

## **Insects and Other Arthropods of Economic Importance in Indiana During 1980**

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### **Introduction**

The winter of 1979-1980 was relatively mild. Abundant snow cover (particularly in the southern part of the state) kept soils from freezing to their normal depth. A wet and cool March was followed by April, May and June rain deficits which gradually depleted the moisture in the saturated soils. The first 2 weeks of June were warmer than normal, but the very warm period in July was probably the most crucial for the corn crop. The heat combined with a shortage of moisture at pollination and silking time caused a number of anomalies that resulted in reduced fertilization and subsequent yield losses. Soybeans, which have a longer flowering period, suffered less than corn; soybeans were nevertheless shorter, the stems with fewer pods than normal at the base. The shorter and therefore more erect plants often failed to close the rows, encouraging weed growth. The drought stresses were most severe in the WC (west central) and NW districts, both important corn growing areas. On the other hand, the weather was excellent for planting and harvesting, both of which were completed ahead of normal.

### **Corn and Small Grains**

Soil treatments were applied to about 47% of the 6,100,000 acres of grain corn in Indiana to prevent injury primarily by the corn rootworm complex (Western corn rootworm - *Diabrotica virgifera*, and northern corn rootworm - *D. longicornis*) in 1978, the last year for which firm data exist (5). Except for increases due to inflation, 1980 pesticide costs are not expected to differ a great deal. Two other factors, however, must be added. One involves pesticide efficacy: there were reports of insecticide failures. The other involves the spread of economic populations into corn growing areas not previously seriously infested; to some extent the land once treated "for insurance," i.e., treated whether populations were known to be present or not, is becoming land where treatment (or crop rotation) is needed. In short where once only 40% of the treated acreage was actually infested, this year perhaps 50% or more was at risk.

Surveys conducted during the last half of July and early August indicated a state average of beetles/plant double that of 1979, a jump from 0.30 to 0.63 beetles/plant. The counties with the highest averages were in the EC district - Wayne, Union and Fayette counties averaged 2.0 beetles/plant. This is an extension south and east of beetle stress. On a district basis, the NC and EC averaged 1.2 the NW, WC and C averaged 0.9 adults/plant. Southern populations were all under 0.2, and even the NE averaged only 0.4. Over the years the western corn rootworm (WCR) has gradually come to outnumber the NCR and this year WCR:NCR relationships were 95:5 over all except in the southern districts. The two species were in about equal numbers in the SC; in the other southern districts the NCR still outnumbers the WCR. Although there undoubtedly were fields in which silks were damaged seriously by adults, especially where late-planted fields were near early-planted, infested fields, no such field was observed among the more than 400 visited; however a rough, preliminary estimate puts at 70,000 the acres treated to protect silks.

Development proceeded as follows. First instar larvae were collected on 5 June and on 18 June, again in Tippecanoe Co., 54% of the larvae were 1st instars, 35% second and 11% third. A week later the seconds were the most abundant (47%), and on 2 July, when 46% were thirds, the first adult WCR was dug from the ground. Peak emergence from the ground of adults was reached during the week ending 23 July, for both species, and stick-trap catches peaked during the 7 days following.

Adult western corn rootworms were collected for the first time from Brown, Floyd, Harrison, Crawford, Ohio, Switzerland and Clark counties.

European corn borer (*Ostrinia nubilalis*) numbers fell to a state average of 68 live 4th and 5th instar larvae/100 stalks as counted during the fall survey (Sept. and Oct.), near the 20 year (1961-1980) average of 62. Only in the northern districts were the averages above the 20 year levels. Starke Co. averaged 377/100 stalks, with numbers tapering off in all directions from that county. A new pupa was seen in Rush Co. on 20 May, but pupae were probably present earlier as 1st and 2nd instar larvae were collected in Knox and Gibson counties by 6 June. Adults were reported from black light traps on 28 May in Hendricks and LaGrange Cos. BL trap numbers peaked for the 1st time in the latter county on 11 June. There were no breaks between the 1st and 2nd flights, or for that matter, between the 2nd and 3rd. Other peaks occurred on 13 August and 17 September. If a third generation occurs in Indiana it usually is confined to the SW district, but this year early instars were present at the end of September even in the northern districts.

