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INSECTS AND OTHER ARTHROPODS OF ECONOMIC IMPORTANCE IN INDIANA IN 2004

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ABSTRACT. Indiana experienced a number of exotic invasive insects of regulatory concern in 2004. Among the species are emerald ash borer, European Sirex woodwasp, Asian ambrosia beetle, two species of longhorned beetles from China, banded elm bark beetle, and *Cydella* (Tortricidae) and *Chlorophorus* (Cerambycidae) from Indian pine cones. Pine shoot beetles were discovered in five more counties in 2004. The majority of Indiana's corn crop was planted and harvested earlier than usual in 2004. The western corn rootworm beetle variant pushed its way southward during 2004; and, as a result, for the first time poses moderate risk to first year corn in central and south Indiana counties in 2005. Generally, reports of fruit and vegetable-damaging insects were slightly lower than normal in 2004. Apple pests, including codling moth and spotted tentiform leafminer, were conspicuously absent throughout much of the state. The insect event of the year in 2004 was the mass emergence of Brood X, the 17-year periodical cicada, *Magicicada* spp., in much of the central and southern parts of the state. Insects in lawns and golf courses were less of a problem in 2004 than usual. Japanese beetles emerged earlier than normal in 2004; and some high, localized populations existed.

Keywords: Periodical cicada, emerald ash borer, exotic invasive insects

GENERAL WEATHER OVERVIEW

Indiana experienced a comparatively mild winter in 2004. Accumulated growing degree days were higher than normal in late winter and early spring than in prior years (Indiana Agricultural Statistics 2004). Unusually wet weather conditions developed in early-to-mid spring of 2004 and persisted across most of the state causing localized flooding in many areas. Precipitation continued throughout most of the growing season (spring and summer) and then ceased in early September for 4–5 weeks, allowing soils to dry out.

AGRICULTURAL INSECTS

Bean leaf beetle (*Certoma trifurcata* (Forster)) damage on soybeans was isolated and localized. Soybean leaf aphid (*Aphis glycines* Matsumura) populations were much lower in 2004 than the previous year. Lack of synchrony between the development of the aphid and the plant, as well as the absence of south winds during the migratory phase of the aphid resulted in minimal new movement in 2004 as compared with 2003. Asian lady beetle (*Harmonia axyridis* (Pallas)) populations in soybean fields were low during 2004 probably due, in large part, to the decreased abundance of soybean aphids. Lack of aphids also mitigated the nuisance problems with syrphid flies (Diptera: Syrphidae) that Indiana residents experienced in 2003.

The majority of Indiana's corn crop was planted and harvested earlier than usual in 2004. Corn earworm (*Heliothis zea* (Boddie)) normally a late season pest, did not develop during 2004. The western corn rootworm beetle variant (*Diabrotica virgifera virgifera* LeConte) pushed its way southward during 2004 and, as a result, for the first time poses moderate risk to first year corn in central and south Indiana counties in 2005. European corn borer (*Ostrinia nubilalis* Hübner) numbers have been falling over the last three years, possibly due to wet spring seasons. Estimates based on stalk splitting in late 2004 indicate that populations of European corn borer are the lowest recorded in many years. A lower

population of corn borers went into the winter of 2004, suggesting a lower threat again in 2005 (although the ultimate 2005 population may be more dependent upon spring and early summer growing conditions than on the size of the population going into winter). True armyworm (*Pseudaletia unipuncta* Haworth) was found in an isolated area on early field corn, indicating a probability of a single early heavy flight event from the southern states. However, armyworm infestations were not as severe or as widespread as was the case in 2001.

In alfalfa, the alfalfa weevil (*Hypera postica* (Gyllenhal)) population and damage were moderate to light (similar to 2003). Potato leafhopper (*Empoasca fabae* (Harris)) populations were high in 2003 and started out heavy in 2004, but cool rains and possibly fungal infections hampered the buildup of this pest. Populations continued to decline as the year progressed.

