

Insects and Other Arthropods of Economic Importance in Indiana During 1974¹

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Abstract

The abundance and economic impact of selected arthropods responsible for crop losses, annoyance to man and animals, destruction of food and fibre products as well as the abundance and activity of selected entomological parasites and predators of importance in their control in Indiana during 1974 are discussed.

Major meteorological factors are briefly discussed insofar as they influence insect populations directly as well as indirectly by influencing their host plants. An unusually heavy snow in December, 1973, was followed by generally above-average rainfall, especially in May—corn planting time—when an average of 2 inches of rain fell above the normal. With generally poor drying conditions—temperatures were lower than normal—planting of both corn and soybeans was delayed, and subsequent rainfall made the replanting of some corn and some soybean acreage necessary. The root systems that developed especially in corn were poorly adapted to the droughty conditions that followed. Rainfall was below average as early as the first week in June in the Fort Wayne area, and a top-soil moisture shortage developed there by mid-June. For most of the rest of the state, rainfall was below normal at the end of June, and top-soil moisture deficiencies which developed in mid-July lasted through mid-August in most of the state, and through September in the northern districts. The southern districts suffered least.

With the drought in July came high temperatures, but poor growing weather was more the rule through the year, and scattered frosts as early as September 23, and killing frosts on October 2 and 3 came too early for some of the more retarded corn and beans. Poor harvesting conditions continued until late in the fall. Frost, however, took its toll in the spring as well; a spell of warm weather in March encouraged the development of fruit trees, and at least the peaches suffered greatly with sub-freezing temperatures on March 24.

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Corn and Small Grains

Corn earworm (*Heliothis zea* (Boddie)) and fall armyworm (*Spodoptera frugiperda* (J. E. Smith)). These insects are considered here only as feeders on the ears of corn grown for grain. Of 4725 ears of corn examined during the fall corn survey from all over the state, 3.56% were attacked by larvae of these species, with a loss of 0.037% of the crop. (In September, 53 *H. zea* were collected from ears as compared with 33 *S. frugiperda*.) The first adult *H. zea* was taken in a blacklight (BL) trap on July 25 in Lawrence County.

European corn borer (*Ostrinia nubilalis* (Hübner)). The 1973 fall borer population was the largest in the history of the survey. Examination of 300 fall-collected larvae revealed 4% parasitized by *Eriborus terebrans* (Hymenoptera:Ichneumonidae) (mostly in the northern half of the state), and 16% affected by a microsporidian (mostly in the southern fourth of the state). Pupation was complete or nearly so by May 22 in the WC² district, and first adults were taken there on the night of May 27. First flight peak occurred during the first week in June. Second generation flight began and peaked during the week ending July 25 in the SW district, at the height of the drought, which may have been a factor in the reduction of the population to its low fall levels. Summer generation larvae averaged 3/100 stalks, about one-third of the 1973 summer population. Twenty-three percent of the corn in the state was infested in the fall, and there were 27 larvae/100 stalks, less than one-fourth of the 1973 fall population and below the ten-year average. The highest district population was in the SSW, with 87 larvae/100 stalks. All other districts had about one-third that figure or lower, with the areas south and east of Indianapolis having the lowest.

Western corn rootworm (*Diabrotica virgifera* (LeConte)). Overwintering eggs hatched about June 10, and a month later between 10 and 15% of the larvae had pupated and about 7% had emerged but were still in the soil, with occasional adults observed above the ground, in the NW corner of the state on July 10. By three different measures, the 1973-1974 season was a good one for this insect. In 90% of the NNW, 83% of the NNC and 71% of the NNE district fields adults were observed during the July survey, as compared with 36, 17 and 0% in 1973. In numbers, adults averaged from 48-117/100 plants in the northern districts, as compared with 0-16 in 1973. Finally there was an increase in the territory occupied by the species: there were 14 new county records—Steuben, Adams, Wells, Warren, Vermillion, Montgomery, Parke, Howard, Grant, Tipton, Madison, Boone, Blackford and Jay. Thus, roughly one-half the state is now infested, and the infestation is expected to be more serious in the center of the state than it has been in the north. Losses due to this insect in 1974 were certainly no more than 1,000,000 bushels, according to Purdue specialists.

² See maps on page 288 of Meyer, R. W. and J. V. Osmund. 1971. Insects and other arthropods of economic importance during 1970. Proc. Indiana Acad. Sci. 80:286-298, for location of districts.

