

NOTES ON ORTHOPTERA AND ORTHOPTERAN HABITATS IN THE VICINITY OF LAFAYETTE, INDIANA.

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Between September 3, 1912, and November 30 of the following year I was stationed in pursuance of official duties at Lafayette, Tippecanoe County, Indiana. At intervals during my stay there I made a series of observations on the *Orthoptera* and Orthopteran habitats of the surrounding country which, incomplete as they are, nevertheless constitute a distinct positive contribution toward an accurate knowledge of the faunal features of the region. My earlier studies on the distribution of *Orthoptera* in Pennsylvania and New Jersey¹ had impressed me with the importance of detailed local lists of species in a scientific study of distribution. The usual distribution as given in most works of reference is entirely too general for accurate study, no regard being paid to local peculiarities of distribution or to the relative abundance of the species in different parts of its range. Take, for example, such a form as *Psinidia fenestralis*. Its range, as usually given, extends from Massachusetts to Florida, Texas, northern Indiana and southern Minnesota. Such a statement would incline one to think that the entire region south of say a line drawn from Cape Cod to the southern extremities of the Great Lakes and thence to the southern border of Minnesota would be characterized by the presence of this species. As a matter of fact such is very far from being the case. In the East, for instance, *Psinidia fenestralis* is regularly found only in the low sandy belt fringing the coast, while in the interior it is of extremely local occurrence, being met with only on widely scattered, isolated deposits of loose sand. All positive data on this species indicates that its distribution is conditioned by the presence of areas of loose sand.

¹Data on the Orthopteran Faunistics of Eastern Pennsylvania and Southern New Jersey. Proc. Acad. Nat. Sci., Phila., 1914, pp. 441-534.

Wherever these are lacking the species is absent. In southern New Jersey where sandy deposits are of practically universal occurrence *Psinidia* is common, while on the opposite side of the Delaware River in Pennsylvania it is unknown. A case like this shows us how essential it is that we should have accurate local data before we can be certain of the exact range of a species.

The studies of Morse, Hancock, Rehn, Hebard, Vestal and others have clearly shown the intimate relation between the distribution of numerous *Orthoptera* and certain features of the environment. As Shelford has so well pointed out the success or failure of a species in any place will depend on how closely the environmental complex approximates to that condition at which the normal physiological activities of the species can be carried on to the best advantage. Where this state of affairs obtains the species will attain its maximum abundance; if one or more of the factors of the environmental complex are less favorable it will be present in diminished numbers, while if any essential factor is prohibitive the species will be absent. It is the aim of biogeography to explain the facts of organic distribution in terms of physiology, as an expression of the reactions of organisms to the varying conditions of their surroundings. In the case of the *Orthoptera* this can be done only when we know much more than we do now about the intrinsic qualities of the species and their ability to accommodate their activities to varying intensities of environmental factors. To acquire such knowledge will require much experimental investigation. In the absence of such knowledge we must meanwhile be content to record the facts of distribution as actually observed and to point out any correlation which may exist between the range of species and the different types of environments. By the accumulation of data along these lines a good foundation will be laid for the ultimate causal interpretation of distribution and kindred biological problems.

In the present article I have endeavored not only to give a full list of the species observed about Lafayette, but in addition to point out the more evident physical and botanical features of the region with which the local distribution of the *Orthoptera* is correlated. Most of the facts here given were gathered by myself, but I am also indebted for some valuable additional data to Mr. P. W. Mason, Instructor in Entomology at Purdue University, whose kindness in placing his notes at my disposal I here take pleasure in acknowledging.

GENERAL DESCRIPTION OF THE REGION.

Most of my observations were made on the west side of the Wabash River extending from Battle Ground on the north to the mouth of Indian Creek on the south. (For these and other localities a good map to consult is the map accompanying the report of the soil survey of Tippecanoe County in the field operations of the U. S. Bureau of Soils for 1905.) On the east side of the river a few observations were made from the mouth of Wild Cat Creek, about two miles north of the city, to a spot east of Battle Ground, about a half mile south of the mouth of Buck Creek. Only one trip was taken on the east side south of Lafayette. It was limited to the line of the Wabash Railroad and extended about three miles below the city.