Pest activity that is new and unusual includes corn leaf blotch miner (*Agromyza parvicorreis* Loew) in isolated areas. South-central Indiana may be experiencing higher wireworm (Coleoptera: Elateridae) problems possibly due to the changing farming practices of that area. The use of silage from winter wheat and a second crop of corn (both cut green) leaves the soil full of decomposing grass roots throughout the entire growing season. This practice provides abundant food for wireworm larvae.

BEEKEEPING

In general, Indiana experienced excellent weather for beekeeping in 2004. There was sufficient rain throughout the season (until September), but there was also plenty of sunny weather for bees to forage on flowers. Most beekeepers removed surplus honey in August, but the bees were able to produce more honey for overwintering. A lack of rain from September to early October caused the fall flowers (primarily goldenrod and aster) to quit producing nectar slightly earlier than normal. As a result, some Indiana hives were light on honey stores in the fall due to the September drought-like conditions; but the situation is not as bad as it was during 2003. Varroa mites (*Varroa destructor* Anderson & Trueman) and tracheal mites (*Acarapis woodi* (Rennie)) are a problem throughout the state. Small hive beetle was found to be locally established in LaPorte County.

EXOTIC INVASIVE INSECTS OF REGULATORY CONCERN IN AGRICULTURE

Old world bollworm, *Helicoverpa armigera* (Hübner), surveys were initiated in 2004 under the Indiana Cooperative Agricultural Pest Survey (CAPS) program. *Helicoverpa armigera* is a highly polyphagous pest of many economically significant crops in Africa, Asia, Australia, and Europe. It feeds on over 180 wild and cultivated species, including corn and soybean. Approximately 49% of the continental U.S. provides suitable habitats. *Helicoverpa armigera* is not known to occur in the United States. No specimens were collected, and surveys will continue in 2005.

EXOTIC INVASIVE INSECTS OF REGULATORY CONCERN IN NATURAL RESOURCES

Emerald ash borer (*Agrilus planipennis* (Fairmaire)) was the most significant invasive insect during 2004. Both LaGrange County and Steuben County have townships under quarantine due to this pest. On 19 April 2004, IDNR and USDA APHIS placed Jellystone Campground, Fremont (Steuben County: Jamestown Township) under quarantine. On 26 May 2004, IDNR and USDA APHIS placed LaGrange County: Clay Township under quarantine. On 22 August 2004, IDNR and USDA APHIS placed part of LaGrange County (Van Buren Township) under quarantine. In the spring of 2004, Winchester (Randolph County) received nursery stock containing a dead adult emerald ash borer. It was ruled as a regulatory interception, and surveys were initiated for detection of emerald ash borer. On 17 November 2004, IDNR and USDA APHIS placed Manapogo Campground (Steuben County: Millgrove Township) under quarantine.

Emerald ash borer has been introduced into Indiana by three different pathways. In Steuben County, emerald ash borer was most likely introduced in firewood from Michigan. In LaGrange County, emerald ash borer was most likely introduced by infested ash trees that were brought into a local lumber mill. In Randolph County, emerald ash borer was introduced into the county from infested nursery

stock. An estimated 40,000 ash trees will be removed in the quarantined townships of LaGrange County and Steuben County by the spring of 2005. Six percent of all forest trees in Indiana are ash, a total about 150 million ash trees. In addition, urban areas in Indiana are comprised of up to 40% ash, where they have been heavily used for street trees, in parks, and in both public and home landscaping. IDNR, USDA APHIS, Purdue University, and USDA Forest Service have ongoing research and surveys for emerald ash borer that will continue in 2005.

European gypsy moth (*Lymantria dispar* Linnaeus) trappings were down 75% in total number from 2003. Indiana Department of Natural Resources (IDNR) will possibly treat 21,000 acres in 2005 for gypsy moth. The Indiana Department of Natural Resources and the USDA Forest Service participate in the STS (Slow the Spread Program). The European gypsy moth first appeared in Indiana in the early 1970s. European gypsy moths in Indiana are concentrated in the northeast part of the state, but populations do appear elsewhere. In 2003, male gypsy moths caught in traps were 23,090; however, in 2004, the number of male gypsy moths caught in traps declined to 8971. In 2004, IDNR treated 39 sites for the European gypsy moth. In 2005, IDNR will possibly treat 22 sites (21,000 acres) with pheromone disruption flakes and *Bacillus thuringiensis* subspecies *kurstaki* sprays.

