

## ENTOMOLOGY

### Insects and Other Arthropods of Economic Importance in Indiana During 1977.

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#### Introduction

Because the biology of many of our pest species is not yet well enough known, the effect of climate on abundance and activity cannot always be determined. The difference between 1975 and 1976 fall oviposition by the alfalfa weevil probably is weather-related, but what the factor is cannot be stated with certainty. The "premature" activity of many insects (Table 2 has dates for first and peak activity of many species) in 1977 is probably weather-related, and the severe setback in population numbers that the bagworm suffered is almost certainly due mostly to the cold. Some cold-susceptible insects on the other hand survived; the snow cover was probably responsible for that. But insect activity in general was less than normal in 1977. Fewer calls for extension service help, fewer nursery inspection problems, fewer arboviral infections.

January averaged 9° F., 18° below normal for the month. Soil moisture was adequate through May even though rainfall was less than normal. June and July were both hot and dry, and August was cool and wet. The weather, in short was excellent for farm operations, permitting early planting and excellent harvesting conditions. And the dry period, though reducing yields in some crops, was not enough to seriously affect our two largest cash crops, corn and soybeans. In addition, it was a good year for cutworms and other lepidopterans.

#### Corn and Small Grains

Adults of the western corn rootworm (*Diabrotica virgifera* LeConte) appeared earlier (Table 1 gives available developmental data), in greater

TABLE 1. New State (\*) and County Records for 1977

Organism	County
<i>Anaphes flavipes</i> (Forster)	Whitley, Jay, Bartholomew, Marion, Hendricks, Shelby
<i>Bathyplectus anurus</i> (Thomson)	Bartholomew, Decatur, Clark, Dearborn, Jefferson, Jennings, Ripley, Scott, Switzerland, Brown, Monroe, Perry, Martin
<i>B. curculionis</i> (Thomson)	Bartholomew, Decatur, Jefferson, Ohio, Scott, Switzerland, Monroe, Perry, Martin, Pike, Vanderburgh
<i>Chorizococcus lounsburyi</i> (Brain)	Marion*
<i>Diabrotica virgifera</i> (LeConte)	Fayette, Union, Wayne, Dearborn, Franklin, Ripley, Scott, Lawrence, Monroe, Daviess, Dubois, Martin
<i>Diaparis</i> sp.	Huntington, Franklin
<i>Lemophagus curtus</i> Townes	Franklin
<i>Microctonus aethiopoides</i> Loan	Bartholomew, Scott
<i>Tetrastichus julis</i> (Walker)	LaGrange, Noble, Steuben, Wells, Whitley, Carroll, Lake, Jay, Blackford, Wayne, Fayette, Madison, Marion, Putnam, Owen, Brown, Monroe

TABLE 2. Date of first appearance and/or peak population of several species of insects.

