.

ACKNOWLEDGMENTS

We thank the following for their help and effort in producing this report: Indiana De-

partment of Natural Resources (IDNR) Division of Entomology and Plant Pathology, Division of Forestry, and Division of Nature Preserves, Purdue University Extension Specialists and Educators, Purdue University Extension Entomology, Purdue University Plant & Pest Diagnostic Laboratory, and the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ).

LITERATURE CITED

European gypsy moth in Indiana. 2005. Indiana Department of Natural Resources Division of Entomology and Plant Pathology: Invasive Species (Gypsy Moth). http://www.in.gov/dnr/entomolo/gypsymoth/index.htm

Exotic Wood Borer Bark Beetle National Survey Field Manual. 2004. United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine. 113 pp.

Gibb, T.J. & L.W. Bledsoe. 1990. Population and behavior modifications of selected arthropod pests in Indiana during the 1988 drought. Proceedings of the Indiana Academy of Science 98: 201–206.

Gibb, T.J. 1992. Arthropod activity during the drought of 1991 in Indiana. Proceedings of the Indiana Academy of Science 101:56–62.

Meyer, R.A. 1984. Insects and other arthropods of economic importance in Indiana in 1983. Proceedings of the Indiana Academy of Science 92: 225–229.

National Agricultural Statistics Service. 2005. Indiana Agricultural Statistics: Indiana Publications. http://www.nass.usda.gov/in/

Old World Bollworm Survey. 2005. Indiana Cooperative Agricultural Pest Survey (CAPS) Program: 2005 Surveys and Reports. http://www.entm.purdue.edu/CAPS/

Pest & Crop Newsletter. 2005. A newsletter for agriculture producers. Purdue University Cooperative Extension Service. http://www.entm.purdue.edu/Entomology/ext/targets/p&c/index2006.htm

Pierce, C.M.F., T.J. Gibb & R.D. Waltz. 2005. Insects and other arthropods of economic importance in Indiana in 2004. Proceedings of the Indiana Academy of Science 114:105–110.

Purdue Plant & Pest Diagnostic Laboratory. 2005. Electronic newsletters. 2005 http://www.ppdl.purdue.edu/PPDL/weeklypics/8-21-06.html http://www.ppdl.purdue.edu/PPDL/hot06/8-16.html

Slow-The-Spread of the Gypsy Moth Project. 2005. STS Operations Portal. http://www.gmsts.org/operations/

Solid Wood Packing Material Survey. 2005. Indiana Cooperative Agricultural Pest Survey (CAPS) Program: 2005 Surveys and Reports. http://www.entm.purdue.edu/CAPS/

Turf Tips. 2005. An electronic newsletter to turfgrass producers. http://www.agry.purdue.edu/turf/tips/index.html

Vegetable Crops Hotline. 2005. A newsletter for commercial vegetable growers. Purdue University Cooperative Extension Service. http://www.entm.purdue.edu/Entomology/Vegisite/commercial/hotline2006.html

Manuscript received 6 September 2006, revised 15 February 2007.