

Insects and Other Arthropods of Economic Importance in Indiana During 1976.¹

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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 fiber products as well as the abundance and activity of selected entomological parasites and predators of importance in their control in Indiana during 1976 are discussed.

Introduction

As a prelude to the discussion of insect activity, the more important meteorological influence on both invertebrate and plant life are reviewed. January was a cold month, February and March averaged 7° F. above normal, and temperatures fell through April to below average levels where they remained through much of the summer. The early warm months were interrupted by frosts, including a low of 9° on 17 March, 17° on 8 April and 28° on 8 May. These damaged some wheat, apples and peaches, but had little effect on corn and soybeans. The northern counties had good snow cover until 8 February, and snow fell over much of the state near the Ides of March, in advance of the 17 March freeze. There were a few local frosts early in October, but the big freeze of the fall occurred on 18 October.

Rainfall was short through most of the first 9 months of the year, especially in the southern third of the state. This facilitated planting, and by 28 May, 97% of the corn was planted, in contrast to 70% during average years. By the same time 80% of the soybeans were planted; in normal years that figure is 35%. In spite of the early planting, however, the cool summer so slowed development that harvest-ing was little earlier than usual. And though the rainfall was short, enough fell at the right time to produce excellent yields of both corn and soybeans.

Corn and Small Grains

Three criteria indicate that the western corn rootworm (*Diabrotica virgifera* LeConte) was more abundant this year than last. In a survey

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conducted in July adults were seen in 77% of the fields visited (1975:-59%) in the northern fourth of the state, in 22% of the remainder of the northern half (1975:14%). Secondly, it outnumbered the northern corn rootworm in almost all of the area north of Indianapolis. Lastly, the species invaded 15 new counties between last year and this (See Table 1 for new county records). (Table 2 contains all of the available developmental data.)

TABLE 1. *New State and County Records for 1976. New county records which are also new state records are followed by an asterisk.*

Organism	County
<i>Anaphes flavipes</i> (Först.)	Dearborn, Huntington
<i>Ascospaera apis</i>	Carroll*
<i>Bathyplectes anurus</i> (Thomson)	Spencer, Dubois, Daviess
<i>B. curculionis</i> (Thomson)	Noble, Clay, Warren, Grant, Jay, Blackford Fayette, Clark
<i>Diabrotica virgifera</i> LeConte	Putnam, Vigo, Clay, Owen, Hendricks, Marion, Hancock, Morgan, Johnson, Shelby, Rush, Henry, Sullivan, Greene, Jackson
<i>Eriococcus azaleae</i> Comstock	Marion
<i>Microctonus aethiopoidea</i> Loan	LaPorte*
<i>Popillia japonica</i> Newman	Decatur, Scott, Union
<i>Scaphoideus opalinus</i> Osborn	Marion*
<i>Tetrastichus julis</i> (Walker)	Pulaski, White, Huntington, Montgomery, Tippecanoe, Bartholomew, Boone, Hendricks, Johnson, Morgan, Harrison, Washington, Jackson, Lawrence, Orange, Dearborn, Franklin, Jennings
<i>Toumeyella pini</i> (King)	Marion*

Northern corn rootworm (*D. longicornis* (Say)) apparently declined in numbers. At least adults were found in fewer fields during the July survey than last year. From north to south, by quarters of the state, they were found in 9% (1975:20%), 27 (19), 27 (27), 8 (41) of the fields. Likewise the southern corn rootworm (*D. undecimpunctata howardi* Barber) populations were depressed; they were found in only 2% (only in the southern fourth) as compared with 16% of the fields in 1975.

Pupation of overwintering larvae of the European corn borer (*Ostrinia nubilalis* (Hübner)) was virtually complete by 12 May in upright stalks in Daviess Co., and adults appeared in BL traps by mid-May over much of the state. First flight peaked between 28 May and 17 June and the second flight remained heavy over much of the state from 23 July to 19 August. There was an average of 3.1 larvae/100 stalks in mid-July, up from 1975 (0.9/100). The northeastern and southwestern corners of the state had the highest populations. The fall survey, with a similar population distribution, averaged 40 borers/100 plants, 4 fewer than average.