According to the Bureau of Soils' report on the soils of Tippecanoe County the general altitude of the country is about 750 feet above sea level. Back from the Wabash River and its tributaries the country forms a nearly level, or at most slightly undulating, plain. Near the river it is much more rugged, a relatively steep line of bluffs leading down to the valley of the Wabash which is about 100 feet below the general level of the upland. Similar conditions prevail along the main tributaries, such as Burnett, Wild Cat and Indian Creeks.

The valley of the Wabash forms a nearly level tract varying according to location from a half to two miles in width. It is formed of what are known as bottom lands, or more specifically "first bottoms" to distinguish them from the older bottoms which are no longer covered by the overflow from the river. The surface of these first bottom lands is according to the report already mentioned between 10 and 20 feet above low water mark. They are "subject to overflow during periods of high water." During the destructive floods of March, 1913, these bottom lands were completely submerged.

The margin of these bottom lands is formed by the line of steep bluffs already mentioned as forming the edge of the upland. Locally, as is the case in the vicinity of West Lafayette and of Battle Ground, these bluffs recede a mile or two back from the river and in the embayments thus formed "second bottoms" are developed, that is, "fossil" floodplains or terraces representing an earlier, prehistoric stage of deposition. The surface of these "second bottoms" is level or slightly rolling and on the side facing the river is marked by a gentle slope rising from forty to

fifty feet above the present bottoms. They are never covered by overflow from the river at the present time.

The whole region about Lafayette is deeply buried under glacial deposits, the depth of these deposits being usually very great (at least 150 feet), though in limited areas they may be quite thin or lacking. Only rarely, however, do the underlying Palæozoic limestones reach the surface. One such outcrop I have seen on the upland near Montmorenci where the Lake Erie and Western Railroad crosses Indian Creek. Outside of these rare and insignificant cases, the whole country is underlaid by a very coarse glacial gravel. Overlying this is usually a layer of loess varying in thickness from an inch to several feet. From this loess are derived the representative soil types of the region.

The drainage of the region is in general good. The streams are few and in periods of protracted drought frequently dry up entirely in their upper courses. Most of the rainfall, however, is carried off by underground drainage, the underlying gravel allowing the ready percolation of water. Locally, as in upland swales and depressions and at the base of the river bluffs, where the seepage of underground water takes place, the ground is, except in seasons of drought, more or less completely saturated with water resulting in the formation of swamps. At the present time most of these naturally wet areas, especially on the upland, have been artificially drained and the land utilized for growing crops. The bottom lands are at present well drained, the cultivation of the soil breaking it up into a loose condition which allows the water to flow off readily beneath the surface.

On the upland the dominant soil is a fine-grained, silty loam, varying in color from light brown to almost black, the color depending upon the amount of organic matter present, which is usually considerable. Of this soil the Bureau of Soils recognizes two categories which are termed respectively Marshall silt loam and Miami silt loam. Both are nearly alike in mineral content, being characterized by relatively high per centage of silt and clay and extremely low per centage of sandy constituents, but differ in their organic content, the Miami being as a rule much poorer in this respect than the Marshall. The table shows the mechanical composition of the soils, the data being taken from the Bureau of Soils report.

SOIL.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
Marshall Silt Loam.....	0.2	1.1	1.3	3.9	5.7	67.2	20.0
Miami Silt Loam.....	0.4	1.8	1.0	2.2	7.3	68.4	18.9

On the "second bottoms" the soils contain a much greater percentage of sand and are correspondingly poor in silt and clay. The quantity of organic matter is variable depending upon location and drainage conditions. Typical examples of "second bottom" soils are the Sioux sandy loam and Miami sand the composition of which, as given by the Bureau of Soils, is shown in the following table:

SOIL.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
Sioux Sandy Loam.....	2.2	9.8	10.2	28.5	10.3	27.1	11.2
Miami Fine Sand.....	.0	3.0	13.3	52.0	11.5	13.8n	6.4