EXOTIC INVASIVE INSECTS OF REGULATORY CONCERN IN NURSERIES

Indiana was inundated with a number of exotic invasive insects of regulatory concern in 2004. Asian ambrosia beetles (*Xylosandrus crassiusculus* (Motschulsky)) were collected during Indiana Department of Natural Resources (IDNR) nursery inspections in 2004. Asian ambrosia beetles are known to occur in Jackson and Bartholomew counties in Indiana; suspect specimens were collected in Boone, Hendricks, Johnson, and Monroe counties. No regulatory action has been taken for this pest. Host plants for the Asian ambrosia beetle include over 120 known plants, which include: pecan, Chinese pistachio, red oak, bur oak, redbud, Bradford pear, and chinquapin oak. 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.

Due to infestation by the pine shoot beetle (*Tomicus piniperda* Linnaeus), five new counties (Decatur, Jennings, Ripley, Union, and Vigo) in southern Indiana were added and placed under quarantine in 2004. Currently, 60 of the 92 counties in Indiana are under quarantine for this pest. Pine shoot beetle was first reported in the U.S. (including Indiana) in 1992. Pine shoot beetles do not harm sawed timber but require live or very recently-killed pine trees in order to feed and reproduce. Damage from the this beetle is usually limited to killing several shoots approximately 10–15 cm in length on a tree. The beetles can kill already-stressed trees and may weaken and kill healthy trees when populations get very high.

EXOTIC INVASIVE INSECTS OF REGULATORY CONCERN IN STORES

The United States Department of Agriculture (USDA) Animal and Plant Inspection Service (APHIS) issued a national recall on imported pine cones originating in India. These pine cones were sold both singly and in potpourri as a specialty holiday item. The recall was issued because they harbor two different insect pests: the slender banded pine cone longhorned beetle (*Chlorophorus strobilicola* Champion)—a wood-boring beetle native to India, and larvae of a seed-feeding moth belonging to the genus *Cydella*. On 18 December 2003, there were 21 potpourri products listed in the recall; however, the number of recalled potpourri products continued to expand as state and federal inspectors located additional products. Pine cones infested with live insects were found in at least 11 states, including Indiana, New Jersey, New York, Maryland, and Delaware. APHIS will now require mandatory fumigation for all pine cones from India entering U.S. ports of entry. Products packaged in impermeable wrappers will be refused entry unless they are removed from the packaging to allow effective treatment. *Chlorophorus strobilicola* was not found in Indiana; however, several *Cydella* moths were collected.

The United States Department of Agriculture (USDA) Animal and Plant Inspection

Service (APHIS), Plant Protection and Quarantine (PPQ) officers found live insect larvae in a product known as "Rustic Twig Tower™" imported from China. The initial find was made in Wisconsin by a concerned consumer who purchased this product. The larva was identified as an exotic invasive longhorned beetle (Cerambycidae: Lamiinae). In addition to this infestation, a consumer in Florida reported finding insect larvae in the same product. This product contained numerous insect larvae that were identified as a different exotic invasive longhorned beetle (Cerambycidae: Lamiinae). USDA APHIS is very concerned about the introduction of these two insect pests into the United States. The sub-family Lamiinae is known to infest hardwood trees, and the sub-family Cerambycinae is known to infest softwood trees such as sequoia, bald cypress, and other similar species. IDNR Division of Entomology and Plant Pathology recovered eight Rustic Twig Tower's™ from around the State of Indiana.

In December of 2004, the USDA recalled artificial Christmas trees with real-bark trunks manufactured by Polytree Hong Kong Co. Ltd. The Christmas trees imported from China contained a quarantined significant pest, the brown fir longhorned beetle (*Callidiellum villosulum* (Fairmaire)) found in shipments in Illinois and Michigan. The adult beetles were removed from the wooden portion of the artificial trees sold in a "Michael's" craft store. The product was traced back to the Polytree Company in China. Polytree was also involved with a recall on similar artificial trees sold at Ace Hardware. The recall notice instructs consumers to return these trees to the stores in which they were purchased. Further investigation by USDA APHIS found that heat treatment certificates accompanying the two shipments indicate the treatment conducted did not meet U.S. entry requirements.

