Insects and Other Arthropods of Economic Importance in Indiana in 1963

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Because of the importance of bioclimatology as an influencing factor in insect development, this annual report commences with a review of the pertinent weather occurrences during the year. The 1963 growing season followed one of the most severe winters on record in Indiana. The spring and summer months were characterized by unusual conditions of fluxuation and drought. April commenced rather normally with respect to temperature and rainfall, although the latter was down in the southern part of the state. May was extremely hot in the early period, but temperatures then dropped to below freezing late in the month with record lows in the southeastern area. June was warm changing to cold and then hot late in the period. July was characterized by prolonged dry hot periods, but August was relatively cool and below normal. September and early October were unseasonably warm. The most striking occurrence of the weather was the dry period extending from the second week in June through early October. During this period northern Indiana was 3.9 inches below normal in rainfall, central Indiana 5.9 inches, and southern Indiana 3.7 inches. September is reported as the driest since 1897. It is impossible to generalize on the effect of this season as related to insect development. Many species reacted noticeably to the conditions as will be indicated below. It is suspected that many insects will go into the winter with certain nutritional deficiencies which may influence activity next spring.

Field and Crop Insects

Armyworm (*Pseudaletia unipuncta* (Haw.)) infestations were considerably more abundant than they have been for several years. Some small grain fields were nearly stripped in LaPorte and St. Joseph counties. Growers initiated control measures on a large scale and serious loss was prevented; control measures were instituted on an estimated 35,000 acres.

A billbug (*Sphenophorus callosus* (Olivier)) was less destructive in Montgomery County where it has been a problem in fields with a muck soil. Drainage of the land, the control of the weed host, nutgrass (*Cyperus esculentus* L.), and the use of insecticides have greatly reduced the population. In Decatur County a second species of billbug (*S. zeae* Walsh) caused slight injury to small corn in two fields that had sod in them the previous year.

Blister beetles (*Epicauta spp.*) were of no economic importance in 1963.

The cereal leaf beetle (*Oulema melanopa* (L.)) received more attention than any other insect in Indiana during 1963. This was in line

1. Information for this summary has been provided by: W. L. Butts, H. O. Deay, R. C. Dobson, R. E. Dolphin, R. T. Everly, R. L. Gallum, R. L. Giese, G. E. Gould, D. W. Hamilton (USDA), D. L. Schuder, M. C. Wilson.

with its position of being new and of being the first known pest introduced directly into the Midwest from the Old World. It is a serious threat to grains and forage grasses. It was found in 25 counties in northern Indiana. However, severe infestations occurred only in townships along the Michigan State border in St. Joseph and LaPorte counties. Three fields of oats are known to have been plowed under because of complete loss. Damage is expected to be more severe in 1964 as beetle populations develop. Purdue, Michigan State, and Ohio State Universities and the USDA are cooperating in a diversified research effort. New facilities for this project include a mobile field laboratory and a programmed comparative ethology chamber. Areas of investigation for control of this species include biology, ecology, behavior, host plant resistance, and control with parasites, predators, and pathogens, attractants, and chemicals.

Common stalk borer (*Papaipema nebris* (Guen.)) was not particularly important, although it was observed damaging rye and wheat in St. Joseph County.

Corn earworm (*Heliothis zea* (Boddie)) populations were the lowest in six years. Light trap catches showed that the flight normally expected in the last half of August did not materialize. There was a small flight on September 19, and sweet corn silking at that time was severely damaged especially in the south. There were no infestations of importance in tomatoes. The fall insect survey showed southern corn to be damaged as follows: 3.4 per cent of plants infested, 9.3 kernels destroyed per infested ear, and 24.6 per cent of the fields showed some infestation.

Corn leaf aphid (*Rhopalosiphum maidia* (Fitch)) has increased greatly in the southern half of the state, particularly in mid-season and late-planted corn. An average of 58.7 per cent of plants were infested and 88.8 per cent of fields examined showed infested plants. Many small ears were found in heavily infested fields with the tip of the ear pollinated, but without developed seed. The per cent of plants infested broke down to: 6.2 per cent severely infested with nubbin ears or barren, 21.5 per cent heavily infested with incompletely developed ears, and 31.0 per cent lightly infested with ears about normal although smaller than on non-infested plants.