The characteristic soil of the river bottoms is the Wabash silt loam. This is the material deposited during periods of high water. It resembles the upland soils in its high silt-clay content, but differs in having a considerable percentage of sand. The mechanical composition of this soil as given by the Bureau of Soils is as follows:

SOIL.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
Wabash Silt Loam.....	0.0	Trace.	0.3	27.0	2.1	66.1	28.4

These, as well as the other soils of the region not herein specifically mentioned, are all characterized by their prevailing fine texture, a rule that holds even in the case of the sandy soils in which the major constituent is the fine sand, so that, in spite of the rapid drainage afforded

by the underlying boulder drift, the capacity of the soil to retain moisture is quite high. For this reason all the soils are very productive and are in consequence in a high state of cultivation. About Lafayette, with insignificant exceptions, practically all the land is under cultivation. On the upland the principal crops are corn, oats, clover and wheat, while the bottom lands form one unbroken stretch of corn. The only waste places—oases for the naturalist—are on the upland an occasional grove or more rarely a swampy depression, on the bottoms frequent, though small, bogs marking the places where the underground waters ooze out from the marginal bluffs. In such places the rarer and more interesting *Orthoptera* are to be found.

ORTHOPTERAN HABITATS.

No attempt at an exhaustive study of the various Orthopteran habitats was made owing to the limited time that could be spared for that purpose. Consequently in the following pages only the grosser features of the habitats are mentioned. About Lafayette, owing to the intense cultivation of the region, nearly all the country is open, in consequence of which the dominant *Orthoptera* are campestral types. Where the ground is unfilled it is usually covered with a close growth of blue grass (*Poa pratensis*), which in damper spots is replaced by foxtail (*Chatochloa viridis* and *glauca*). In such situations the grasshoppers usually encountered include the following species:

Syrbula admirabilis, *Arphia xanthoptera*, *Chortophaga viridifasciata*, *Eucoptolophus sordidus*, *Dissosteira carolina*, *Melanoplus atlantis*, *Melanoplus femur-rubrum*, *Orchelimum vulgare*, *Conocephalus strictus* and *Nemobius fasciatus*.

In cultivated lands this assemblage is largely characteristic of the grassy borders of roads, paths and fence-rows. Most of the species named continue abundant in such places with the possible exception of *Arphia xanthoptera* and *Chortophaga viridifasciata*, both of which appeared to be rather scarce in the particular cultivated tracts examined by me.

A second group of *Orthoptera* is characteristic of dry upland woods. On the level uplands woodland is represented only by widely scattered groves, in most of which the trees have been thinned out. This allows a rich growth of blue grass which is largely utilized as pasturage for cattle. Such pastured woodlands are almost invariably very barren in *Orthoptera*, those that do occur being similar to those found in the open

country. The most nearly continuous and undisturbed areas of woodland are those which clothe the tops and sides of the bluffs which, as already mentioned, form the outer margins of the river-bottoms. These are exclusively hardwood formations, the dominant tree at higher levels being the white oak (*Quercus alba*), with which are commonly associated the sugar maple (*Acer saccharum*), pig-nut hickory (*Hicoria glabra*), red oak (*Quercus rubra*), shell-bark hickory (*Hicoria ovata*), bass-wood (*Tilia americana*), elm (*Ulmus* sp. not det.), beech (*Fagus ferruginea*), dogwood (*Cornus florida*) and aspen (*Populus tremuloides*). Wherever these woodlands are sufficiently open to admit sunlight blue grass usually springs up and forms a continuous cover to the ground or, if the soil is exceptionally dry, an aggregation of more or less scattered tufts with interspaces of bare earth. Where the grass is thick one usually finds *Melanoplus scudderi*, while in places where it is short and scattered *Spharagmon bolli* and *Melanoplus luridus* are usually encountered. Along the edges of the woods in undisturbed ground these more strictly sylvan types were observed to meet and to intermingle with a campestrial assemblage which usually included *Syrbula admirabilis*, *Arphia xanthoptera*, *Chortophaga viridifasciata* and *Encoptolophus sordidus*. In scrubby areas and in tall herbaceous growths *Atlantius testaceus* was fairly common.