Damage by the corn earworm (*Heliothis zea* (Boddie)) was observed in only 4 fields (of 189) all in the southern quarter of the state and all in late-planted corn. The corn leaf aphid (*Rhopalosiphum*

maidis (Fitch)) according to the fall corn survey infested only 7.5% of the corn, mostly lightly and about the same as in 1975. A field of susceptible (Kentucky 27) corn of appropriate age averaged 581/stalk in 1976, as compared with 934 in 1975. Although several fields of sorghum in Vermillion Co. were noticeably infested by this species, most fields were free of them, an uncommon occurrence. The greenbug (*Schizaphis graminum* (Rondani)) was also rarely observed on this crop.

TABLE 2. Date of first observation and/or peak population of several pest species.

Organism	Stage	Occurrence		County	Data Source
		First	Peak (s)		
<i>Agrotis ipsilon</i> (Hufn.)	Adult	16 Apr	2-8 Jul	Tippecan.	BL Trap
<i>Aphis pomi</i> DeGeer	1st instar	4 Mar	—	Vigo	Observed
<i>Argyrotaenia velutinana</i> (Walker)	Adult	6 Jun	mid-Jun	Knox	Pheromone
<i>Choristoneura rosaceana</i> (Harris)	Adult		15 Sep	Knox	Pheromone
<i>Diabrotica longicornis</i> (Say)	Adult	5 Jul	—	Parke	Observed
<i>D. virgifera</i> LeConte	Larva	11 Jun	—	Porter	Observed
	Adult	1 Jul	—	LaPorte	Observed
	Adult	—	27 Jul	Tippecan.	Stickyr tr.
<i>Epilaelna varivestis</i> Mulsant	O/wnter adult	26 May	14-21 Jun	Lawrence	Research
	Gen. 1 egg	8 Jun	5 Jul	Lawrence	Research
	Gen. 1 adult	15 Jul	2 Aug	Lawrence	Research
	Gen. 2 egg	19 Jul	5-12 Aug	Lawrence	Research
	Gen. 2 adult	19 Aug	7-12 Sep	Lawrence	Research
<i>Grapholitha molesta</i> (Busck)	Adult	—	22 Apr	Knox	Pheromone
<i>Heliiothis zea</i> (Boddie)	Adult	6 Aug	—	Porter	BL Trap
<i>Laspeyresia pomonella</i> (Linnaeus)	Adult	10 Jun	30 Aug	Knox	Pheromone
<i>Ostrinia nubilalis</i> (Hbn.)	Gen. 1 adult	16 May	31 May	Randolph	BL Trap
	Gen. 2 adult	—	4 Aug	Randolph	BL Trap
<i>Oulemma melanopus</i> (Linnaeus)	1st instar	10 May	—	Huntingt.	Research
	2nd instar	19 May	—	Huntingt.	Research
	3rd instar	25 May	—	Huntingt.	Research
<i>Peridroma saucia</i> (Hbn.)	Adult	19 Apr	9 Jul	Tippecan.	BL Trap
<i>Philaenus spumarius</i> (L.)	1st instar	12 Mar	—	Dubois	Observed
<i>Pseudaletia unipuncta</i> (Haworth)	Adult	30 Mar	24 Apr, 3 Jul	Tippecan.	BL Trap
<i>Pyrrhalta luteola</i> (Muller)	Egg	22 May	—	Tippecan.	Observed
	1st instar	24 May	—	Tippecan.	Observed
<i>Reticulitermes flavipes</i> (Kollar)	1st swarm	8 Mar	—	Vigo	Observed
<i>Rhagoletis pomonella</i> (Walsh)	Adult	30 Jun	mid-Jul	Knox	Pheromone
	Adult	25 Jun	—	Tippecan.	N. J. Trap
<i>Synanthedon pictipes</i> (Grote & Robinson)	Adult		10 Jun, 9 Sep	Knox	Pheromone

