

Insects and Other Arthropods of Economic Importance in Indiana in 1960¹

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Among the principal factors governing the extent of insect population development each year are the weather conditions. Weather influences not only the insect but also its hosts. These conditions in Indiana in 1960 during the insect-development period can be characterized as "consistent" but with a few fluctuations. The latter included long periods of inundation in local southern areas and several dry periods in north central Indiana and southwest Indiana. April was relatively warm but the rest of the development season until mid-August experienced temperatures which were normal or slightly below normal. This condition had the effect of supporting insect development but retarding the rate in many species. With respect to moisture, conditions were especially favorable for many insects in that a modest but continuous supply of rain fell intermittently from April until the dry period late in September. Such conditions favored insects requiring moisture and those which develop large populations in lush vegetative growth.

Field and Crop Insects

Corn earworm [*Heliothis zea* (Boddie)]. Although moth flights were not as heavy in 1960 as in the previous year, larval infestations in sweet corn were heavy. Some plantings of both early and late corn were 100% infested. Because of spotty occurrences in southern Indiana, the total damage will be about equal to that of last year with fall damage being especially heavy.

European corn borer [*Pyrausta nubilalis* (Hbn.)]. Both the June and August generations of moths were more abundant than in 1959. Late sweet corn had 60% of their stalks infested in central Indiana. In general infestations and populations were slightly higher than in 1959. This is particularly true in northern Indiana, and in the pocket counties of the southwest corner of the state. One field of white corn in Posey County north of Wadesville averaged more than two borers per plant with about 96% infestation.

Armyworm [*Pseudaletia unipuncta* (Haw.)]. Infestations below normal.

Fall armyworm [*Laphygma frugiperda* (J. E. Smith)] was of little economic importance in Indiana in 1960, probably due to rank growth of plants. Infestations in late-planted field corn were reported in localized areas of several south central counties.

Common stalk borer [*Papaipema nebris* (Guen.)] was more prevalent than the preceding year. Larvae damaged early-planted corn and were also found in wheat stems. Infestations were more common along weedy fence rows.

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Cutworms—Several species were common during spring months. They caused significant losses to corn, mint and home gardens. The black cutworm, *Agrotis ypsilon* (Rott.), as in 1959, was the dominant species in corn fields.

Webworms [*Nomophila noctuella* (D. and S.)]. Not important in 1960.

Wireworms—Although activity by this complex group is indicated by the increased use of soil insecticides, damaging populations occurred in only localized area.

Northern corn rootworm adults [*Diabrotica longicornis* (Say)] were quite abundant in many corn fields of the northern part of the state. Larval feeding on corn roots was rather general, although few reports of stalk lodging were received. Beetles feeding on corn silks were abundant enough in Jasper, Newton, and Benton counties to be of concern to hybrid seed corn procedures.

Southern corn rootworm adults (*Diabrotica undecimpunctata howardi* Barber) were abundant on many vegetable crops during August and September.

Corn leaf aphid [*Rhopalosiphum maidis* (Fitch.)]. Infestations were quite general and more aphids were found in late corn than in 1959, although their effect on the yield of this late corn was not apparent. Heavy infestations that were investigated showed few barren plants. However, fall estimates of losses were equal to those of 1959. Heaviest infestations were found in the north east part of Indiana. The infestations in the southern part of the state were higher but not severe. Sorghums in general were less infested than in 1959.

A billbug [*Calendra callosa* (Olivier)] was exceedingly abundant in a muck soil in Montgomery County planted to corn. The insects in early June had reduced the stand in one field by 50 per cent, while many of the surviving plants showed feeding injury. Fourteen acres of this field were disced after some experimental treatments had been made to the soil. Corn was replanted and on June 30 over 60% of the plants, regardless of treatment, showed leaf injury. This corn grew rapidly and most plants survived the feeding of the billbug.