Organism	Stage	Occurrence:			Data Source
		First	Peak(s)	County	
Apple maggot	Adult	17 Jun		Tippecanoe	N.J. light
	Adult		6 Jul	Knox	Pheromone
Armyworm	Ad., 1st flight	29 Mar	21 Apr	Tippecanoe	BL trap
	Ad. 2nd flight		19 May	Tippecanoe	BL trap
	Ad. 3rd flight		16 Jun	Tippecanoe	BL trap
	Ad. 4th flight		11 Aug	Tippecanoe	BL trap
<i>Bathyplectes anurus</i>	Adult	30 Mar		Harrison	Sweep
<i>B. curculionis</i>	Adult	4 Apr		Harrison	Sweep
Black cutworm	Ad., 1st flight	8 Apr	23 Jun	Tippecanoe	BL trap
Cereal leaf btle	Adult	28 Mar		Harrison	Sweep
<i>Chrysopa carnea</i>	Adult	9 Mar		Tippecanoe	N.J. light
	Ad. 1st flight		17 Jun	Tippecanoe	Sticky t.
	Ad. 2nd flight		4 Aug	Tippecanoe	Sticky t.
<i>Chrysops cincticornis</i>	Adult	7 May		Washington	Bait
<i>Chrysops niger</i>	Adult	8 May		Scott	Bait
Codling moth	Ad., 1st flight	20 Apr	1-18 May	Knox	Pheromone
	Ad. 2nd flight		6 Jul	Knox	Pheromone
	Ad. 3rd flight		17 Aug	Knox	Pheromone
Convergent lady beetle	Ad. 1st flight		17 Jun	Tippecanoe	Sticky t.
	Ad. 2nd flight		28 Jul	Tippecanoe	Sticky t.
	Ad. 3rd flight		9 Sep	Tippecanoe	Sticky t.
Corn earworm	Ad., 1st flight	3 Aug	8 Sep	Tippecanoe	BL trap
European corn borer	Ad., 1st flight	15 May	26 May	Tippecanoe	BL trap
	Ad. 2nd flight		21 Jul	Tippecanoe	BL trap
	Ad. 3rd flight		1 Sep	Tippecanoe	BL trap
European red mite	1st instar	19 Apr		La Porte	Observed
Fall armyworm	Ad., 1st flight	8 Jul	18 Aug	Tippecanoe	BL trap
Lesser peachtree borer	Ad., 1st flight	20 Apr	11 May	Knox	Pheromone
	Ad. 2nd flight		22 Jun	Knox	Pheromone
	Ad. 3rd flight		17 Aug	Knox	Pheromone
Meadow spittle bug	1st instar	28 Mar		Harrison	Observed
Mexican bean beetle	O/wintering ad.	29 Apr		Owen	Observed
	1st gen. eggs	3 Jun	16-27 Jun	Lawrence	Research
	1st instar	16 June		Lawrence	Research
	O/wintering ad.		20 Jun	Lawrence	Research
	1st gen. larvae		30 Jun	Lawrence	Research
	1st gen. pupae		18 Jul	Lawrence	Research
	1st gen. adults	7 Jul	14-21 Jul	Lawrence	Research
	2nd gen. eggs	7 Jul	25-28 Jul	Lawrence	Research
	2nd gen. 1st ins	21 Jul		Lawrence	Research
	2nd gen. larvae		4-11 Aug	Lawrence	Research
Northern corn rootworm	2nd gen. adult	15 Aug		Lawrence	Research
	Adult		21 July	Tippecanoe	Sticky t.
Obliquebanded leafroller	Ad., 1st flight	c.11 May	18 May	Knox	Pheromone
	Ad. 2nd flight		16 Sep	Knox	Pheromone
Oriental fruit moth	Ad. 1st flight		20 Apr	Knox	Pheromone
	Ad. 2nd flight		6 Jul	Knox	Pheromone
	Ad. 3rd flight		3-30 Aug	Knox	Pheromone
Peachtree borer	Ad. 1st flight		3 Aug	Knox	Pheromone

Organism Organism	Stage	Occurrence:			Data Source
		First	Peak(s)	County	
Plum curculio	Adult	1 May		Tippecanoe	Jarring
Redbanded leafroller	Adult	26 Mar		Tippecanoe	Pheromone
	Ad. 1st flight		20 Apr	Knox	Pheromone
	Ad. 2nd flight		1 Jun	Knox	Pheromone
	Ad. 3rd flight		10 Aug	Knox	Pheromone
	Ad. 4th flight		16 Sep	Knox	Pheromone
Spotted lady beetle	Ad. 1st flight		3 Jun	Tippecanoe	Sticky t.
	Ad. 2nd flight		18 Aug	Tippecanoe	Sticky t.
	Ad. 3rd flight		9 Sep	Tippecanoe	Sticky t.
Variegated cutworm	Ad., 1st flight	1 Apr	21 Apr	Tippecanoe	Sticky t.
	Ad. 2nd flight		23 Jun	Tippecanoe	Sticky t.
	Ad. 3rd flight		8 Sep	Tippecanoe	Sticky t.
Western corn rootworm	Adult	15 Jun		Parke	Observed
	Adult		4 Aug	Tippecanoe	Sticky t.

numbers in a larger portion of the state than ever before (See Table 2 for new county records: this species has been found in all counties except 19 in the southernmost part of the state). The masses of adults that invaded Lake Michigan recreation areas during the first week of August, rendering both the water and shore unfit for recreation, were a spectacular though probably unique manifestation of this abundance. Fields with adult populations of 4+ / plant were easy to find as far south as Tippecanoe Co. (where at least 20,000 acres—out of 120,000—were treated for the control of adults feeding on silks). Quart-size yellow sticky traps collected 15, 12, 19 and 11 adults/trap/day during the 4 weeks from mid-July to mid-August in an untreated cornfield in Tippecanoe County which had a good population last year. Large numbers of adults in areas where they were previously scarce caused growers to apply pesticides in record amounts to prevent silk losses, but probably only a third or less of the estimated 300,000 acres so treated (@\$7/acre) were in any real danger. These applications, plus soil treatments to an estimated 2-2.25 million acres (nearly all in the northern half of the state) @ \$8/acre plus losses in both treated and untreated corn make this the number 1 pest in corn in 1977.