Attacks by the black cutworm (*Agrotis ipsilon*), the dingy cutworm (*Feltia ducens*) and sandhill cutworm (*Euxoa detersa*) on corn were reported but were minor problems, fewer than usual. Some wireworm reports, usually on corn in a wheat, soybean, soybean and corn sequence, were received, as well as a few armyworm (*Pseudaletia unipuncta*) - the latter in one case in a no-till field - cases. Most unusual was the loss of about 20% of a 126 acre field due to common stalk borer (*Papaipema nebris*). Normally active only at field edges, in this instance the larvae occupied large patches in a corn field planted no-till in rye.

Corn leaf aphid (*Rhopalosiphum maidis*) infestation rates dropped from 47% infested in 1979 to 30% in 1980. These figures fail to bring out an unusual situation that is reflected by the jump in the rate of severely infested plants from about 1% in 1979 to 3% in 1980. About mid-July, populations in excess of 20,000/plant began to appear on grain corn particularly in the WC district. They covered not only the tassel (in fact, because that portion suffered an early decline as a result of high temperatures and drought, it was not always infested) but also the top leaves (not necessarily the topmost); such colonies were highly visible, instigating many grower inquiries. Often these infested leaves were intermingled with whitened, blasted leaves, heightening the contrast. These infestations appeared first in fields planted in sandy or gravelly soils near the Illinois line, and on hill tops, although not all stressed fields were infested with aphids. Undoubtedly such numbers added to stresses already present, but most of the loss was probably due to the drought. Five percent of the plants surveyed were barren, and another 5% produced mere nubbins. In more normal years only 1% or less fall into each of these categories.

In that connection, smut galls were more common than usual; 6% of the plants were infected, double the infection rate of last year. The counties from Clinton to Grant and as far north as Miami were the most heavily infested, averaging up to 21%. Weed control, on the other hand, was generally good.

Only 2% of the ears showed any signs of bird attack, and a similar number

showed feeding by the corn earworm (*Heliothis zea*) and the fall armyworm (*Spodoptera frugiperda*). Of the larvae still present at survey time, 89% were corn earworms, 11% fall armyworms. Because of the poor fill at the ear tips, kernel losses to these larvae were minimal.

The oat bird-cherry aphid (*Rhopalosiphum padi*) was present in only 13% of the corn fields, just half those of last year, and they were rarely numerous.

The mean percentage infestation by the Hessian fly (*Mayetiola destructor*) for wheat was 1%, very nearly the low figure that applied in 1979. There was a mean of 1.2 puparia/100 stems.

### Forage Legumes and Soybeans

An estimated 200,000 acres of soybeans were treated for the control of Mexican bean beetles (*Epilachna varivestis*) during 1980. Beetle attack reached its highest levels in Owen and Clay counties with extensions in contiguous counties as far south as Daviess Co., and westward into Vigo Co.; Monroe Co. had heavier infestations than usual, and Morgan, lighter. Elsewhere only scattered fields reached economic levels. The beetle tends to extend its soybean territory northward each year. Two years ago Richmond on the east side of the state marked its most northern extension. This year a heavily infested field was seen on the outskirts of Winchester 25 miles north. For the second year a light infestation was reported from Tippecanoe Co. In summary, while the beetles were probably more numerous this year, and more widespread, the damage was less, and probably only half the treated acreage was profitably treated.

Adults were reported as early as 3 May from Franklin and Jackson Co. alfalfa fields, and from trap crop snap beans in Jennings Co. on 21 May. Egg masses were present on soybeans in Monroe Co. by 4 June and 1st instars by 10 June. The following data were collected at 2 week intervals in 10 soybean fields in Bartholomew and Jennings counties by sweeping. Overwintering adults averaged 0.5/sweep on 17 June, 1st generation adults, 2.7/sweep on 27 July. First generation larvae of all ages averaged 0.9/sweep on 22 August, with 3rd and 4th instars 9 times as common as early instars.