Northern corn rootworm (*Diabrotica longicornis* (Say)). Fifteen percent pupation was observed in a field of corn grown for grain in Clinton County by July 12. Like its congener, adults were much more common in 1974 than in the previous year. It was observed in 30 to 57% of the fields visited in the districts north of Indianapolis; in 1973 it was observed in only one district. South of Indianapolis it was observed in from 8-33% of the fields visited in the various districts (0-40% in 1973). Damage to corn grown for grain by this species was negligible.

Southern corn rootworm (*Diabrotica undecimpunctata howardi* Barber). Adults of this species were also much more common in corn fields in July: an average of about 30% of the fields in the state were infested, as compared with 0.6% in 1973. It is of no consequence in Indiana corn.

Birds (several species). Birds were responsible for the loss of 0.299% of the 1974 corn crop through kernel feeding at the milk or dough stage. This is slightly above the 1973 figure, but below the ten-year average.

Grass thrips (*Anaphothrips obscurus* (Müller)). Conspicuous damage to the lower 4-5 leaves of small corn in three fields, one each in Parke, Jackson and Franklin Counties, by this species occurred during the last two weeks of June.

Corn leaf aphid (*Rhopalosiphum maidis* (Fitch)). About 11% of the corn grown for grain was infested by the first of August, as compared with 9% in 1973. Most of the infestations were light (9.9%). By the time of the fall corn insect damage survey, 26% of the corn was infested, down from the 33% of 1973. Of this total, about 4% was heavily infested, 5.5% moderately and 16% lightly. (A heavy infestation includes those stalks whose tassels were nearly completely covered, a moderate, with patches of aphid residues, and a light, with occasional exuviae or live aphids.) The NNW and NW districts were the most heavily infested; the SSW the least.

Armyworm (*Pseudaletia unipuncta* (Haworth)). Larvae, of non-economic numbers, were observed in SW district grains; the only report of economic damage was to corn double-cropped on wheat stubble in Owen County.

Hessian fly (*Mayetiola destructor* (Say)). The state average percent infestation of wheat by this species was the lowest, 0.08%, in 10 years of surveying. Puparia/100 stems averaged 0.1, another record low. Percent infestation was low in both resistant (95% of the fields sampled had Ribeiro (H₃) resistance) and less resistant cultivars.

Cereal leaf beetle (*Oulema melanopus* (Linnaeus)). There were no economic infestations in Indiana in 1974.

Black cutworm (*Agrotis ipsilon* (Hufnagel)). Some damage by larvae of this species occurred, especially in the NW portion of the state where some of the corn was still small enough to be seriously damaged. However, only 16 fields were reported from the state following appeals to county agents, pesticide dealers and the like. Only a few of these had economic damage. Of 300 fields over the state that were carefully observed, only one had black cutworm larvae, and that was non-economic.

Chinch bug (*Blissus leucopterus leucopterus* (Say)). Populations in both fall 1973 and spring 1974 were non-economic as indicated by surveys.

Forage Legumes and Soybeans

Alfalfa weevil (*Hypera postica* (Gyllenhal)). During the last few years serious economic infestations were confined, in Indiana, to the area south of US 50, with occasional heavy damage north of there to Shelby and Morgan Counties, and to the area north of US 30. This year economic infestations were the rule south of Indianapolis, and north to Vermillion and Randolph Counties there were fields that could profitably have been treated. In Warren and Howard Counties where populations recently have been negligible, 50% of the alfalfa stems showed feeding, and a population of two larvae/stem was observed. North of US 30 judicious cutting would have been sufficient to keep losses to a minimum except in the NE corner, where chemical controls were sometimes necessary.

Weevil larval populations in 1974 were ahead of the 1973 populations both in time and relative to the host crop, alfalfa. In Daviess Co., alfalfa averaged 4.7" on March 15, and was infested at a rate of 55% with an average of 2.4 larvae/infested stem. In 1973, alfalfa was from 2-3 inches taller when that population level was reached, nearly 2 weeks later. By April 19, 8.2" alfalfa was 98% infested with an average of 5.3 larvae/infested stem. (Counts after that date were modified by control measures.)