Adults averaged about 20/25 stalks in 75 fields in the northern districts surveyed from 1-3 August; at the same time northern corn rootworms (*D. longicornis* (Say)) averaged 3/25 stalks. In the central districts a week earlier westerns averaged 6, northerns 10/25 stalks, the latter the more numerous because westerns have only recently reached the areas south of Indianapolis.

No soil-borne lepidopteran was of significance in corn this year; the sandhill cutworm (*Euxoa detersa* (Walker))—which damaged the corn in sandy ridges in 5000 acres of corn—the darksided (*E. messoria* (Harris)), the dingy, (*Feltia subgothica* (Haworth)), the claybacked (*Agrotis gladiaria* (Morrison))—all uncommon in corn—as well as the usual black cutworm (*A. ipsilon* (Hufnagel)), were reported mostly from the northern districts.

The state average of 68.4 larvae/100 stalks was the third highest in the history of the Indiana European corn borer (*Ostrinia nubilalis* (Hübner))

survey; only the 1973 average of 110 and the 1971 average of 100 were higher. The north-eastern corner of the state had lower numbers than average, the south-eastern higher than ever before. Orange Co. had the highest county average (238/100) (not all counties were surveyed) and the highest single farm average was 1000/100 stalks, in Greene Co.

Among the ear-feeding insects the fall armyworm (*Spodoptera frugiperda* (J. E. Smith)) far outnumbered the corn earworm (*Heliothis zea* (Boddie)); either one or the other was found in nearly 6% of the ears, with but small loss (about 5.7 lbs/acre on the average). The fall armyworm was extremely abundant this year, and was found in the stalks and shanks (which it occasionally severed) as well as in the ear. It would have been a significant insect had it arrived before the kernels hardened. Bird damage was also light (a loss of an average of 1.6 lbs/acre); the early planting probably was a factor among all the ear-feeding animals and the aphids.

Only 32% of the stalks examined (7500) over the state in the fall corn insect damage survey showed evidence of having served as host to the corn leaf aphid (*Rhopalosiphum maidis* (Fitch)), and most of the infestations were light and late. A field of susceptible (Kentucky 27) corn of appropriate age averaged 47% fewer (after adjustment for stand) than the 1976 level of 581/stalk (1975 = 934/stalk).

Severe infestations by the greenbug (*Schizaphis graminum* (Rondani)) were observed in sorghum in the WC district at the end of May. One treatment was necessary; predators kept them in control following the treatment to such an extent that the only greenbugs left on the plants were in the whorls, an unusual place for this species. The cereal leaf beetle (*Oulema melanopus* (Linnaeus)) was of no consequence in small grains with the possible exception of some fields of wheat grown for forage and some oat fields in Harrison Co. Several of these were conspicuously silvered. Larvae were to be found in many northern and eastern fields, however; last year they were generally difficult to find.

While Hessian fly (*Mayetiola destructor* (Say)) infestations were still at low levels, they were twice numerous as last year and the highest in 4 years. Of 285 fields surveyed in 44 counties, 35% were infested; 13 fields had infestations higher than 10%. The mean number of puparia/100 stems for all surveyed wheat was 1.7, the mean for cultivars resistant to Race B Hessian fly was 0.8, the mean for cultivars having no source of resistance, 4.9. The fall 1976 survey of preferred overwintering sites of the chinch bug (*Blissus leucopterus* (Say)) collected no chinch bugs. A few were taken outside the survey area in Adams Co., however, and they were occasionally reported from the same county in 1977 in non-economic numbers in corn. The insect has also been collected from turf for several years, first in the Richmond area, and in 1977 as far west as Tippecanoe Co.

#### Forage Legumes and Soybeans

Alfalfa weevil (*Hypera postica* (Gyllenhal)) egg deposition usually begins after temperatures moderate in the fall. In contrast to the fall of 1975, when egg numbers in Harrison Co. alfalfa averaged in excess of 70/quarter square foot,