EXOTIC INVASIVE INSECTS OF REGULATORY CONCERN IN SOLID WOOD PACKING MATERIALS

Surveys continued for the European woodwasp (*Sirex noctilio* Fabricius) in Bloomington, Indiana in 2004. *Sirex noctilio* was found inside a factory warehouse there in 2002. Surveys for *S. noctilio* are in their third year in that city, but to date no *S. noctilio* specimens have been collected. *Sirex noctilio* infests all major commercial pine species. The female wasp drills into the wood and inserts a toxic mucus and the fungus, *Amylostereum areolatum* (Chaillet) Boidin, into the tree. The mucus prevents the tree from defending itself against the fungus. The fungus grows and causes the tree to dry out (weeks to months). The combination of fungus and mucus kills the tree.

A "Hot Zone" survey between the USDA APHIS PPQ and the Indiana CAPS program targeted invasive Solid Wood Packing Material (SWPM) pests at 55 sites in Indiana in 2004. Traps were set at sites that are believed to have risk for the introduction of exotic invasive bark, jewel, and woodboring beetles. Twenty exotic invasive bark, jewel, and woodboring beetles that threaten Indiana natural resources were targeted in this survey that will continue in 2005 (Table 1). No pests targeted in the SWPM survey were collected; however, banded elm bark beetles (*Scolytus schevyrewi* Semenov) were collected in Marion County through this survey. No regulatory action was taken for this pest. The banded elm bark beetle affects elms and autumn olive—among other plants.

FRUIT AND VEGETABLE INSECTS

Generally, fruit and vegetable damaging insects were slightly lower in 2004 than normal. Apple pests, including codling moth (*Cydia pomonella* (Linnaeus)) and spotted tentiform leafminer (*Phyllonorycter blancardella* (Fabricius)) were conspicuously absent throughout much of the state. European corn borer (*Ostrinia nubilalis* Hübner) damage to sweet corn and other crops was reduced. When first generation flights are low, the second generation of corn borers does not develop in numbers high enough to cause injury to sweet corn. Corn earworm (= tomato fruitworm), *Heliothis zea* (Boddie), populations were low throughout the state in the early 2004 season. However intense tropical storm activity in the southern states accounted for a higher influx of earworms into Indiana during the late summer and resulted in some late season damage.

Table 1.—List of target bark, jewel, and woodboring beetles surveyed for in the "Hot Zone" survey in 2004.

Scientific name:	Common name:
Agrilus planipennis Fairmaire	Emerald ash borer
Anoplophora chinensis (Forster)	Citrus longhorned beetle
Anoplophora glabripennis (Motchulsky)	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 dark 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

HOUSEHOLD AND STRUCTURAL (URBAN) INSECTS

The number of complaints about social and solitary wasps around homes was slightly higher in 2004, despite early rains. The number of complaints about spiders around homes and other buildings was common in 2004, but complaints were not as common as during 2003. Box-elder bug (*Boisea trivittatus* (Say)) complaints were higher than normal (similar to 2003). Elm leaf beetles (*Xanthogaleruca luteola* (Müller)), home-invading weevils (black vine weevil (*Otiorhynchus sulcatus* (Fabricius)), and strawberry root weevil (*Otiorhynchus ovatus* (Linnaeus)) were extremely low during 2004.

The number of calls from homeowners regarding termites and ants was lower than usual this year. Wet organic matter in yards and gardens near residences promoted the survival of high numbers of millipedes, sowbugs and pillbugs, especially during the spring and early summer time. Like in 2003, homeowners in 2004 often complained of these nuisance pests covering sidewalks, patio and garage floors and entering into basements through window cracks and utility ports. Over the northern and central regions of the state, earwigs (Dermaptera: Forficulidae) continue to be a common nuisance.