Potato leafhopper (*Empoasca fabae* (Harris)). Like last year, this insect appeared in economic numbers over much of the state in alfalfa. At least once between June 20 and August 20, populations increased to economic numbers between cuttings in the 29 fields in southern Indiana that were closely watched. Nymphal numbers peaked between the 11th and 25th of July. In the northern districts, adult numbers peaked about the 24th of July, nymphal numbers between then and the 15th of August. NW and NC averages ran to 3 adults/sweep, NE to 2.

Meadow spittlebug (*Philaenus spumarius* (Linnaeus)). The first nymph of the season was taken on March 15 in Harrison County. SC fields were 12% infested by April 5, and Washington County fields averaged 27% infested by the end of April, in alfalfa. On September 3, adults in alfalfa averaged 1.7/sweep in the Dubois County area, 2.3 in Harrison, 3.5 in Washington and 0.6 in Jackson.

Mexican bean beetle (*Epilachna varivestis* (Mulsant)). Adults were unusually numerous in alfalfa—up to 20/50 sweeps—at the end of May, before soybeans were generally available, and in a few instances remained at fairly high numbers even when soybeans were available; trace numbers of larvae were present also. One Washington County field averaged 5/10 sweeps in mid-August. An estimated 100,000 acres of soybeans were infested by this insect. They infested scattered fields south of Indianapolis, their usual range, except that they were more often reported from the eastern half of that range than has been customary in the last few years. Damage has been esti-

mated at an average of a bushel/acre or less in infested fields, by Purdue specialists.

Vegetable Crops

Imported cabbageworm (*Pieris rapae* (Linnaeus)). Cabbages were relatively free of injurious insects in the northern districts until mid-July when this insect appeared. It had reached second instar at that time. By July 26, on an experimental farm in the WC district, all stages were present and numerous on cabbages, together with the cabbage looper (*Trichoplusia ni* (Hübner)) and the diamondback moth (*Plutella xylostella* (Linnaeus)). The latter ranged to 15/plant.

Two-spotted spider mite (*Tetranychus urticae* Koch). This mite was reported from various locations in both the northern and southern ends of the state, on garden beans.

Variiegated cutworm (*Peridroma saucia* (Hübner)). Larvae of this species, plus small numbers of the yellowstriped armyworm (*Spodoptera ornithogalli* (Guenée)), black cutworm (*Agrotis ipsilon* (Hufnagel)), and spotted cutworm (*Amathes c-nigrum* (Linnaeus)) defoliated or severely damaged 200 (of 500) acres of potatoes in St. Joseph County, which had been treated on a weekly basis. Even shallow tubers were damaged by the larvae which ran to 25/sq. ft.

Spotted cucumber beetle (*Diabrotica undecimpunctata howardi* Barber). Possibly one-third of the jack-o-lantern pumpkins in a 20-acre field in Floyd County were damaged on the underside by larvae of this species.

Ornamentals, Forest and Shade Trees

The top ten insect pests as observed by nursery inspectors in Indiana, together with the number of reports on which they appear, are listed below:

1. Bagworm (<i>Thyridopteryx ephemeraeformis</i> (Haworth))	136
2. Fletcher scale (<i>Lecanium fletcheri</i> Cockerell)	58
3. Maple bladdergall mite (<i>Vasates quadripes</i> Shimer)	57
4. Oystershell scale (<i>Lepidosaphes ulmi</i> (Linnaeus))	52
5. Bronze birch borer (<i>Agilus anxius</i> Gory)	42
6. Euonymus scale (<i>Unaspis euonymi</i> (Comstock))	33
7. Cooley spruce gall aphid (<i>Adelges cooleyi</i> (Gillette))	30
8. Apple aphid (<i>Aphis pomi</i> DeGeer)	29
9. Mimosa webworm (<i>Homadaula anisocentra</i> Meyrick)	28
10. Fall webworm (<i>Hyphantria cunea</i> (Drury))	21
11. An aphid (<i>Periphyllus americanus</i> (Baker))	21

A pineshoot borer (*Eucosma sonomana* Kearfott). This was collected in Elkhart County for a new state and a new county record.

A pseudococcid (*Eurycoccus jessica* (Hollinger)). This homopteran was reported for the first time from Indiana.

Spruce budworm (*Choristoneura fumiferana* (Clemens)). Collected in Tippecanoe and LaGrange Counties for new county records.