An estimated 20,000 acres of soybeans were treated for the control of green cloverworm (*Plathypena scabra*), especially when grasshoppers (*Melanoplus* spp.) added to leaf loss. The latter were more common this year than usual, and often inflicted conspicuous damage especially at field edges.

Because of the scattered nature of the attack, it is difficult to estimate the number of acres that were attacked by bean leaf beetle (*Cerotoma trifurcata*). This insect, which normally ends its activity when the beans enter their reproductive phases or before, this year attained economic numbers in soybeans at pod-fill stages as late as August. Most of these attacks occurred in Sullivan and Daviess counties.

A leaf-mining beetle, *Odontota horni*, was observed at the rate of about 1/sq. meter in a soybean field in Starke Co. These adults had probably emerged from soybean leaves as abandoned mines were present. Adults of this species were numerous enough to be noted from beetle samples collected from the shores of Lake Michigan. The species, in the same genus as the locust leaf minor (*O. dorsalis*) which more frequently attacks soybeans, is said to breed normally in tick-clover (*Desmodium rigida*). The larvae have not been described. Isolated specimens of this species have been collected from soybeans before, but never in such abundance.

The soybean cyst nematode (*Heterodera glycines*) was reported for the first time from Benton Co., a new county record. They were collected from the roots of soybeans 2 September near Earl Park by John Ferris who also identified them.

An estimated 25,000 acres of alfalfa were treated for the control of alfalfa weevil (*Hypera postica*) larvae in alfalfa; 20,000 of these were in the state south of US 50, and the remainder between that highway and Indianapolis. Treatment elsewhere was sporadic. Treatment south of Indianapolis was probably inadequate as severe defoliation was observed as far north as Vermillion Co. on the west side of the state and Randolph on the east. Many growers were able to use the early harvest of the first cutting as a control measure. In less severe attacks, regrowth almost masked the damage done by larvae at their peak numbers; this situation was common.

Three hundred thirty alfalfa samples 15 cm<sup>2</sup> from throughout the state collected during November and December of 1979 averaged 5.6 eggs/sample with no significant differences between the northern, central or southern districts (Range in means from 0 to 16.9). (In the fall of 1978 the southern districts had 4 times as many eggs as the northern, the average was 17 and the range 1-74). By the end of April, 1980, larvae averaged 4/infested stem in alfalfa 26cm tall in the SC district, averaged 84% infested. At the same time WC infestations averaged 22%, with 0.7 larvae/infested stem in alfalfa 16 cm tall (Infestations ranged from 0-72%). In mid-May northern districts ranged from 0-42% infested (average 20%) in alfalfa 30 cm tall, with about 1.5 larvae/infested stem.

Probably fewer than 50,000 acres of alfalfa were treated for the control of the potato leaf hopper (*Empoasca fabae*) during 1980. The species was less of a problem than normal.

### Vegetables

(This vegetable summary, provided by Alan C. York, was based on numerous visits to both commercial and private acreages, and telephone and written reports received through the extension services.) Only the imported cabbageworm (*Pieris rapae*) appeared in normal - and damaging - numbers on cole crops. Cabbage looper (*Trichoplusia ni*) and diamondback moth (*Plutella xylostella*) larvae were fewer than normal, there were a few reports of zebra caterpillar (*Ceramica picta*), and cabbage aphids (*Brevicoryne brassicae*) were virtually absent.

Colorado potato beetles (*Leptinotarsa decemlineata*) were in below-normal numbers in both generations with the possible exception of central Indiana. Most other pests of solanaceous crops were at normal levels: potato leafhopper (*Empoasca fabae*), potato flea beetle (*Epitrix cucumeris*), and tomato fruitworm (*Heliothis zea*) (there was some influx of those from early maturing field corn). Aphids, both the green peach (*Myzus persicae*) and the potato (*Macrosiphum euphorbiae*), were almost absent. The tobacco hornworm (*Manduca sexta*) on the other hand was more numerous than at any other time in the last six years, at least in the NW district. Some tomato fields there were stripped of leaves from early to mid-September.