In strong contrast to the foregoing group is an assemblage characteristic of moist areas. Such areas most frequently occur at the outer margin of the river bottoms where the seepage from the neighboring bluffs keeps the ground perpetually moist and soggy. The soil in such places is a typical muck, frequently intermixed with gravel and silt. In nearly all the swamps I have visited the vegetable content of the soil appeared to be thoroughly decomposed. At one place (1) in a wet depression in the midst of a fairly large woods on the upland about one and a half miles northwest of West Lafayette the substratum was a true peat. In the bottomland swamps, however, the soil appears in all cases where I have examined it to be a muck. Such a swamp harbors a rich vegetation of which the dominant member in wetter spots is rice cutgrass (*Homalocenchrus oryzoides*) with which are often associated cat-tails (*Typha latifolia*) and jewel-weeds (*Impatiens biflora*). Surrounding the cutgrass areas in slightly dryer ground is usually a dense thicket composed of tall herbaceous plants, especially composites, among which I noted the taller ragweed (*Ambrosia trifida*), ironweed (*Vernonia fasciculata*), joe-pye-

weed (*Eupatorium purpureum*), boneset (*Eupatorium perfoliatum*) and a bewildering variety of members of the sunflower tribe (*Helianthus*, *Bidens*, etc.). Where this thicket is sufficiently open there frequently occur patches of wild rye (*Elymus virginicus*, *E. canadensis*).

The central portion of these swamps dominated by *Homalocenchrus* appeared to be characterized by a rather different assemblage of Orthoptera than that typical of the surrounding thickets, though, owing to the usually restricted size of the swamps, it was not possible in all instances to clearly distinguished the two groups. In general, however, the *Homalocenchrus* areas appeared to be characterized by such Orthoptera as *Orchelimum nigripes*, *Neoconocephalus palustris*, *Stauroderus curtippennis*, *Conocephalus attenuatus* and *Paroxya hoosieri*. The surrounding thickets were especially characterized by the short-winged *Melanopli*, such as *Melanoplus obovati-pennis*, *M. scudderi*, *M. gracilis* and *M. viridipes*, together with numerous examples of *Melanoplus differentialis*, *Conocephalus nigropleurum* and *Conocephalus memorialis*. Two forms that appeared to occur indifferently in both zones were *Orchelimum vulgare* and *Conocephalus brevippennis* (incl. *ensiformis*).

RELATIVE FREQUENCY OF THE SPECIES.

As regards numbers the most abundant grasshopper in this region is *Melanoplus femur-rubrum* which appears to swarm everywhere on both upland and lowland, though it appeared to be less frequent in wooded areas than in more open situations. Next to it in point of numbers I would place *Melanoplus atlantis* which is common, but more local than *femur-rubrum*. Other species which appeared to be present in what may be regarded as abundance were *Encoptolophus sordidus*, *Dissosteira carolina*, *Melanoplus differentialis*, *Orchelimum vulgare*, *Conocephalus strictus* and *Nemobius fasciatus*. Much less frequent, but on the whole rather common were such species as *Syrbula admirabilis*, *Arphia xanthoptera*, *Chortophaga viridifasciata*, and *Melanoplus femoratus*. Some species appeared to be of frequent or regular occurrence locally wherever the special conditions making up their normal environment prevailed. Thus *Spharagemon bolli* and *Melanoplus scudderi* and *luridus* occurred, usually in considerable numbers, wherever there were dry open woodlands, while in the swamps, or their borders, three species, *Melanoplus differentialis*, *Orchelimum nigripes* and *Conocephalus brevippennis* were in all but one or two instances abundant. Associated with the last three were frequently