Japanese beetle [*Popillia japonica* (Newm.)]. This insect continued to spread to many new areas of the state. Most infestations have been localized in areas adjacent to railroads, but the new one in Evansville extends from the Ohio River to a point north of the city. New county records consist of Vanderburg County (Evansville), Ripley County (Milan), Martin County (Shoals and Willowvalley), Daviess County (Washington), and Grant County (Marion). Other new localities within previously reported counties include: Ijamsville, North Manchester, Brimfield, and Milford Junction. In Newton County, where agricultural land is involved, the beetle population was higher this year, although not severe enough to cause damage to soybeans or corn.

Sorghum webworm [*Celama sorghiella* (Riley)]. This insect was observed in sorghum heads as far north as the Davis farm near Winchester, Indiana. No severe infestations were reported.

Tomato fruitworm [*Heliothis zea* (Boddie)]. Infestations in tomatoes were relatively unimportant. Corn, which is its preferred host, was in a

favorable condition to attract the moth and thus absorbed the bulk of the population.

The fruit fly (*Drosophila melanogaster* Meig.) built up rapidly during the latter part of the tomato season and developed one of our most severe infestations. Egg counts taken on cut fruit were nearly all positive with counts ranging up to 500 during the period of August 20 to September 15. This period was characterized by high humidity, heavy plant growth, and moderate temperatures.

Hornworms on tomatoes [*Protoparce sexta* (Johan.) and *P. quinque-maculata* (Haw.)] were very abundant with 80 per cent being *P. sexta*. Parasitism by *Apanteles congregatus* (Say) was so high, 90-95 per cent, in August that damage to the fruit and foliage was not as severe as in 1959.

Blister beetles (several species) were common on many crops. Some reports of localized abundance on tomatoes were received.

The striped cucumber beetle [*Acalymma vittata* (F.)] did more injury in 1960 than it has for the past several years. The spotted cucumber beetle (*Diabrotica undecimpunctata howardi* Barber) was not nearly as abundant on cucumbers as it was the previous year and did very little damage to cucurbits.

A variety of the pale striped flea beetle, the banded flea beetle (*Systema blanda* Melsh.) was much more abundant than normal in June when it damaged cucumbers severely.

The potato leafhopper [*Empoasca fabae* (Harr.)] was less abundant than usual on potatoes.

The squash vine borer [*Melittia cucurbitae* (Harr.)] was very abundant on certain varieties of squash, 50 per cent of the vines in some plantings being infested.

The squash bug [*Anasa tristis* (DeG.)] was again abundant throughout much of the state after being scarce for five years. In the pumpkin producing area of Jackson and Scott counties, it caused some losses. It was also quite abundant around Lafayette. Good growing conditions for cucurbits and the late development of the bugs probably forestalled serious losses in the Lafayette area.

The mint looper [*Rachiplusia ou* (Gn.)] was less abundant than in the past two seasons. A late infestation developed in August on second growth mint, but was of little economic importance. A number of parasites and diseases were found in fields in Jasper and Starke counties. Of these, a nuclear polyhedrosis virus disease was isolated from a large number of loopers collected from commercially grown mint. The disease was of epizootic proportion in the populations and was bringing about adequate reduction.

Both the imported cabbage worm [*Pieris rapae* (L.)] and the cabbage looper [*Trichoplusia ni* (Hbn.)] were destructively abundant on cabbage and related crops during July and August. Damage was especially severe from the looper, in spite of the parasite, *Apanteles glomeratus* (L.) which was abundant in many areas.

Meadow spittlebug [*Philaenus leucophthalmus* (L.)] was again the most serious insect pest on alfalfa and red clover. Infestations were very

heavy in eastern Indiana, particularly in counties along the Ohio border. Populations as high as three to five nymphs per stem were common.

Spotted alfalfa aphid [*Therioaphis maculata* (Buckton)]. This insect was not taken in Indiana in 1960 until October 5 when it was found in Floyd County west of New Albany. In an extensive survey it was not found anywhere else in the Ohio River Valley.

Hessian fly [*Phytophaga destructor* (Say)]. This insect showed a slight increase over 1959. Susceptible wheat averaged 15.3 per cent infested with a high of 40 per cent. Resistant varieties averaged 0.3 per cent infested.

