Insects and Other Arthropods of Economic Importance in Indiana during 1973[1]

Robert W. Meyer
Department of Entomology
Purdue University, West Lafayette, Indiana 47907

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 1973 are discussed.

A brief description of climatic conditions which possibly influenced the size of insect populations and the severity of their attacks directly as well as indirectly through their influence on food crops and cultural practices follows.

The 1973 growing season followed, and was delayed, interrupted and generally disrupted by more than a half year of weather which kept soils filled with water. Either heavy rains, which began in September of 1972, or poor drying conditions which alternated with rainy periods, delayed, and in some cases prevented harvesting in 1972, delayed ground preparation for the 1973 planting season and interfered with corn and bean planting as well as the care and harvesting of the first crop of alfalfa. In fact it was not until mid-May that the corn planting season really got underway. Thirty per cent of all of the 1973 corn crop was planted during the week ending May 29. Although this surge in planting brought the corn planting up to the average for that date, additional rain in the following weeks again delayed the planting, so that it was not until the 25th of June that corn planting was 95% complete. The first cutting of alfalfa, at least in the southern third of the state, could not be harvested at the optimum time. The pesticides that should have been applied to first cutting alfalfa had to be omitted or were applied by air.

Corn and Small Grains

Corn earworm ***(Heliothis zea*** **[Boddie]) and fall armyworm** ***(Spodoptera frugiperda*** **[J. E. Smith]).** Damage due to these species cannot readily be assigned to one or the other unless the larvae are

[1] Journal Paper No. 4260, Purdue University Agriculture Experiment Station. The following includes those who have made identifiable contributions to this summary: Walter L. Stirm (weather and cropping data), F. Tom Turpin (corn soil insects), David L. Matthew (extension data), Robert Gallun and Omelio Sosa (wheat), M. Curtis Wilson (cereal pests, alfalfa weevil parasites), Wayne P. Henderson *(Lasius alienus)*, Richard C. Dobson, Christian Christensen (cattle insects), Roger T. Huber (alfalfa, vegetables), John Favinger and James Clark (nurseries, forest and shade trees, economic insects), Donald L. Schuder (ornamentals), Darryl Sanders (horseflies, extension data), C. Richard Edwards (soybeans), Leland Chandler (bees, sheep insects), Donald Schroyer (mosquitoes), H. Randolph Lawson (ants). To these, and to the many others who have made less readily identifiable but nevertheless important contributions, thank you.

present, so they are discussed together. (Of the 77 instances where the larvae were still present at the time of the fall survey, 66 were *H. zea.*) Evidence of the presence of these species in the ears of corn grown for grain (including two popcorn fields) was found in 4.32% of the 4,700 plants examined in the fall survey, up slightly from the 3.39% observed in 1972. The increase was probably due to the lateness of the corn planting. Loss due to these insects was 0.134%, up very slightly from 0.105% in 1972. Their presence in the ears was not always accompanied by loss of kernels; frequently they completed their development at the tip of the ear without ever reaching the kernels, or at most damaging only a few. One *H. zea* was found in the shank of an ear, another inside the cob, while one *S. frugiperda* was found inside the stalk. These are unusual sites for these insects. The southern one-fourth of the state was hardest hit (up to 15% of the ears were attacked in some districts) and the northern one-fourth was second, with little damage between.

Spodoptera frugiperda occurred occasionally in corn whorls in widespread locations when the corn was younger; up to 5% of the field was damaged in one instance. The larvae were also reported as causing damage in wheat in October in the SW district.

European corn borer *(Ostrinia nubilalis* **[Hübner]).** A heavy second generation appeared this year, somewhat as a surprise, as the first generation was subjected to adverse conditions. Pupation was about 50% complete by mid-May in Tippecanoe Co. (WC), when only about 15% of the corn had even been planted. The flight of first generation adults, as indicated by light trap data, began when only 40% of the corn had been planted, and peak flights were over by mid-June, at which time the average height of the corn that had been planted was but 8 inches. Thus, there was only a small amount of acceptable corn available on which the females could oviposit. Summer surveys showed that about 10% of the emerged corn was infested, with an average in the state of 8.5 borer larvae/100 stalks. Flight of second generation adults, as indicated by light trap data, began throughout the state during the week ending July 16, when corn averaged 44 inches with 5% silked. Flights peaked early in August, when 60% of the corn had not yet reached dough stage. Large acreages of corn with acceptably mature plants, plus good oviposition and hatching weather, combined to the benefit of the borer, and a state average of 110 live larvae/100 stalks was attained by the time of the fall survey in October. District averages ranged from 47 larvae/100 stalks south of Indianapolis (SC) to 194 larvae/100 stalks in the northeastern corner of the state, the highest district average ever encountered in Indiana. Only one other time since 1961 has the state average exceeded 90/100 stalks (in 1971, with an average of a borer per stalk). Of the 4,700 plants examined in the fall survey, 62% were infested.