considerable numbers of *Dichromorpha viridis*, *Sturoderus* (*Stenobothrus*) *curtipennis*, *Melanoplus scudderi*, *Melanoplus obovatipennis*, *Melanoplus femoratus*, *Conocephalus fasciatus*, and *Conocephalus nigropleurum*. Certain species were scarce in most places, but were found to be common or even abundant in one or two restricted areas. Thus *Hippiscus rugosus* was found in only one place, but was there quite common. *Paroxya hoosieri* was taken in numbers in a swamp (16) in the Wabash bottoms opposite Battle Ground but was not observed elsewhere. A peculiar variety of *Orchelimum nigripis* and *Conocephalus attenuatus* literally swarmed in a boggy depression (14) on the upland about 2 miles northwest of West Lafayette. The former variety I did not find in any other place, while of the latter I noted elsewhere only a single individual which I captured in a bog in the Wabash bottoms (6) about half a mile south of Lafayette.

Certain species were observed to be of rather infrequent occurrence but could hardly be called rare. Among these were *Schistocerca americana*, *Melanoplus viridipes*, *Melanoplus gracilis*, *Scudderia texensis*, *Scudderia furcata*, *Neoconocephalus palustris*, *Conocephalus nemoralis* and *Atlanticus testaceus*. The following species appeared to be quite scarce: *Truxalis brevicornis*, *Orphulella speciosa*, *Chixaltis conspersa*, *Schistocerca alutacca*, *Melanoplus walshii*, *Neoconocephalus robustus crepitans* and *Conocephalus saltans*.

DESCRIPTION OF LOCALITIES WHERE COLLECTIONS WERE MADE.

1. A fairly extensive bit of woodland on the edge of the upland about a mile northwest of West Lafayette. The timber was in part rather dense, but there were a number of open spots well fitted for sylvan Orthoptera. There had been no grazing in the portion of the woods where the collecting was chiefly done, so there was considerable undergrowth. Most of the land which these woods covered was dry or only moderately humid, but it included one or two depressions where the ground was either soggy or covered with standing water. One of these, a very limited tract, was included in the northwestern edge of the wood and was occupied by an almost pure growth of button-ball bush (*Cephalanthus occidentalis*): the other was slightly larger and occupied by a mixed growth of sapling silver maples (*Acer saccharinum*) and red-berried elder bushes (*Sambucus racemosa*) together with a variety of other plants. Both of these swampy areas proved to be quite barren in Orthoptera. The best collecting was done along a path entering the woods at its northwest corner and in the

neglected clearings adjoining it. This path was nearly overgrown with grassy and sedgy thickets in which were numerous tall composites. Among the grasses I recognized *Brachyelytrum erectum*, *Panicularia nervata*, *Bromus purgens* and *Hystrix hystrix*; the sedges were species of *Carex*, one of which appeared to be *C. lupulina*. In these grassy areas and the rank herbage bordering it I found on July 27 a considerable number of nymphs of *Melanoplus scudderi*, also smaller numbers of adults of *Melanoplus gracilis*, *Dichromorpha viridis* and *Chlœaltis conspersa*. Near the edge of the wood, in a grassy opening not far from the button-bush bog, I found a single female nymph of *Truxalis brevicornis*. At various points along the edges of the woods and in cut-over areas *Dissosteira carolina*, *Melanoplus atlantis* and *Spharagemon bolli* were of frequent occurrence.