Chinch bug [*Blissus leucopterus* (Say)] populations showed an increase over 1959 and insecticide controls were applied in a few localized areas in central Indiana.

Grasshoppers [*Melanoplus femur-rubrum* (DeG.), *M. differentialis*, and *M. bivittatus*] were more abundant and destructive than they have been for several years. Nymphal development was successful in lush fence rows, roadsides, and field margins. Migrations into crop land occurred in July and August causing considerable localized damage to corn, soybeans, and tomatoes. Adult *M. bilituratus* were collected in Vigo County during late June and in Tippecanoe County the first week of July.

Tree, Shrub and Forest Insects

Zimmerman pine moth [*Dioryctria zimmermani* (Grote)]. Infestations continue to be heavy in untreated pine plantings in northern Indiana.

European pine shoot moth [*Rhyacionia buoliana* (Schiff.)] had heavy overwintering populations in pine plantations of northern Indiana.

Bagworm [*Thyridopteryx ephemeraeformis* (Haw.)] populations were back to normal, important on both deciduous and evergreen plants.

Mimosa webworm [*Homadaula albizziae* Clark] was very serious on honey locust trees in central and southern Indiana. The insect continues to spread farther north in the state.

Elm leaf beetle [*Galerucella zanthomelaena* (Schr.)] was exceedingly abundant on Chinese elm trees in central Indiana. Nearly every Chinese elm tree was brown by late July.

The smaller European elm bark beetle [*Scolytus multistriatus* (Marsh)] continues its steady spread of the Dutch elm disease.

Cottony maple scale [*Pulvinaria innumerabilis* (Rathv.)] was abundant on silver maple in northern Indiana.

European pine sawfly [*Neodiprion sertifer* (Geoff.)] was again the most serious defoliator of pine plantations in 1960. The insect has now been reported from counties along the Ohio River, indicating that this insect now infests most of the state.

Fall webworm [*Hyphantria cunea* (Drury)]. The fall generation was unusually heavy in the most southern counties.

Catalpa sphinx [*Ceratonia catalpae* (Bdr.)] defoliated catalpa trees in the north central counties in August and September.

The walnut caterpillar [*Datana integerrima* G. and R.] defoliated walnut trees in northern Indiana in late August.

Eastern tent caterpillar [*Malacosoma americanum* (F.)] was commonly found on apple and black cherry trees in April and May.

The Judas tree leafhopper [*Erythroneura aclys* McAtee] was again abundant on redbud through the state. Most ornamental redbud trees were yellowed by mid-September.

The maple bladder gall [*Vasates quadripedes* (Shimer)] was unusually abundant on silver maple trees in the spring of 1960.

The honey locust pod gall [*Eotetranychus multigitula* (Ewing)] was frequently reported deforming the foliage of honey locust trees in northwestern Indiana.

Locust leaf miner [*Chalepus dorsalis* Thunb.] was the insect responsible for the brown foliage of black locust trees in southern Indiana.

The hackberry lacebug [*Corythucha celtidis* O. and D.]. Severe infestations occurred in Madison, Fayette, and Tippecanoe counties.

Columbian timber beetle [*Corthylus columbianus* Hopk.]. This is a very important insect, in terms of forest economics. In total, its damage is inestimable; it is known that a one-third reduction in stumpage and finished lumber value is experienced due to the reduced quality caused by this insect. The insect is known throughout the southern one-half of the state and has been recovered as far north as Vermillion County.

Walking stick [*Diapheromera femorata* (Say)] is implicated in severe local outbreaks in northern Indiana. One such outbreak resulted in complete defoliation of from 10 to 20 acres of oak (probably bur oak, *Quercus macrocarpa* Michaux).

The symbiotic relationship between a leafroller and a webworm that resulted in maple blight as a major disease in Michigan and Wisconsin was discovered in Turkey Run State Park. The leafroller, *Acleris chalybeana* (Ferm.), provides the only possible oviposition site for the maple webworm, *Tetralopha asperatella* (Clem.), a colonial feeder.

An undetermined species of *Gracilaria*, another leafroller of sugar maple, is a new record for Indiana.