European corn borer (*Ostrinia nubilalis*) larvae attacking several categories of garden produce, were extremely numerous in September in what appears to have been a third generation.

Squash vine borer (*Melittia satyriniformis*) larvae were early and numerous again, and the squash bug (*Anasa tristis*) was more numerous. Striped cucumber beetle (*Acalymma vittatum*) adult activity was brief and low in number the first

generation. The second generation was normal. Spotted cucumber beetle (*Diabrotica undecimpunctata howard*) numbers were also about average.

The aphid *Brachycolus asparagi* was collected for the first time in the state by James Clark, 27 August, a new state record. It was subsequently collected in Johnson Co. (8 Sep. by John Favinger), Vigo Co. (Terre Haute) and Clay Co. (Brazil) by Earl Huff and Virgil Knapp 21 Oct., Hendricks Co. (North Salem, 21 Oct.) and Madison Co. (Anderson, 22 Oct.) by Virgil Knapp. All determinations, by Virgil Knapp, were confirmed by Manya B. Stoetzel, USDA. These are, of course, all new county records for this aphid, which attacks asparagus ferns, causing conspicuous witches brooms in addition to the usual aphid damage.

#### Ornamentals, Forest, Shade and Fruit Trees

The Japanese beetle (*Popillia japonica*) was collected from the following counties by means of lure traps this year - all new county records. (County names are followed by the name of the nearest town, the date the trap was recovered and the name of the collector). Floyd (Greenville 15 Aug., Mark Bratovich), Vermillion (Clinton 15 Aug., Earl Huff), Johnson (Greenwood 15 Aug., Rudy Carandang), Jay (Portland 17 Aug., Harry Bollinger), Gibson (Johnson 18 Aug., Mark Bradovich), Owen (Vandalia 20 Aug., Robert Heaton), Madison (Anderson 4 Sept., Virgil Knapp), Boone (Zionsville 7 Sept., Virgil Knapp), Hamilton (Noblesville 9 Sept., Virgil Knapp) and Carroll (Delphi 17 Sept., Virgil Knapp). Determinations by the collectors were confirmed by James Clark.

The gypsy moth (*Lymantria dispar*) was reported earlier this year from Vigo, Hendricks, Wayne and Franklin counties elsewhere (4). In addition to those new county recoveries, the following are added here: from Elkhart and Goshen in Elkhart county by W. Felts on 12 Aug.; from Ellison in Allen Co. by Harry Bollinger on 8 Sept. Determinations by the collectors were confirmed by James Clark.

Larvae near pupation of the spruce budworm (*Choristoneura fumiferana*) were collected from blue and Norway spruce in Putnam Co. about 6 June by Philip Marshall, and eggs and empty pupal cases were collected by Cedric Durkes in Lafayette (Tippecanoe Co.) from spruce 11 June. Determination of the first was by Philip Marshall, the Tippecanoe Co. record by Donald L. Schuder. These are both new county records, and only the 2nd and 3rd time that this species has been observed overwintering in this state. (An earlier record was from Lake Co.) Large numbers of adults entered the state in 1974; unless these are the result of that invasion, even such a large invasion was unsuccessful.

Linden looper (*Erannia tiliaria*) and halfwing geometer (*Phigalia titea*) larvae were again rather common on SC trees by early May. They caused less damage this year than last. Eastern tent caterpillar (*Malacosoma americanum*) was also rather common in Washington and Harrison as well as Pike counties. Cottony maple scale (*Pulvinaria innumerabilis*) was again very common on urban maples in a number of larger cities. While they attracted a great deal of attention, the oystershell scale (*Lepidosaphes ulmi*), which was also very common, escaped attention.