LANDSCAPE AND ORNAMENTAL INSECTS

The insect event of the year in 2004 was the mass emergence of Brood X the 17-year periodical cicada (*Magicicada* spp.) in several areas across the central and southern parts of the state. Some reports described thousands of cicadas emerging from the ground all at once. While in most situations this was merely a phenomenon, some complaints of damage were registered. Calls received ranged from complaints of damage to trees and shrubs because of the oviposition slits made by the female, to the unbearable noise of the cicadas calling, to even a few complaints of odor produced as the insects began decaying in mass. Three species of cicada (*Magicicada septendecim* (Linnaeus), *Magicicada cassini* (Fischer), and *Magicicada septendecula* Alexander and Moore) were involved in this mass emergence. Extension and media alerts throughout the emergence period helped to minimize the potential damage by this insect to small ornamental trees, nursery stock, and fruits. Advanced warnings allowed control

strategies (including modifying chemical treatments, altering planting recommendations, and positioning netting material over susceptible trees) to be in place that prevented most severe cicada damage to commercial trees.

Numbers of most aphids and scales were low on ornamental plants. Webworms such as eastern tent caterpillar (*Malacosoma americanum* Fabricius), fall webworm (*Hyphantria cunea* (Drury)), and mimosa webworm (*Homadaula anisocentra* Meyrick) were higher than normal. Bagworms (*Thyridopteryx ephemeraeformis* (Haworth)), continued to create problems in spruce and other evergreen plantings and at many deciduous sites. Generally, spider mite (*Tetranychidae* spp.) activity was higher than usual, with spruce spider mites the most abundant.

PUBLIC HEALTH PESTS

Lower than normal tick and biting fly complaints were received during the spring and summer of 2004. Mosquito complaints were common early in the season, due primarily to the nuisance mosquito (*Aedes vexans* (Meigen)), during heavier rain periods. *Aedes japonicus japonicus* (Theobald) was reported in several southern and central Indiana counties. Overall, human-biting ticks and insects remained relatively quiet during 2004, except for the early season nuisance mosquito complaints. Reports of bed bug (*Cimex lectularius* Linnaeus) infestations have been more common during the past few years in Indiana. This mirrors the increase in bed bug activity nationwide and confirms the reported resurgence of true bed bug infestations especially in the hotel and bed and breakfast industry. Until recently, bat bugs (*Cimex adjunctus* Barber) dominated the number of cimicid-related calls.

STORED FOOD AND GRAIN INSECTS

More reports of psocids than normal occurred in stored grains and also in processed foods in 2004. Hairy fungus beetles (*Mycetophagus punctatus* Say) in stored foods were also higher, both probably due to the humid conditions of early 2004. Higher than usual foreign grain beetle (*Ahasverus advena* (Waltl)) activity was found both in stored grains and in new homes this year. New home construction during the wet spring conditions in early 2004 resulted in damp/wet wood becoming enclosed in wall voids and attics. Mold development in these conditions was highly conducive for supporting foreign grain beetle infestations.

TURFGRASS INSECTS

Insects in lawns and golf courses were a lesser problem in 2004 than usual. Japanese beetles (*Popillia japonica* Newman) emerged earlier than normal in 2004. Reports of some high, localized populations existed in the greater Marion County area. However, due to the moist growing conditions of the spring and summer, concentrations of the beetles doing damage to either plants, trees, or laying eggs in turfgrass were not evident. Spotty Japanese beetle damage was reported in berries, fruits and grains during 2004; however, lack of damage during early 2004 may be due to the abundance and diversity of host plants that competed for the beetle feeding. Billbugs (*Sphenophorous* spp.) in turfgrasses continue to increase in number and damage recently, even though their damage often goes misdiagnosed. Incidence of cluster fly (*Pollenia rudis* (Fabricius)), activity is also increasing.

Due to publicity by the media and warnings by extension specialists the impending threat of emerald ash borers (*Agrilus planipennis* Fairmaire) invading Indiana, more green beetles were submitted for identification during 2004 than previously. These included beetles such as carabids: fiery hunters (*Calosoma calidum* (Fabricius)), tiger beetles (Coleoptera: Cicindelidae), and green June beetles, (*Cotinis nitida* (Linnaeus)).

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