Chinch bug (*Blissus leucopterus* (Say)) populations remained at non-economic levels.

European corn borer (*Ostrinia nubilalis* (Hbn.)) infestation was slightly higher in 1963 in the state averaging 35.7 borers per 100 plants as compared with 28.9 in 1962. The heaviest infested area was the north-northwest area with 72.5 borers per 100 plants, slightly lower than the previous year. The greatest increase in populations occurred in the north-northeast, south-southwest, and south-southeast areas. Increases ranging from 125 to 500 per cent. All fields in the northern half of the state had some infestation, with the heaviest field in the entire state occurring in the north-northeast with 76 per cent plants infested, 304 borers per 100 plants and an estimated loss in yield of 9 per cent. Approximately 76 per cent of the fields in the southern half of the state were infested. The loss in yield in 1963 was estimated at 1.1 per cent or 4,318,400 bushels of corn compared with 0.8 per cent loss in 1962. Heavy

infestations in potatoes again occurred in Jasper County. This suggests the possibility that early planted potatoes are more attractive to the first generation moths and may provide higher survival than early planted corn in this area. This condition exists on the east shore of Virginia.

The southern corn rootworm (*Diabrotica undecimpunctata howardi* (Barber)) was present in normal numbers in corn fields. Its abundance on cucurbit crops was somewhat lower than usual.

Northern corn rootworm (*Diabrotica longicornis* (Say)) was widespread and damaging this past year. Reports were received from many parts of the state, especially relating to the beetles feeding on the silks of corn during August. An area of heavy infestation occurs in the northern section of the state. In Henry County, yield losses in one field are estimated at 30 per cent. To date, no resistance to chlorinated hydrocarbons has been reported or observed in Indiana.

The striped cucumber beetle (*Acalymma vittata* (Fab.)) occurred at levels similar to those in 1962.

Fall armyworm (*Laphygma frugipenda* (J. E. Smith)) was not important even in the pocket area frequently infested in previous years.

The fruit fly (*Drosophila melanogaster* (Meig.)) continued to be a major problem in tomato fields, although in general growers thought the population down from that of 1962.

Grasshopper (*Melanoplus spp.*) populations showed no increase over 1962. Damaging infestations occurred in localized areas in central, western, and southern areas of the state. Crops infested included soybeans, tomatoes, tobacco, and home gardens. *M. differentialis* (Thomas) and *M. femurrubrum* (DeG.) were again the dominant species.

Hessian fly (*Phytophaga destructor* (Say)) field populations of Race B, capable of infesting wheat varieties Dual, Monon, Redcoat and Reed have increased in size and virulence. Samples from 180 certified wheat fields showed an increase over 1962 of W38 resistant wheats becoming infested by this species. No infested samples were collected from Knox 62, a wheat having a different source of resistance from W38, which indicates this latter variety is maintaining resistance against Race B populations of *P. destructor*.

The tomato and tobacco hornworms (*Protoparce quinquemaculata* (Haworth) and *P. sexta* (Johan.)) were conspicuous this year by their absence. A few were observed in late July, but not enough to cause serious injury.

The Japanese beetle (*Popillia japonica* (Newman)) was present again in Newton County in destructive numbers. Populations on soybean foliage were slightly less than in 1962, but the area of heavy infestations enlarged during the past year. Damage was noted in several fields seven miles north of the area around the junction of roads 24 and 71.

Meadow spittlebug (*Philaenus spumaria* (L.)) infestations were less severe on alfalfa and clover than the two previous seasons.

Potato leafhopper (*Empoasca fabae* Harris) continued in general abundance across the state. Plant damage was more severe than the two previous years because of below-normal rainfall.

The spotted alfalfa aphid (*Therioaphis maculata* (Buckton)) was collected for the first time in early spring in Indiana near Maukport in Harrison County. This suggests that it may have overwintered. It did not, however, increase to any significant number.

The cabbage looper (*Trichoplusia ni* (Hubner)) and the imported cabbage worm (*Pieris rapae* (L.)) were severe in late cabbage in most areas of the state.

Wireworms (*Melanotus* spp.) damaged field corn in extensive areas of the state. Reports of losses in Decatur County were common.