Western corn rootworm *(Diabrotica virgifera* **[Le Conte]).** Mid- or late-instar larvae were first observed in a field of corn grown for grain in Porter Co., on June 25, and adults were taken in the same county

on July 10. Damage due to this species was heavier in the NW district and as far east as Elkhart County in the NC district, than in previous years. Its range was extended eastward to counties abutting Ohio, and southward nearly to Indianapolis. Its extension to central Indiana brings the insect to an area where soil conditions at least are more favorable for its development than they were further north. New county records include DeKalb, Allen, Huntington, Clinton, Hamilton and Fountain.

Northern corn rootworm *(Diabrotica longicornis* [Say]). The first adult of the season was seen on July 10, in Pike Co. (SW), and at the same time several adults, still in the soil, were taken in Tippecanoe Co. (WC). There were few if any cases of damage to corn grown for grain in the state in 1973 by this species.

Slugs (Species not determined). In some cases damage was extensive enough to require control measures in young corn grown for grain in several NE and NC fields. In all observed instances the damaged corn followed sod, legumes or diverted acreages.

Corn leaf aphid (*Rhopalosiphum maidis* [Fitch]). This year infestations by this aphid, in corn grown for grain, occurred later relative to corn development than is customary. In the summer survey, taken as nearly as possible while the tassels were still in the whorl, only 9.3% of the stalks observed were infested, mostly only lightly, as compared with 28% in 1972. Eventually, however, 33% of the stalks had aphids, slightly more than in the fall survey of 1972, though the infestations were generally less severe. Because infestations were both late and light, they were probably of little economic consequence.

Oat bird-cherry aphid (*Rhopalosiphum padi* [Linnaeus]). Light infestations were observed in scattered heads of wheat all over the SW and SC districts. At the end of May, scattered heads in small patches were occasionally so heavily infested that they were noticeable from the highway. This was especially true in Knox and Daviess Counties (SW).

English grain aphid (*Macrosiphum avenae* [Fabricius]). Light populations (small colonies on isolated heads of wheat) were observed in many fields in the northern districts by mid-June.

Hessian fly *(Mayetiola destructor* [Say]). Hessian fly populations were lower this year than last. The average number of puparia/100 stems for all varieties was 1.9, compared with 9.1 in 1972. Only 14 fields in seven counties (out of 53 surveyed) had individual fields with infestations of 10% or more, as compared with 27 counties last year. This was probably due in large part to the increased use of varieties which were resistant to the prevailing race of the fly. Resistant varieties averaged 0.4% infested as compared with 6.7% infested in wheat which was susceptible to Race B of the fly. Overall, 1.1% of the stems examined were infested.

Cereal leaf beetle (*Oulema melanopus* [Linnaeus]). Populations were depressed to the point that no economic infestations were either reported or observed during 1973 in oats or wheat.

Cornfield ant (*Lasius alienus* [Foerster]). A swarm of alate males and females a half-mile in diameter was observed on July 20, 1973, at 2:30 PM. in Boone Co. (C) nearly 2 miles south of Lebanon. The swarm was about 3 miles northwest of a heavy thunderstorm. The temperature was 85°F, the wind was SW at about 10 mph. Numbers were great enough to impair the visibility of motorists in the area.

Forage Legumes and Soybeans

Alfalfa weevil (*Hypera postica* [Gyllenhal]). Economic damage from larval feeding occurred in the counties in the southern districts as far north as the counties through which U.S. Highway 50 runs, with sporadic economic infestations north of that area to Shelby and Morgan counties. Economic damage also occurred in the two northern tiers of counties, with a diminution of intensity both eastward and southward from South Bend. Even new fields were not spared in the southern districts, and controls were needed both on the first cutting and often even on the stubble. Rain delayed the harvest and made application of control measures at the appropriate time difficult if not impossible, even by air.

Average counts of larvae in the Daviess Co. (SW) area ranged from 0.5 larvae/stem by March 23 to an average (in six fields) of 4.6 larvae/stem by the 11th of May. Individual fields had averages up to 13 larvae/stem. Similar populations were observed in all of the southern districts, where peak populations occurred later eastward and northward from Daviess County.