the fall, 1976, average was about a tenth of that. Spring oviposition also lagged; by 28 March there were only about 30, and by 4 April about 66/quarter square foot. Springlaid eggs began to hatch in numbers by 14 April, but by then alfalfa was approaching maturity. By the 20th it was 19" tall and still averaged only about 2.3 larvae/infested stem. For the first time in at least 5 years, a well managed alfalfa field in the southern third of Indiana generally did not need a control treatment where the harvest was properly timed. A stubble treatment after the first cutting was often necessary, however. For not only were alfalfa weevil larvae present, but this year clover leaf weevil (*H. punctata* (Fabricius)) larvae were present and sometimes more effective in retarding growth than were the alfalfa weevils. And for the first time in at least 10 years alfalfa was invaded by cutworms in significant numbers. Oviposition by the variegated cutworm (*Peridroma saucia* (Hübner)) was observed on small plastic white flags planted in Harrison and Washington Co. alfalfa fields between 15 and 29 April. Mature larvae were present at the time of the harvest in numbers large enough to seriously delay regrowth in a number of fields in those counties as well as in Knox Co. (Up to 13/sq. ft. were counted under newly windrowed alfalfa in the latter county.) Incidentally, although white flags as well as flags of other colors were planted in areas where adults were known to be present, they were never again used as oviposition sites. Later, in the last week in August, fall armyworms removed all of the leaves of 2 acres of alfalfa in a large field in Harrison Co. This was the most severe infestation observed, but larvae were widespread in this crop as well as in corn in the southern third of the state. Adult Mexican bean beetles (*Epilachna varivestis* Mulsant) invaded alfalfa fields in September in such numbers, especially in Harrison and Washington Co., that a few growers were forced to treat for them. On the other hand the potato leafhopper (*Empoasca fabae* (Harris)) was less of a problem than usual; the 1st and 2nd cuttings escaped injury entirely, though the 3rd and 4th in some cases were treated.

In the fall adult alfalfa weevils appeared as early as the last week of August—at the rate of 1/sweep in a Fulton Co. field, a rate that was reached by 4 Nov. in a Warren Co. field. These are very high numbers for this part of the state, where economic infestations are not the rule.

The Mexican bean beetle is primarily a pest of beans. In soybeans it was of importance especially through most of the SE district, in a few counties in the SC, in Daviess Co. in the SW and in Clay, Owens, and Parke in the WC. Populations in soybeans were observed as far north as the northern border of Wayne Co. in the east and the southwest corner of Montgomery Co. in the west, both the northernmost extensions of this pest on soybeans so far observed. Between 250,000 and 300,000 acres of soybeans were treated for this pest in 1977. The green cloverworm (*Plathypena scabra* (Fabricius)) was almost at outbreak levels as well, particularly in Benton, White and Jasper counties in August. Possibly 2% of the susceptible crop was endangered.

#### Vegetables

The most important insect in Indiana gardens in 1977 was probably the variegated cutworm. It was a problem especially in cabbages and tomatoes, but attacked a large variety of other garden plants and flowers. The cabbage looper

(*Trichoplusia ni* (Hubner)) and the imported cabbage worm (*Pieris rapae* (Linnaeus)) were also important in cole crops, but not the diamond back moth (*Plutella xylostella* (Linnaeus)).

The first generation population of the Colorado potato beetle (*Leptinotarsa decemlineata* (Say)) was economic, especially in the northern part of the state; the second was not. Corn earworms were an important pest in both sweet corn and tomatoes in August and early September. It and the European corn borer devastated snap beans in the Vincennes area during the same period, often rendering the pods unsaleable. Root maggots seem to be on the increase, as well.

### Ornamentals, Forest and Shade Trees

In general, the elm leaf beetle (*Pyrrhalta luteola* (Muller)), the mimosa webworm (*Homadaula anisocentra* Meyrick) and sod webworm (*Pediasia*, *Crambus* sp. populations were down, and the bagworm (*Thyridopteryx ephemeraeformis* (Haworth)) was virtually wiped out except for warmer portions of the state. The black vine weevil (*Otiorrhynchus sulcatus* (Fabricius)) on the other hand, was reported much more frequently, particularly from *Taxus* but also from blueberries and rhododendrons. The obscure scale (*Melanaspis obscura* (Comstock)) was also common especially on pin oaks. The big news among forest insects was again the forest tent caterpillar (*Malacosoma disstria* Hübner), whose 1977 expansion together with acres previously covered exceeded 30,000 acres.

There were a few reports of a small scarab (*Ataenius spretulus* (Haldeman)) attacking turf; this insect has frequently been reported from the same host in Ohio. The bluegrass billbug (*Sphenophorus parvulus* Gyllenhal) was reported from a golf course in Wells Co., in damaging numbers.