Angoumois grain moth (*Sitotroga cerealella* (Oliver)) was less of a field problem this year with only 2 per cent of the fields infested in Gibson, Warrick, and Spencer Counties. Actual loss from this insect decreased one-third over the previous year. Everly's data show that the actual occurrence in the field increased five fold from September 15 to November.

Fruit Insects

European red mite (*Panonychus ulmi* (Koch)) continued to be the most prevalent species attacking fruit. Although early season activity was retarded because of the low spring temperatures, heavy populations developed by mid-season. Difficulties were experienced in maintaining control since the species has developed resistance to most of the acaricides labelled for use on fruit.

Two-spotted spider mite (*Tetranychus telarius* (L.)) was abundant in apple orchards, especially in the southern half of Indiana. Populations were not as heavy as those experienced from 1960 through 1962 because of the cool wet spring. This species is resistant to most of the labelled miticides.

Four-spotted spider mite (*Tetranychus canadensis* (McGregor)) was not numerous in Indiana orchards. Heaviest populations were observed in western Illinois orchards.

Red-banded leaf roller (*Argyrotaenia velutinana* (Walker)) populations were low and readily contained by recommended spray schedules.

Aphids—There were no serious outbreaks of the rosy apple aphid (*Anuraphis rosea* Baker) or the apple aphid (*Aphis pomi* De Geer). Limited outbreaks of aerial colonies of the woolly apple aphid (*Erisoma lanigerum* (Hausmann)) were present.

Codling moth (*Carpocapsa pomonella* (L.)) populations and injury were extremely light, partly because of the cold spring temperatures that retarded first-generation activity, but also because of the outstanding insecticides used to prevent injury, especially Guthion and carbaryl. Need for a well-planned insecticide program to control this pest was demonstrated by collection of 10,000 overwintering larvae from corrugated paper bands placed around unscraped tree trunks of 150 apple trees in an orchard where control was attempted by using a light dust program.

Plum curculio (*Conotrachelus nenuphar* (Herbst)) produced lighter than average injury on apples, even on unsprayed trees. Overwintering

adult populations seem to have been reduced by the extreme low temperatures encountered in January.

Forbes scale (*Aspidiotus forbesi* Johnson) and San Jose scale (*Aspidiotus perniciosus* Comstock). Infestations continue to be light in most orchards, but a heavy infestation of San Jose scale in a small isolated orchard near Vincennes has not been readily controlled the past two seasons with the control measures generally recommended. Reasons for increase in this orchard are not apparent.

Leaf miners—No major outbreaks of apple or peach leaf miners were observed in 1963.

Apple maggot (*Rhagoletis pomonella* (Walsh)) populations were similar to those of the past few seasons.

Periodical cicada, Brood 23, with a 13 year life cycle emerged in 1963. The major portion of adults was comprised of individuals of the two species *Magicicada tredecim* (Walsh and Riley) and *M. tredecassini* Alexander and Moore; however, a small number of individuals from the species, *M. tredecula* Alexander and Moore, also comprise a portion of the whole population for the brood. A partial survey of apple and peach orchards where emergence occurred in 14 orchards in Indiana in 4 counties, Sullivan, Knox, Gibson, and Vanderburg, showed that they occurred in 400 acres of apples and 225 acres of peaches. Brood 3, with a 17 year life cycle, also emerged in small numbers in 3 counties, Pulaski, McDonough and Fulton.

A thrips (*Frankliniella tritici* (Fitch)) was active and caused "dimpling" of apples during the bloom period.

The complete crop failure for peaches prevented observations on many of the peach insects normally reported.

Oriental fruit moth (*Grapholitha molesta* (Busck)) injury to terminal twigs was heavier than usual in numerous orchards since no insecticides were applied to the trees. Heavy overwintering populations are anticipated.

Peach tree borer (*Sanninoidea exitiosa* (Say)) was relatively unimportant.

Lesser peach tree borer (*Synanthedon pictipes* (Grote & Robinson)) caused moderate to severe injury in a large number of orchards, especially where winter injury was present.

Shot-hole borer (*Scolytus rugulosus* (Ratzeburg)) injury was more prevalent than usual in peach orchards. The degree of injury present is not considered to be of consequence since it is present where trees were weakened by winter injury.