Larvae of the black cutworm (*Agrotis ipsilon* (Hufnagel)) were observed in more fields than usual. Nevertheless, although growers were encouraged to report problem fields, no more than 400 acres in the state had economic infestations. In fact, the common stalk borer (*Papaipema nebris* (Guenée)) probably occasioned more inquiries than

the black cutworm. Minor but uncommon pests of corn in 1976 include: a billbug (*Sphenophorus zea* Walsh), reported to have destroyed 20 acres in Decatur Co., a sod webworm, (probably *Crambus mutabilis* Clemens) destroyed patches of corn in Adams, Warren, Decatur and Washington counties; wireworms (unidentified), which necessitated replanting 180 acres of popcorn; and a grass thrips (*Anaphothrips obscurus* (Müller)), which seriously damaged about 3 acres of corn in Gibson Co.

The armyworm (*Pseudaletia unipuncta* (Haworth)) was the source of more telephone calls to Purdue Extension Service workers than any other insect in 1976. As many as 250 adults/week/BL trap were collected by 27 April, and by 12 May larvae had reached a half-inch in southern Indiana roadsides. By 28 May there were reported from wheat in the same area and were cutting wheat heads a week later in Sullivan Co. A 30-acre field of corn planted on turned-down rye was severely damaged in Rush Co. Calls from north-central Indiana began about 4 June, and continued through the middle of June. Most populations did not exceed 2-3 larvae/linear foot of wheat row, and didn't require treatment unless the larvae began cutting heads, which occasionally happened. BL trap collections peaked at about 1600 adults/trap/week.

Two species of aphids, the oat bird-cherry (*Rhopalosiphum padi* (Linnaeus)) and the English grain (*Macrosiphum avenae* (Fabricius)) which normally are abundant only in the southwest corner of the state, were numerous enough in small grains to attract attention as far north as the central and even northern districts. The infestations were too late in the season to do damage to the crops.

Hessian fly (*Mayetiola destructor* (Say)) remained at low levels. Of 260 fields in 48 counties surveyed, 13% were infested, only 3 of which had 10% of higher levels of infestation. The mean number of puparia/100 stems for all surveyed wheat was 0.9, the mean for cultivars resistant to Race B Hessian fly was 0.2, the mean for cultivars not resistant was 4.0.

Late instar nymphs of the chinch bug (*Blissus leucopterus* (Say)) were reported from 4 locations in Adams Co. about 15 July from corn fields next to wheat. None was economic, nor did any economic numbers show up in the fall, 1975, preferred host survey. The cereal leaf beetle (*Oulema melanopus* (Linnaeus)) rarely reached economic levels, but populations increased over 1975.

Forage Legumes and Soybeans

The number of larvae resulting from the hatch of overwintering eggs of the alfalfa weevil (*Hypera postica* (Gyllenhal)) are customarily a problem only along the Ohio River. In 1976 these eggs survived in such numbers and hatched so early that overwhelming numbers were present on very short alfalfa as far north as US 50. Insecticides were necessary so early that they were no longer effective when spring-laid eggs hatched, and a second treatment, or at least a stubble-spray, was often advised in that area.