The species of insects reported most often by nursery inspectors during 1977 are the following:

1. Fall webworm (*Hyphantria cunea* (Dury))
2. Maple bladdergall mite (*Vasates quadripes* Shimer)
3. Boxelder twig borer (*Proteoteras willingana* (Kearfott))
4. Bronze birch borer (*Agrilus anxius* Gory)
5. Oystershell scale (*Lepidosaphes ulmi* (Linnaeus))
6. Cooley spruce gall aphid (*Adelges cooleyi* (Gillette))
7. Velvet mite (*Eriophyes aceris* (Riley))
8. Japanese beetle (*Popillia japonica* Newman)
9. Potato leafhopper (*Empoasca fabae* (Harris))
10. Euonymus scale (*Unaspis euonymi* (Comstock)) and Painted maple aphid (*Drepanaphis acerifoliae* (Thomas))

### Man and Animals

The following is a review of the inquiries received by Purdue Extension staff concerning household anthropod problems, which for convenience are grouped according to their intimacy with their hosts. An average year brings 251 inquiries concerning household nuisances. This year only 191 such inquiries were made, the lowest in at least the last 10 years, and the first to fall below the 200 mark. The

greatest shortfall was among the "accidental invaders of the home" category, which dropped from an average of 99 to 65. Only the strawberry root weevil (*Otiorhynchus ovatus* (Linnaeus)) was reported in excess of its usual number of times—more often (12 times) than in any of the preceding 10 years. Large swarms of the larger yellow ant (*Acanthomyops interjectus* (Mayr)) were observed on 2 and 8 July in Henry Co.

Creatures that live full time in man's houses—moth flies, sow bugs and so forth,—but do not normally share his food, were complained of but 6 times, a third of the usual, with moth flies (Psychodidae) heading the list. Commensals—extension calls average 73 annually—dropped to 53, and the Indian meal moth (*Plodia interpunctella* (Hubner)) which for the last 6 years has headed the list, became second behind the foreign grain beetle (*Ahasverus advena* (Waltl)), recorded 9 times. The flat grain beetle (*Cryptolestes pusillus* (Schonherr)) and the Australian spider beetle (*Ptinus ocellus* Brown) may have been in the state for many years; they were however identified for the first time from materials sent to the extension department and are thus newcomers to the list.

Insects that feed upon so-called inedibles dropped only slightly in numbers of inquiries. The black carpet beetle (*Attagenus megatoma* (Fabricius)) remained the most commonly reported. New to this category last year was the brown house moth (*Hofmannophila pseudospretella* (Stainton)); it was reported again this year. The eastern subterranean termite (*Reticulitermes flavipes* (Kollar)) was reported at average levels, and led the list of arthropods that damage homes.

Arthropods that bite or other wise attack man were reported 30 times, slightly above the 25 that is average, with the clover mite (*Bryobia praetiosa* Koch) in the lead. Two new arthropods were added to this group. The first is a centipede, *Hemiscolopendra punctiventris punctiventris* (Newport), taken in a Harrison Co. bedroom from the leg of a child. The child had been bitten several times, and this centipede was believed to have been the attacker. The second is a milichiid fly of the genus *Desmometopa* near *m-nigrum* (Zetterstedt). Larvae of this species were eventually found breeding in the dead space between two walls of a hospital in Miami Co., a space to which water had been admitted as a result of a construction project. Adults which emerged from the soaked debris found their way through the lighting system to the operating room to which they were attracted by open wounds and apparently the soap used for scrubbing or other odors associated with scrubbing.

Blackflies (Simuliidae) were extremely abundant in several White Co. communities early in May, driving children from the playgrounds and golfers from the links.

Only 10 cases of St. Louis encephalitis and 2 of the LaCrosse strain had been confirmed in the state by mid-November.

### Beneficial Insects

(For range extensions of some beneficial insects see Table 1).

*Pediobius foveolatus* (Crawford), an exotic parasite of the Mexican bean beetle, was released for the first time in June in Scott and Clay Counties. It was

probably an unfavorable time to release this parasite, a hot and dry period, but it provided protection in at least some parts of Scott Co.

*Rhinocyllus conicus* Froelich, a weevil, was released in Jefferson, Johnson and Switzerland Counties in an effort to control the musk thistle (*Carduus nutans*).

The spotted lady beetle (*Coleomegilla maculata* DeGeer), was less abundant this year than in previous years, both in alfalfa and in corn. On 7500 corn stalks surveyed during the annual corn insect survey only 79 were observed, as compared with 121 on 4725 stalks in 1976, and 159 on 4700 stalks in 1975. On sticky traps in cornfield in Tippecanoe Co. they were outnumbered by *Hippodamia convergens* Guerin-Meneville, the usually less common convergent lady beetle. There was also no indication of a fall flight, which usually occurs about October first.