The potato leafhopper complex (*Empoasca fabae* [Harris] **and possibly other species**). This pest was as serious as the alfalfa weevil in alfalfa in 1973. Controls were warranted on all alfalfa on light soils throughout the state, and on all fall-1972 and spring-1973 seeded alfalfa on any soil. This insect probably caused stand reduction in alfalfa. It attacked both the second and third cuttings in the southern districts late in June and in July, and the third in the north, in August.

Mexican bean beetle (*Epilachna varivestis*) [Mulsant]). Populations, generally non-economic, were observed in occasional soybean fields the first week in June in the WC (Clay, Owen, Parke and Putnam Counties) and C (Morgan and Johnson) districts as well as the three southern districts which were usually infested. Few if any developed into problems, and activity was at a low level during July and August. The development of populations which normally occurs in August was delayed until September. At that time, as a result of movement from mature plants to late-planted fields, a few fields accumulated heavy populations. One such field in Lawrence Co., which received the adults from three other fields, had, on September 27, a population which averaged 23/4 feet of row, in addition to a number of other soybean feeders in large numbers. After the soybeans matured the adults moved

to alfalfa fields where they were sometimes quite numerous. A small population of Mexican bean beetles was observed on soybeans in Clinton Co. (C), the farthest north this insect has been observed in numbers on this crop.

Green cloverworm (*Plathypena scabra* [Fabricius]). Economic larval populations were observed in Warrick Co. (SW) and probably occurred, but infrequently, over the state on soybeans. Their large numbers induced some control measures which were probably unwarranted. They peaked in numbers in the southern districts the last week in July, in the rest of the state during August, and disappeared abruptly as a result of disease. Although several species probably were involved, several determinations revealed that they were mostly *P. scabra.* They also attacked alfalfa in some southern districts, occasionally causing economic damage.

Garden symphylan (*Scutigerella* sp.). Symphylans produced a significant reduction in yield in a field of soybeans in Johnson Co. (C), as indicated by a comparison of treated with untreated portions of the field.

Yellowstriped armyworm (*Spodoptera ornithogalli* [Guenée]). Larvae of this species were more frequent in soybean fields than usual. Even so, this colorful larva was not common and posed no threat to the beans.

Vegetable Crops

Potato leafhopper (*Empoasca fabae* [Harris] **and possibly other species**). These were numerous enough in 1973 to cause widespread hopperburn on potatoes and garden beans, and to reduce the quality of lettuce.

Green peach aphids (*Myzus persicae* [Sulzer]) were hard to control in both southern and northern Indiana peppers. In September, both rose aphids (*Macrosiphum rosae* [Linnaeus]) and potato aphids (*Macrosiphum euphorbiae* [Thomas]) attacked tomatoes and peppers. Tomatoes were also attacked in early August by loopers, in late August by tobacco hornworms (*Manduca sexta* [Linnaeus]). The latter were heavily parasitized. European corn borers (*Ostrinia nubilalis* [Hübner]) were a problem in sweet peppers in August. In June, flea beetles (unidentified species) were a problem on tomatoes in most areas of the state.

Cabbage looper (*Trichoplusia ni* [Hübner]). Larvae occurred in populations of 6-8/cover leaf in cabbage and cauliflower in central and northern Indiana by the end of August. These populations required control measures to insure a marketable product.

Maggots (unidentified species of Anthomyiidae) and flea beetles were abundant and reports numerous this year on turnips, radishes and carrots.

Corn flea beetle (*Chaetocnema pulicaria* [Melsheimer]). Adults were a problem on early sweet corn. Later in the year the European corn borer, the corn earworm (*Heliothis zea* [Boddie]) and the fall armyworm

(*Spodoptera frugiperda* [J. E. Smith]) were a problem in sweet corn ears.

Striped cucumber beetle (*Acalymma vittata* [**Fabricius**]). Adults were numerous (6-8/transplant especially on cantaloupe) by May 18. They were especially difficult to control because of the cold and windy weather which made application of pesticides difficult or ineffective. Attacks were observed in the melon and cucumber growing areas over the state.

Melon aphid (*Aphis gossypii* **Glover**). This aphid began to accumulate in early August on melons in the southern districts, but remained spotty even in individual fields.

Ornamentals, Forest and Shade Trees

A gall midge (*Taxodiomyia cupressiananassa* [**Osten Sacken**]). Galls produced by this midge were found on bald cypress (*Taxodium distichum*) trees in Warrick, Spencer (SW) and Perry (SC) Counties December 7, 1972, all new county records.