2. This was on the west bank of Burnett Creek in the stream bottoms about two and one-half miles southwest of Battle Ground. The surface is elevated only a few feet above the level of the stream and forms a nearly flat tract between the stream and the neighboring terrace. It is well wooded, the larger trees being chiefly cottonwood (*Populus deltoides*) and buttonwood (*Platanus occidentalis*). The larger trees were much scattered and beneath them the marshy ground supported a rich undergrowth of small trees, shrubs and tall herbage. The principal shrubs were hazel (*Corylus americana*) and Pussy-willows (*Salix discolor*). In the more open bogs the vegetation consisted of a reedy herbaceous growth in which I noted such plants as *Typha latifolia*, *Homalocenchrus oryzoides*, *Cinna arundinacea*, *Panicularia nervata*, *Scirpus atrovirens*, *Ambrosia trifida*, *Sagittaria latifolia*, *Vernonia fasciculata*, *Eupatorium purpureum*, *Eupatorium perfoliatum* and the usual host of sunflower-like composites (species of *Helianthus*, *Bidens* and allies). The soil at this place is mapped by the Bureau of Soils as Wabash fine sandy loam, but in these bogs it was almost a true peat. This place was visited twice, on August 9th and September 13. On the former date thirteen species were taken. Of these the most common in or about the bogs were *Conocephalus brevipennis* and *Melanoplus differentialis*. With them were smaller, but not inconsiderable numbers of *Melanoplus obovatipennis* and *Conocephalus nigropleurum*, while only a few examples of each of the following species were taken in similar haunts: *Melanoplus scudderi*, *Melanoplus gracilis*, *Melanoplus femoratus*, *Scudderia fuscata* and *Orchelimum vulgare*. One individual of *Truxalis brevicornis* was observed and captured along the edge of a rather extensive growth of cat-tail (*Typha latifolia*). *Melanoplus femur-rubrum*,

which abounded in the surrounding country, appeared to be scarce in this place as only a single individual was observed. In a relatively dry part of the woods, where the ground was slightly damp, but by no means wet, were observed in a few specimens of *Dichromorpha viridis* and a single male *Spharagemon bolli*, the latter doubtless a stray individual from the dryer groves of the adjoining upland. On September 13 the fauna had much the same character, but was evidently poorer in both individuals and species. Of the latter only nine were recorded and of these only two, *Orchelimum nigripes* and *Chlœaltis conspersa* had not been taken on the earlier date. The former species is usually the most abundant of the bog "long-horned" grasshoppers, but at this place it was exceptionally scarce. Of *Chlœaltis conspersa* only a single male was taken along the edge of the cat-tail bog close to the spot where the *Truxalis* was taken on the earlier date. Besides these other species taken or observed on September 9 were *Dichromorpha viridis* (10), *Melanoplus obovatipennis*, *M. differentialis*, *Scudderia furcata* (10), *Orchelimum vulgare*, *Conocephalus brevipennis* and *C. nigropleurum*.

3. The Purdue Experimental Farm in West Lafayette is located on "second bottom" land. The soil is the Sioux loam. Nearly all the land is under cultivation, the principal crops being corn, wheat, rye, oats, clover, cow-peas, alfalfa and soy beans. Where the land is untilled, as along fences and the borders of paths, there is a firm blue-grass sod in which scattered patches of clover (*T. pratense*) are frequent; also the usual weeds, such as witch-grass (*Panicum capillare*), spreading panic-grass (*P. dichotomiflorum*), crab-grass (*Echinochloa crus-galli*), foxtail (*Chaetochloa viridis*, *C. glauca*), Orchard grass (*Dactylis glomeratus*) and *Eragrostis major* and *purshii*. In the more fully cultivated portion the "home" of the Orthoptera was in this relatively undisturbed grassy sod, although they spread from this in large numbers into the neighboring plats. The most abundant species here was naturally *Melanoplus femur-rubrum*; other common forms were *Encoptolophus sordidus*, *Dissosteira carolina*, *Melanoplus atlantis*, *Orchelimum vulgare* (specially in the taller grasses, such as fox-tail, etc.) and *Conocephalus strictus*, the latter very common in the denser areas of blue grass. Other species of frequent occurrence, but not so abundant as those just mentioned, were *Syrbula admirabilis*, *Chortophaga viridifasciata*, and *Melanoplus differentialis*. Occasionally a specimen of *Schistocerca americana* would be taken or observed in the rank weedy growth bordering the experimental plats and in the more thickly

planted plats themselves. Once two individuals of *Neoconocephalus robustus crepitans* were taken and another heard in the corn fields; both of those captured were taken on corn in the early evening.