Livestock Insects

Face fly [*Musca autumnalis* DeG.] has replaced the house fly as the most important fly to the livestock industry. Populations in the northern half of the state built up to a high level in late June and remained high throughout the season. Counts were as high as 65 per cent per cattle face; increase in flies beyond this number resulted in their appearance on the cattle backs with counts up to 200 per animal. This fly is presently restricted in its habitat to about the northern half of the state. (See Pests of Man and Households)

House fly [*Musca domestica* L.]. This insect is now considered to be the second most important insect in dairy and beef herds. Populations were normal throughout the summer but increased to a rather heavy level in the fall.

Horn fly [*Siphona irritans* (L.)] was present in severe numbers on untreated cattle throughout the northern half of Indiana throughout the year. In the southern half, when the rains stopped the populations dwindled quite rapidly. Counts of 600 per animal were recorded on untreated cattle during August in central Indiana.

Horse flies [*Tabanus atratus* Fab. and *T. sucifrons* Marquart] were abundant in the northeastern portion of the state from the first week of

August through the first week of September. The number of "strikes" was about 20 per minute, a severe infestation but lower than that of the previous year.

Stable fly [*Stomoxys calcitrans* (L.)] was a serious pest locally in barns and loafing sheds where straw bedding was not changed frequently. Preceding late summer showers, this pest caused considerable annoyance to humans.

Cattle grubs [*Hypoderma bovis* DeGeer and *H. lineatum* (DeVilliers)] continue to cause moderate losses to the native cattle of Indiana.

Pests of Man and Households

Face fly [*Musca autumnalis* DeG.]. This insect of cattle has now become a serious threat as a household pest. Fall invasion of rural and suburban houses became a fact this fall with several homes having thousands of these insects congregating in attics and upstairs rooms. In one home in Warren County, thousands of flies, apparently seeking an overwintering locality, entered the attic, window frames, and rooms. In suburban houses, counts have been consistently high (30 to 40 per day) during the fall.

Cat flea [*Ctenocephalides felis* (Bouché)]. The essentially unbroken moist conditions this summer in many areas of the state have been conducive to flea development. Homes have been heavily infested, and control has been difficult except with organic phosphates.

Subterranean termites [*Reticulitermes* spp.]. Inquiries concerning these insects were numerous during the swarming season and have been less numerous but regular since that time. The trend toward increased interest in pretreatment noted in 1959 has continued.

Ticks—The brown dog tick [*Rhiphicephalus sanguineus* (Latrielle)] has been the subject of fairly regular inquiries since early July. The American dog tick [*Dermacentor variabilis* (Say)] has appeared to be less numerous this year.

The elm leaf beetle [*Galerucella xanthomelaena* (Schrank)]. From early February until mid-June inquiries were received regularly concerning the appearance of this insect in houses, due to the emergence of hibernating adults. Although populations seemed normal during the summer, there have been few complaints thus far this fall.

Field crickets [*Nemobius* sp.] have been unusually abundant this year due to desirable climatic conditions. From time to time they appeared by the hundreds on sidewalks outside of houses and stores.

Sap beetles [*Glischrochilus* spp.]. These insects have been particularly troublesome as uninvited guests when cooking is done outdoors. If the present trend toward "outdoor living" continues, these may well become one of our most troublesome pests.

German cockroach [*Blattella germanica* (L.)]. In 1959 this household pest was reported to be increasing in numbers and importance due to resistance to chlorinated hydrocarbons. Instances this year of suspected resistance to phosphates compound the problem and seem to indicate that it will continue to be the number one pest in this category.

Importance Rating

A rating is given of the ten most important arthropod pests in Indiana in 1960. In establishing this judgment, the following criteria were utilized: Damage or annoyance actually caused, newness of the situation requiring considerable investigation, and the extent to which measures were taken to prevent economic loss. The rating is:

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| 1. Corn earworm | 6. Codling moth |
| 2. Subterranean termite | 7. Cutworms |
| 3. Face fly | 8. Cockroaches |
| 4. Grasshoppers | 9. European corn borer |
| 5. Smaller European bark beetle | 10. Meadow spittlebug |