A geometrid (*Coryphista meadi* [**Packard**]). Larvae of this species were collected during the summer on barberry and mahonia in Lafayette, Tippecanoe Co. (WC). This is a new county and state record.

Gypsy moth (*Porthetria dispar* [**Linnaeus**]). An adult was taken in Lake Co. (NW) during the week ending Sept. 21, 1973, in a lure trap. This is a new county and state record.

Jack-pine shoot moth (*Eucosma sonomana* **Kearfott**). Larvae were collected from shoots of Scotch pine in Elkhart Co. (NC) on June 18, from which adults of this species emerged. This is a new county and a new state record.

Linden looper (*Erannis tiliaria* [**Harris**]). Larvae of this species almost defoliated a strip of oak woods 150 yards wide by 0.4 mile long in Jasper Co. (NW) during the first week of June. Adults were taken at black light traps on several evenings between Nov. 15 and 25 in Tippecanoe Co. (WC).

Hickory leafroller (*Argyrotaenia juglandana* [**Fernald**]). About 25% of the terminal leaves of shagbark hickory in an area of Warren Co. (WC), were rolled by the first of June, with about half of the mature larvae dead and mummified.

The larger sod webworm (*Crambus trisectus* [**Walker**]). The last generation of this species was numerous this year.

Japanese beetle (*Popillia japonica* [**Newman**]). Adults were trapped in Monroe Co. (SC), for a new county record.

A list of the most-often encountered pests of nurseries, as recorded by the State Entomologist, follows. (The number following the name indicates the number of times that it was encountered during 1973 by nursery inspectors.)

Maple bladdergall mite (*Vasates quadripes* [Fabricius])	70
Bagworm (*Thyridopteryx ephemeraeformis* [Haworth)]	59
Bronze birch borer (*Agrilus anxius* Gory)	55

Fletcher scale (*Lecanium fletcheri* Cockerell)	54
Fall webworm (*Hyphantria cunea* [Drury])	49
Apple aphid (*Aphis pomi* De Geer)	43
Cooley spruce gall aphid (*Adelges cooleyi* [Gillette])	43
Oyster shell scale (*Lepidosaphes ulmi* [Linnaeus])	40
Spruce spider mite (*Oligonychus ununguis* [Jacobi])	35
Mimosa webworm (*Homadaula anisocentra* Meyrick)	34
Honeylocust spider mite (*Eotetranychus multidigituli* [Ewing])	31
Tuliptree aphid (*Macrosiphum liriodendri* [Monell])	29
Euonymus scale (*Unaspis euonymi* [Comstock])	26
Woolly apple aphid (*Eriosoma lanigerum* [Hausmann])	23
Velvet leaf mite (*Eriophyes* sp.)	14
Spruce needleminer (*Taniva albolineana* [Kearfott])	13
Periodical cicada (*Magicicada* sp.) (XIII brood)	13
Leaf-curl ash aphid (*Prociphilus fraxinifolii* [Riley])	12
Peachtree borer (*Sanninoidea exitiosa* [Say])	12
Pine needle scale (*Phenacaspis pinifoliae* [Fitch])	11
Zimmerman pine moth (*Dioryctria zimmermani* [Grote])	11
European pine shoot moth (*Rhyacionia buoliana* [Schiffermüller])	11
Buffalo treehopper (*Stictocephala bubalus* [Fabricius])	11

Man and Animals

Of the insects that invade Indiana homes either accidentally or for shelter or food, the following were reported more frequently than usual:

Cabinet beetles (*Trogoderma*, several species), and Indian meal moth (*Plodia interpunctella* [Hübner]), both pests in dried cereal grain products, and carpenter ants (*Camponotus* sp.), destructive in wood.

Mosquitoes (several species) were very numerous with a great diversity of species occurring. However, there were not an unusual number of complaints about them. Woodland and other mosquito sources that had been unproductive in several of the last years, this year yielded mosquitoes, sometimes in great numbers.

Head louse (*Pediculus humanus capitis* [De Geer]). Based upon reports and inquiries, this insect is apparently becoming more common.

A deer fly (*Chrysops geminatus impunctus* [Kröber]). A single female of this subspecies was collected on July 4, 1973, in Warren Co. (WC), a new county record. It had previously been collected only in Miami and Union Counties.

Face fly (*Musca autumnalis* [De Geer]). Judging from the reports of both the insect and the incidence of pink eye in cattle, this insect was much more abundant than last year.