Jack pine budworm (*Choristoneura pinus* Freeman). Collected in Tippecanoe and LaGrange Counties for a new state and new county

records. This and the previous insect appeared in large numbers at lights on the night of July 15. Winds apparently gathered them from Wisconsin or Minnesota and dumped them in Michigan, northern Ohio and New York, all at nearly the same time.

Obliquebanded leafroller (*Choristoneura rosaceana* (Harris)). Adults were collected during the week ending June 14. The insect was much more common than usual, on a variety of plants including persimmons, roses, fruits and ornamentals.

Elm leaf beetle (*Pyrrhalta luteola* (Muller)). First generation in low numbers, second normal.

Pecan nut casebearer (*Acrobasis caryae* Grote). This insect was reported this year for the first time in many years, from Cass and Dubois Counties.

Locust leaf miner (*Xenochalepus dorsalis* (Thunberg)). Larvae caused heavy damage to black locust in the SC and SW districts of the state, about mid-July.

Periodical cicada (*Magicicada* sp.) Brood XIV emergence was generally light to very light.

Japanese beetle (*Popillia japonica* Newman). Range extensions as indicated by traps were observed in Clay, Parke, and Putnam Counties in the WC district, Dubois and Greene in the SW, Orange in the SC, and Dearborn, Jefferson, Jennings, Ohio and Switzerland Counties in the SE district. In addition, they were collected for the first time from Boone, Warren and Warrick Counties.

A scale (*Chionaspis heterophyllae* (Cooley)). This scale is becoming increasingly abundant in scotch pine and in Christmas tree plantings.

Sod webworms (several species). The very wet spring and the very dry summer greatly reduced the populations by the end of the year.

Man and Animals

Pigeon fly (*Pseudolynchia canariensis* (Macquart)). Reported for the first time from the state, this insect attacked people in a school in South Bend.

American dog tick (*Dermacentor variabilis* (Say)). This arthropod was much more common than it has been for some time.

Mosquitoes (several species). Biting was severe in NW and NC district fish and game areas during June. Collections of biting mosquitoes during the year added 85 new county records.

A deer fly (*Chrysops geminatus impunctus* Kröber). Collected in Parke County, for a new county record.

Sheep bot fly (*Oestrus ovis* Linnaeus). Puparia were observed on May 15 in Warren County, and second generation adults on July 13. Populations dropped to nearly nil in 1974, following high to fairly high populations in the three previous years.

Horse bot fly (*Gasterophilus intestinalis* (DeGeer)). Adult emergence with light oviposition occurred on July 14, with little or no oviposition thereafter.

Face fly (*Musca autumnalis* DeGeer). Peak adult numbers were observed near the end of June (0-35/face, mostly near 35); numbers remained at about 10/face till the end of July, on an experimental farm in Grant County.

Horn fly (*Haematobia irritans* (Linnaeus)). Adult numbers reached a peak of 20-25/side on August 23, dropped to negligible numbers later on black cattle on an experimental farm in Grant County.

Sawtoothed grain beetle (*Oryzaephilus surinamensis* (Linnaeus)). The most frequently reported of the cereal feeding beetles, but not unusually common.

Indian meal moth (*Plodia interpunctella* (Hübner)). The most commonly reported of the cereal feeding moths, this insect was not anymore common than usual, but was reported from unusual hosts. It was collected from marijuana (*Cannabis sativa*) in Sullivan County, and was found in more than half of the St. John's bread (*Ceratonia siliqua*) for sale in groceries in Lake County.

Carpenter bee (*Xylocopa virginica* (Linnaeus)). A large Warren County population was nearly decimated by unseasonal cold.

Polistine wasps (*Polistes fuscatus* (Fabricius) and *P. metricus* Say). Abnormally high numbers in Tippecanoe and Warren Counties. Weathered board fences and building visibly damaged by queens collecting pulp for nest-building.

Termites (*Reticulitermes* sp.). These insects were reported less frequently than in the past. The first report of winged adults was received on April 10 from LaPorte County.

Beneficial Insects

An ichneumonid parasitoid (*Bathyplectes curculionis* (Thomson)). Eighty percent of the cocoons exposed to the environment in the SW district had pupated by the end of the first week in March, and 50% had emerged as adults by April 12. The first parasitized alfalfa weevil (*Hypera postica*) larva was collected March 12 in Harrison County. The average rate of parasitization of alfalfa weevil larvae in the SW and SC districts was about 19% among larvae collected on April 19 and 29, slightly less than in 1973. New county records included Warrick, Gibson, Dubois, Spencer, Jennings, Ripley, Rush, Shelby, Union and Randolph Counties.