Egg deposition started as usual in the fall of 1975. By 10 December eggs/square foot averaged 80 in the northern districts, 48 in the west central, 100 in the east central and 260 in the southern. Or, in a good stand in the southern districts, enough if all survived to supply each stem with 5 larvae. By 25 February egg counts in the southern districts had dropped to 120/square foot, indicating hatch. By 12 March the southwest corner of the state had 2.5 larvae/infested stem in alfalfa that averaged only 2.8". A comparison over several years is instructive. In south-central Indiana, at about the level of 300 heat units (base 48°F.), the following prevailed: (year, height, larvae per infested stem); 1973, 7", 1.7; 1974, 4.4", 0.9; 1975, 5", 5.7; 1976, 3.1", 3.4. By 24 March 10% of the stems in Harrison Co. had clutches of eggs. By 2 April untreated alfalfa at 4.9" had 5.6 larvae, and with an average of 1.5 eggs/stem, more larvae were still to come. When they hatched, even the most persistent pesticides applied to control overwintering larvae were no longer effective. And growth was insufficient to permit harvesting, so a second treatment was the only alternative.

Overwintering eggs appear to have survived in sufficient numbers as well in northern Indiana for the first time to be of importance. Treatment was necessary in most instances north of US 30. In the rest of Indiana north of Indianapolis economic infestations were uncommon although feeding was usually evident. South of Indianapolis damage was usually economic; a minimum of one treatment was necessary and 2 were needed south of US 50.

The potato leafhopper (*Empoasca fabae* (Harris)) is always a serious problem in Indiana alfalfa. However, it reached damaging proportions later than usual so that in 1976 its full impact was not felt until late August.

The Mexican bean beetle (*Epilachna varivestis* Mulsant) was more numerous on a state-wide basis in soybeans than in previous years, but peak populations usually occurred after the point at which greatest damage could have been inflicted. Except for Parke Co., this insect attacks soybeans only south of Indianapolis (One light infestation was observed in Tippecanoe Co. this year). There were reports of some damage in late June in Clay and Owen counties. Later in the year the heaviest infestations occurred in Ripley Co., with smaller areas in Daviess Co., and treated fields were observed in Morgan Co.

Fruits and Vegetables

The Colorado potato beetle (*Leptinotarsa decemlineata* (Say)) was much more abundant than it has been for some years, both in potatoes and occasionally in tomatoes. Both crops were attacked this year also by the potato flea beetle (*Epitrix cucumeris* (Harris)).

The imported cabbage worm (*Pieris rapae* (Linnaeus)) was more common in cole crops this year than the cabbage looper (*Trichoplusia ni* (Hübner)).

The striped cucumber beetle (*Acalymma vittata* (Fabricius)) was present in cold frames in Knox Co. by 30 April, and by 4 June was

present both in Knox and Tippecanoe counties at the rate of 8-10/cucumber plant. In early September they were observed at the rate of 30-40/blossom on butternut squash in Shelby Co.

Ornamentals, Forest and Shade Trees

Gypsy moth (*Porthetria dispar* (Linnaeus)) surveys recovered no moths in 1976. As a precautionary measure, a gypsy moth parasite release program was begun this year, and the following parasites were released in the following counties: *Brachymeria intermedia* Nees—Lake, Porter, LaPorte, Starke, St. Joseph, Steuben, Martin, Lawrence. *Palexorista inconspicua* (Meigen)—Lake, Porter, LaPorte, Starke, Marshall, Elkhart, St. Joseph, Steuben, LaGrange, Martin, Lawrence. Both species are capable of establishing on species other than the gypsy moth.

The forest tent caterpillar (*Malacosoma disstria* (Hübner)) was again present in numbers along the Lawrence (SC)-Martin (SW) county line, and some mortality has occurred especially among oak trees. From 6000 acres in 1975, the area this year was extended to about 15000 acres, including an area in Owen Co. near Cuba. A reduction in the severity of the attack appears likely for 1977, except for smaller areas.

Fall webworm (*Hyphantria cunea* (Drury)) attacks were light through the state except for an area along the Porter-LaPorte Co. line, and some trees in Shakamak State Park.

Japanese beetle (*Popillia japonica* Newman) adults were first observed 18 June in Elkhart Co., earlier than usual. Adults were conspicuous in some Newton Co. soybean fields, which has not happened in some years, and they were reported destroying ornamentals in Tippecanoe Co. and other places.