Fall webworm (*Hyphantria cunea* (Drury)) defoliation on nut trees, persimmons, cherry and other deciduous trees occurred throughout southern Indiana. It was the most prevalent of any year previously observed. Numerous trees were stripped of all foliage during August.

Livestock Insects

Cattle grubs (*Hypodermia bovis* (L.) and *H. lineatum* (De Villers)) continue to be the number one pest of western feeder stock shipped into Indiana. Greatly increased "gadding" from adult flies on cattle this summer indicates a probable upsurge in grubs in native cattle.

Face fly (*Musca autumnalis* (DeG.)) continues important in the state, but the dry period this early summer coupled with a dry fall kept high populations of this insect restricted to a fairly short period during the middle of the season. Pink eye incidence remained high in cattle excepting those fed supplemental quantities of Vitamin A.

Horn fly (*Haematobia irritans* (L.)) was present in high numbers in August and early September. The unusual summer apparently contributed to this condition.

Horse flies (*Tabanus atratus* (Fab.)) were relatively light this year throughout the state.

House fly (*Musca domestica* (L.)) was a continuing problem throughout the state particularly in areas of questionable sanitation.

Stable fly (*Stomoxys calcitrans* (L.)) was a serious pest at farms where bedding was allowed to become fouled. Where followed, strict sanitation reduced this pest to a negligible level.

Pests of Man and Households

Cat flea (*Ctenocephalides felis* (Bouche)) infestations were numerous after midsummer with many complaints from returning vacationers.

The larder beetle (*Dermestes lardarius* (L.)) appeared in numbers in decidedly more numerous instances than is normally encountered. Many of these occurrences were in and around seasonally maintained dwellings which had not been occupied during the winter of 1962-63, and it has been postulated that the occurrence of these beetles might be related to carcasses of hibernating animals which had expired during this unusually severe season. One larval specimen was collected on cultivated cucumber plant in Tippecanoe County (Hemmerlein). Its occurrence in this situation remains unexplained.

Sap beetles (*Glischrochilus* spp.) were troublesome early in the summer, but the problem was apparently less acute than in 1961 and 1962.

Subterranean termites (*Reticulitermes* spp.) have been the subject of numerous inquiries. If the present interest in preventive treatment is maintained, the economic losses due to the activities of these insects may become significantly lower in future years.

The German cockroach (*Blattella germanica* (L.)) has been the subject of numerous inquiries, but problems with respect to this pest appear to have been less acute than in previous years.

Millipedes of undetermined species have been troublesome during late summer and early autumn. They have been important as occasional invaders of dwellings. The general paucity of information of all kinds regarding this group of arthropods has hampered efforts to attain satisfactory control.

Turf, Tree, Shrub and Forest Insects

Sod webworms (*Crambus trisectus* Wlk. and *C. mutabilis* Clem.) were unusually abundant in lawns for the second straight year. Many lawns in the north-central area of the state were badly damaged. Several previously used insecticides appeared to be relatively ineffective this season.

Bagworm (*Thyridopteryx ephemeraeformis* (Haworth)) populations, although locally heavy on both deciduous and evergreen trees and shrubs, were much lower than normal due to the unusally severe winter of 1962-1963.

Eastern tent caterpillar (*Malacosoma americanum* (Fabricius)) was very common in the pocket area of the state. The most common host was wild black cherry.

Elm leaf beetle (*Galerucella luteola* (Muller)) began its annual population acceleration in June. It was found for the first time at Ogden Dunes on the Indiana-Michigan border.

European pine sawfly (*Neodiprion sertifer* (Geoffroy)) a pest of pine trees in the state, was sparce this season. Few overwintering eggs were laid. Four species of parasitoids were recovered from this sawfly. These are the first records of these natural control agents; they represent the families Bombyliidae and Ichneumonidae.

European pine shoot moth (*Rhyacionia buoliana* (Schiffermuller)) populations were very light this season. The insect is known to be killed by temperatures of -16°F.

Sycamore lacebug (*Corythucha ciliata* (Say)) caused considerable disfiguration of plane trees throughout the state.