The pinewood nematode (*Bursaphelenchus lignicolus*) was reported from Porter, Tippecanoe, Marion, Clark (1), Hendricks (2), Perry, Martin, Pike and Jennings (3) counties this year, all new county records. In addition since those reports the species has been collected from the following counties reported here for the first time. All were from Scotch pine except the Lake Co. record, which was from red pine. (The county name is followed by the collector's name and the nearest city.) Marion (Philip Marshall, Indianapolis), Lawrence (D. Ernest, Mitchell), Fulton

(Philip Marshall, Rochester) Pulaski (R. B. Cummings, Winamac) and Lake (R. B. Cummings, Winamac). (Determinations by A. Foudin, USDA.)

Five pheromone traps in Vincennes caught a total of 2900 redbanded leafroller (*Argyrotaenia velutinana*) males during the trapping season, the highest level in 5 years and approached only once - last year (2300). Peak catch was taken during the last 2 weeks of April. The Tippecanoe Co. peak catch occurred during the 1st week of May; Tippecanoe Co. totals were also the highest in 4 years. Codling moth (*Laspeyresia pomonella*) numbers reached a 4 year high in the latter county. Numbers of all other apple and peach moths were not significantly different from other years in either county except for a great drop in the numbers of lesser peachtree borers (*Sanninoidea exitiosa*) from 7200 last year to 1500 this year, in Knox Co.

The aphid *Hyadaphis tataricae* was collected for the first time in the state on 22 Sept. by Bruce Cummings - a new state record. It was collected from *Lonicera tatarica*, a variety of honeysuckle, in Rensselaer, in Jasper Co., a new county record as well. Determination was by Virgil R. Knapp, confirmation by Manya B. Stoetzel, USDA.

#### Man and Animals

There were only 5 confirmed cases of St. Louis encephalitis in the state, all from Knox Co., by 1 Nov, and 2 cases of La Crosse strain - 1 each from Lake and Morgan counties.

#### Beneficial Organisms

The ratios (in percent of the total of these species) among the spotted (*Coleomegilla maculata*), the convergent (*Hippodamia convergens*), the 13-spotted (*H. tredecimpunctata*) and *Cycloneda sanguinea* as indicated by sticky trap collections in a corn field in Tippecanoe Co. in 1977, 1978, 1979 and 1980 follow: 27:65:3:5; 69:6:16:9; 81:9:3:7 and 58:7:2:33. For the first time in the 4 seasons of trapping, *sanguinea* has exceeded the single-digit range. Because of the small numbers of this species collected in past years, it is difficult to state where peak activity is, and to decide whether a major outbreak of corn leaf aphids was a factor in the increase. The numbers of both *Coleomegilla maculata* and *Cycloneda sanguinea* increased following the mid-July burst of aphid activity, but in the case of the former, the increase at that time occurs every year even without aphid explosions. The traps were in the same field every year, but for the first time the whole field was treated, including the trap area, for corn rootworms. The total of coccinellids collected has increased each year, but there was a drop of about a fourth in *Coleomegilla* numbers this year.

About 28% of 297 alfalfa weevil (*Hypera postica*) adults collected in the first 3 weeks of May were parasitized by the braconid *Microctonus aethiopoidea*. Weevil collections were made primarily in the central districts (224 of 297). Reported earlier this year were the new county records from Fulton, Boone, Decatur, Henry, Monroe and Lawrence counties (3). Reported here for the first time are the following new county records: (nearest city and date in parentheses) Fountain (Rob Roy 19 May), Rush (Homer 6 May), Delaware (Royerton 12 May), Randolph (Farmland 12 May), Union (Liberty 6 May) and Jennings (San Jacinto 21 May). All were reared from weevils by the author whose determinations were confirmed by Arwin Provonsha.

About 27% of 880 alfalfa weevil larvae collected the last week of April were

parasitized by *Bathyplectes* spp. Ninety percent of the larvae were collected from the SW and SC districts, and 88% of the parasites were *B. anurus*. This species was collected for the first time from Henry, LaPorte, Vermillion, Sullivan and Jackson counties. The Vermillion, LaPorte and Henry records are the first from north of Indianapolis.

#### Literature Cited

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