Sheep biting louse (*Bovicola ovis* [Schrank]). Unusually heavy infestations were observed on many sheep penned at the Indiana State Fair, and infestations were reported on sheep from several counties.

Sheep bot fly (*Oestrus ovis* [Linnaeus]). These reports refer to a flock of sheep in Warren Co. (WC): first bot expelled April 25; first adult June 17. Adults were virtually absent during the summer months with the lowest numbers in eight years. Significant numbers appeared, however, on August 24-26.

Insidious plant bug (*Orius insidiosus* [Say]). The adults of this species became a nuisance during October because of their numbers in homes and gathering places, and because of their bites.

Beneficial Insects

Bathyplectes anurus [Thomson]. This alfalfa weevil parasite was recovered from the larvae of *Hypera postica* in Washington Co. (SC), for a new county record.

Bathyplectes curculionis [Thompson]. This alfalfa weevil parasite was recovered from the larvae of *Hypera postica* in Daviess (SW), Brown and Washington (SC), Owen (WC), and Morgan (C) Counties, all of which are new county records.

A hyperparasite (*Gelis* **sp.**) of *Bathyplectes curculionis* has been taken in rather large numbers (up to 1/sweep) in LaPorte Co. (NW), in what is probably a new county record.

Build-up of *B. anurus* has been very slow, and, south of US 50, *B. curculionis* parasitizes less than 10% of the population in most fields at least early in the season. North of US 50, up to 70-80% of the weevil population was parasitized by *B. curculionis* later in the season.

A wild bee (*Andrena wilkella* [Kirby]). An extensive nest site of this alfalfa pollinator expanded during the past 7 years. This year, after two days of heavy male emergence and activity, 4.5 inches of rain resulted in a cessation of male activity and no females emerged. The nest site has apparently been completely destroyed. (Warren Co. [WC]).

A European corn borer parasite (*Eriborus terebrans* [Gravenhorst]). Adults of this species were reared from pupae collected from the following counties: Jasper (NW), Marshall (NC), LaGrange and Noble (NE), all new county records. The Jasper County record was collected as an approximately 3rd instar larva of the European corn borer which was reared on artificial medium with the adult parasite appearing on August 2. The other three records were collected as pupae on July 18 from burrows of the corn borer.

A cereal leaf beetle parasite (*Tetrastichus julis* [Walker]). Cereal leaf beetle larvae parasitized by this species were released in the following counties in 1973: LaPorte, Porter, Lake, Starke (NW); Elkhart, St. Joseph, Marshall, Kosciusko, Fulton, Wabash, Miami (NC); DeKalb, Allen, Whitley (NE); Hancock, Rush (C); Wayne, Henry, Union, Fayette, Franklin (EC); Dearborn (SE). It was recovered from LaPorte Co. on June 6, a new county record (NW).

A cereal leaf beetle parasite (*Anaphes flavipes* [Förster]). This parasite was released in 1973 in the following counties: LaPorte, Porter, Lake, Starke, Jasper (NW); Wabash (NC); Noble, Whitley (NE); Rush, Decatur (C); Union (EC); Dearborn, Ohio, Switzerland, Jefferson (SE). It was recovered in the following counties, all new county records. (Date in June of recovery follows county name) St. Joseph (19), Fulton (13) (NC); Steuben (19), LaGrange (20), DeKalb (19), Allen (15) (NE); Wayne (12), Henry (11), Union (12) and Franklin (11) (EC).

A cereal leaf beetle parasite (*Diaparsis* sp.). Parasitized larvae of the cereal leaf beetle (1) containing this species, or adults (a) were released in the following counties during 1973 (where no letter follows the county, the release was by parasitized larvae): LaPorte, Porter, Lake, Starke, White (NW); Elkhart, St. Joseph, Marshall, Kosciusko, Fulton, Wabash, Miami, Carroll (NC); Steuben, DeKalb, Noble, Allen, Whitley (NE); Hancock, Rush (C); Wayne, Union (1 + a), Fayette (1 + a), Henry, Franklin (1 + a) (EC); Dearborn (a), Ohio (a), Switzerland (a) (SE). It was recovered during the year in LaPorte Co., for the second successive year.

A cereal leaf beetle parasite (*Lemophagus curtus* Townes). Cereal leaf beetle larvae parasitized by this species were released in LaPorte Co. (NW).

Parasitoids were supplied by Niles Laboratory, USDA, APHIS, and released by the State Entomologist and APHIS Plant Protection personnel. Parasitoid recovery survey was made by USDA, APHIS Niles Laboratory personnel.