An ichneumonid parasitoid (*Bathyplectes anurus* (Thompson)). The first alfalfa weevil larva parasitized by this species was collected April 9 in Harrison County.

An ichneumonid parasitoid (*Eriborus terebrans* (Gravenhorst)). Adults of this parasitoid of the European corn borer (*Ostrinia nubilalis*) were reared from cocoons collected from Putnam and Kosciusko Counties, both new county records. Over the state, cocoons were collected in only five borer burrows of 122 borer-infested stalks dissected during the July corn survey.

A eulophid parasitoid (*Sympiesis viridula* (Thomson)). Pupae from which adults of this parasitoid of the European corn borer were

reared were collected in Vigo County, a new county record. It should be noted that this parasitoid was collected only once among the 568 corn stalks dissected during the fall corn survey, and not at all during the summer survey.

Lady beetles (several species). Of 44 adults swept from 29 SW and SC district alfalfa fields (25 sweeps/field) during the first week in April, 59% were *Coleomegilla maculata* (DeGeer), 23% were *Hippodamia parenthesis* Say, 9% *Cycloneda sanguinea* (Linnaeus), 7% *Hippodamia convergens* Guerin, 2% *Coccinella 9-notata* Herbst. About mid-August the percent of *C. maculata* was 58, *H. parenthesis* 33, the remainder 3 different species. All coccinellids together averaged 1.3/10 sweeps.

At the end of the month in the same alfalfa fields, they ranged from averages of 1.3/10 sweeps to 1.7, with nearly the same percentages of species. In cornfields in July, 99% of the adult coccinellids observed where *C. maculata*, of which 15% were parasitized by *Perilitus coccinellae*. In cornfields surveyed between September 15 and October 15, 85% were *C. maculata*, 12% were *H. convergens*. The twicestabbed lady beetle (*Chilocorus stigma* (Say)) was common in evergreens and other ornamentals.

A cereal leaf beetle parasitoid (*Tetrastichus julis* (Walker)). This parasitoid was recovered for the second successive year in LaPorte County from cereal leaf beetles. More were released in the same county. This was the only site checked for recoveries.

A cereal leaf beetle parasitoid (*Anaphes flavipes* (Forster)). No new releases were made, and none was recovered in 1974.

A cereal leaf beetle parasitoid (*Diaparsis* sp.). This parasitoid was recovered for the 3rd successive year in LaPorte County. New releases were made in the following counties in varying quantities and at from one to three different sites within the county. NW district—Benton, Jasper, Lake, LaPorte, Newton, Porter, Pulaski, Starke, and White. NC—Carroll, Elkhart, Kosciusko, Marshall. NE—Adams, Allen, DeKalb, Huntington, LaGrange, Noble, Steuben, Wells, Whitley. WC—Fountain, Montgomery, Parke, Putnam, Tippecanoe, Vermillion, Warren. C—Boone, Hendricks, Johnson, Rush, Shelby. EC—Fayette, Henry, Union, Wayne. SC—Brown, Monroe. SE—Dearborn, Jefferson, Ohio, Ripley, Switzerland.

A cereal leaf beetle parasitoid (*Lemophagus curtus* Townes). After several releases, this parasitoid was recovered in LaPorte County (Johnson Twp.—Kingsbury insectary) in 1974, a new state record. It was released again in 1974 in the same county, as well as in the following counties, in varying numbers and in one to several townships. NW—Benton, Pulaski, Starke, White. NC—Carroll, Elkhart, Marshall. NE—nil. WC—Tippecanoe. C—Johnson, Rush, Shelby. EC—Fayette, Henry, Union, Wayne. SW—nil. SC—Brown, Monroe. SE—Dearborn, Jefferson, Ohio, Ripley, Switzerland.

All cereal leaf beetle parasitoids were supplied by USDA APHIS, Plant Protection and Quarantine Programs, Cereal Leaf Beetle Parasite Rearing Laboratory, 2534 South 11th Street, Niles, Michigan, and the

State Entomologist's Office and release was accomplished through the cooperation of the State Entomologist's Office and the Cooperative Extension Service. Surveys for the recovery of the parasites were made only in LaPorte County, by USDA personnel.