Man and Animals

The following is a review of the inquiries received by Purdue Extension staff concerning household arthropod problems. For convenience synanthropic arthropods are here grouped according to their intimacy with their hosts. Of the arthropods that only accidentally invade the home spiders were still the most commonly reported, followed closely this year by Collembola, the latter at twice their usual number. Moth flies (Psychodidae) were much less frequently reported than average. Among commensals the Indian meal moth (*Plodia interpunctella* (Hübner)) was reported more often than at any time in 10 years. A cabinet beetle, *Trogoderma ornatum* (Say), occupied second place and was reported more this year than in the previous 9 years together. Of the insects that feed upon so-called non-edible properties the black carpet beetle (*Attagenus megatoma* (Fabricius)) was most often reported, followed immediately by the carpet beetle (*Anthrenus scrophulariae* (Linnaeus)). Both of these were at 10-year highs. Termites were reported an average number of times, but the carpenter ant (*Camponotus* sp.) was reported only half as frequently as usual. Among the arthropods that invade our person the clover mite (*Bryobia praetiosa* Koch) was the most frequently reported.

Of the arboviruses, 18 cases of St. Louis encephalitis and 3 of California encephalitis were recorded by mid-November, as compared with 323 cases of the St. Louis strain alone in 1975.

Beneficial Insects

An attempt was made to estimate the rate of parasitization of the alfalfa weevil by 2 species of *Bathyplectes*. During the month of May collections of alfalfa weevil larvae from all districts yielded the following rates (mean %) of parasitization by *Bathyplectes curculionis* (Thompson): the lowest rate—4%—was in the northwest district. The west central had 48, the south central had the highest—57, the southwest had 28 (one-field sample) while the rest of the state ranged between 17 and 20.

Bathyplectes anurus (Thompson) is confined to south central and southwest Indiana. In the former, in April, it occurred in 8.3% of the alfalfa weevil larvae held for rearing; in May, 1.3%. In the southwest, where it has only recently arrived, it appeared in April in 0.19%, in May in 0.4% of the hosts.

The alfalfa weevil egg parasitoid *Patasson luna* (Girault) was present in 3.5% of 801 alfalfa weevil eggs collected from the northern half of Indiana on 10-11 December 1975.

Only 23.8% of the 421 field-collected black cutworm larvae held for rearing were parasitized this year, as compared with about 60% in 1975. Of this percentage 14.3% were parasitized by *Meteorus leviventris* (Wesmael), 5.2% by the tachinid fly *Bonnetia compta* (Fallen), the remainder by other species.

Cereal leaf beetle larvae parasitized at the rate of 28% by *T. julis*, 20% by *Diaparsis* spp. and 2% by *Lemophagus curtus* Townes were released at 3 sites in each of the counties between Morgan Co. east to Union Co. inclusive and as far south as Perry Co.

The sarcophagid parasite *Sarcophaga aldrichi* Parker parasitized 30% of the forest tent caterpillar (*Malacosoma disstria* Hübner) larvae collected in the outbreak area in Lawrence Co. (SC) as of 20 July.

Adult lady beetles, *Coleomegilla maculata* DeGeer were present in most southern alfalfa fields by mid-April, and larvae were approaching maturity by mid-May. The numbers of this species observed on corn during the annual summer (July) corn survey were much higher than in previous years, 294 on 2400 stalks (96 fields), as compared with 192 in 1975, 87 in 1974. The increase was more than likely due to the large numbers of aphids that occurred earlier in the year on small grains. Of the 294, 16 were parasitized by *Perilitus coccinellae* Schrank and 3 were dead of unknown causes. A flight of this beetle was detected by sticky traps in Tippecanoe Co. between 2-4 October. A similar flight, detected by rotary trap, occurred between 27 September and 1 October in 1975.