Honeylocust mite (*Eotetranychus multidigituli* Ewing) again caused severe defoliation of thornless honeylocust trees. The condition was probably aggravated by the droughty conditions so prevalent in the state.

A leafroller (*Tortrix pallorana* Rob.), an usually severe pest of newly planted pine trees, was of little consequence this season. In June the population was 3% compared to a population of 36% the previous year.

Locust leafminer (*Chalepus dorsalis* (Thunberg)) caused the leaves of black locust in southern Indiana to turn brown early in the summer.

The maple bladder gall (*Vasates quadripedes* (Shimer)) on silver maple were the frequent source of inquiries from many areas of the state where infestations were heavy.

The vein pocket gall (*Itonida* spp.) deformed the leaves of pin oak trees in many areas of S.W. Indiana, and was particularly bad in the Jasper and Evansville areas.

The mimosa webworm (*Homadaula albizziae* Clarke) which has been severely damaging honeylocust and mimosa trees in the southern half of the state was noticeably less abundant in 1963.

The brown race of the oystershell scale (*Lepidosaphes ulmi* (L.)) was more damaging to silver maples this year. Reports were received from many areas of the state. Control measures were necessary to prevent death of the hosts.

Fletcher's scale (*Lecanium fletcheri* Cockerell) caused the thinning of the foliage of many plantings of taxus in the Marion county area.

The cottony maple scale (*Pulvinaria innumerabilis* (Rathvon)) was very abundant on silver maple trees in the Fowler area.

Tuliptree scale (*Toumeyella liriodendri* (Gmelin)), a pest of our state tree, causes much disfiguration by the sooty black mold associated

with its honeydew and the killing of heavily infested branches. It continued to spread and be more noticeable in 1963.

The spruce spider mite (*Oligonychus ununguis* (Jacot)) was unusually damaging to evergreen plantings in the northwest part of the state. Defoliation and necrosis often follows heavy populations.

The smaller European elm bark beetle (*Scolytus multistriatus* (Marsh)), the vector of Dutch elm disease, continues to spread this arboricultural catastrophe in the northern counties of the state.

The pales weevil (*Hylobius pales* (Herbst)) was found again this year in plantations in Warrick and Brown counties. In the latter area, it appeared more numerous.

The tulip tree callous borer (*Euzophera ostricolorella* Hulst), first reported from Indiana in 1961, continues to spread and was found in Owen county in May; this is a new county record.

The bronze birch borer (*Agrilus anxius* Gory) was the cause of the premature demise of many ornamental white birch trees. The condition was probably aggravated by the dry fall of 1962. With the dry conditions now prevalent again this year we can anticipate an even more difficult problem next season.

Zimmerman pine moth (*Dioryctria zimmermani* Grote) continued to spread within the areas already reported to be infested. Populations in a plantation in northern Indiana averaged 20 per cent of the trees in June.

Juniper tip midge (*Oligotrophus* spp.) continued to increase in abundance and spread. A severe pest of cannaert junipers, it kills the new growth buds and the trees become stunted and browned as if scorched by fire.

The Fall cankerworm (*Alsophila pometaria* (Harris)) presented a rather serious problem on maple trees and American elm trees in the Lafayette area in the spring of 1963.

The white-marked tussock moth (*Hemerocampa leucostigma* (J. E. Smith)) was numerous on Norway maples in the Marion county area during late June and early July.

Rose slug (*Endelomyia aethiops* (Fabricius)) skeletonized the foliage of neglected roses in many areas of the state in the fall of 1963.

Walkingstick (*Diapheromera Femorata* (Say)) was again abundant in Starke County oak stands.

Columbian timber beetle (*Corthylus columbianus* (Hopk.)) maintained its low density status in southern Indiana.

Nantucket pine moth (*Rhyacionia frustrana* (Comstock)) was very low in numbers this year presumably due to the severe winter.

It seems appropriate to go on record here and mention a cause of economic loss which is increasing annually and which complicates the assessment of insect damage in certain instances. This situation is that of injurious birds. An example is the corn in southern Indiana. Of the fields examined, 46% had been invaded by birds and 12% of the plants were significantly damaged. Some fields were almost entirely destroyed. Among the birds involved were starlings, red-winged blackbirds, Brewers blackbird and several sparrows.