The most interesting collecting on the Purdue grounds, however, was done in a small waste lot not far from the Lake Erie and Western Railroad. About half of this lot was occupied by a nearly pure growth of timothy (*Phleum pratense*), while the remaining half had at some time or other been used as a dumping place for manure or other refuse and was now occupied by a rich growth of *Elymus virginicus*, with which were intermixed some areas of *Bromus (ciliatus?)* and a few clumps of a taller species of *Elymus*, probably *canadensis*. On one side near a fence row was a rank growth of sumac (species not determined). In another part of the field at one end of the *Elymus* formation in a shallow gully was a rank growth of green foxtail (*Chaetochloa viridis*). Collections were made here at intervals throughout the summer. The species were much the same as those occurring in the cultivated areas, but in addition a number of species were taken which were absent or very rare in the latter. In this waste land most of the collecting was done in the timothy, which had recently been cut, a circumstance which made it relatively easy to capture the grasshoppers. *Melanoplus femur-rubrum*, *Melanoplus atlantis*, *Encoplophus sordidus* and *Conocephalus strictus* were here abundant, while both *Syrbula admirabilis* and *Arphia xanthoptera* were of frequent occurrence. Early in July *Melanoplus femoratus* was fairly common in this tract, but it soon ceased to be an evident component of the fauna. Two ♀♀ of *Orphulella speciosa* were taken on July 22; repeated search failed to reveal any additional specimens of this apparently very rare species. A single male *Scudderia tenensis* was also captured here the same date. In the *Elymus* patch a solitary male *Conocephalus fasciatus* was taken also on the same date; while much later in the season—September 13—a small colony of *Conocephalus nemoralis* was found in a place where the *Elymus* was encroached upon by the sumac thickets. *Melanoplus differentialis* was also frequent here. Outside of these three species, the forms in the *Elymus* area were the same as those in the timothy with the exception of *Arphia xanthoptera* which appeared to be limited to the latter. The foxtail growth formed the favorite habitat of *Orchelimum vulgare*. The same grass also yielded a female of *Stenobothrus curtippennis*.

A short distance west of this lot in the adjoining field, which had been

planted in clover, I captured a female specimen of *Schistocerca abutacca*. The capture was made close to the railroad, along which there was a mixed growth of elder (*Sambucus*) and white melilot (*Melilotus alba*). The latter formed a very rank growth in some abandoned gravel pits on the opposite side of the railroad. The color of this specimen was much duller than that of examples from the New Jersey sphagnum bogs, being an olive brown or pale leather color with hardly a trace of green, and with the dorsal stripe, although easily recognizable, by no means conspicuous.

4. At this point some roadside collecting was done. The place is on the slope leading from the "second bottom" at West Lafayette to the upland immediately north of the town. The roadside vegetation consisted in the dryer parts of a mixture of blue grass and timothy and in the gullies of a rank growth of *Mililotus alba*. The Orthoptera were all of common types. *Melanoplus femur-rubrum* swarmed everywhere, while its congener, *M. differentialis*, was almost entirely limited to the thickets. In the blue-grass-timothy areas *Conocephalus strictus* was common, while *Synbala admirabilis* was of frequent occurrence.

5. This place, locally known as "the tank" from the presence of the storage tank of the West Lafayette water company, is on the edge of the upland at the head of a deep ravine known as Happy Hollow. It overlooks the Wabash bottoms, "second bottoms" being absent from this point north. The soil is Miami silt loam. The land was untilled the past season and had evidently not been in cultivation for a long period. It was open, but at its southern edge where it meets the steep slopes leading down into Happy Hollow was bordered by the relatively dense woods which clothe these slopes. The open areas were closely covered with blue grass with which were locally intermixed small areas or scattered clumps of wiregrass, *Poa compressa*, and foxtail, *Chertochloa glauca*. There were also considerable clover and some low trailing briars. Close to the woods the blue grass became rather sparse and grew only in short scattered clumps with open places between where the bare soil was exposed or where certain hardy herbs, mostly composites, grew. In one or two places on the higher land where the blue grass was very thin, were formations of *Andropogon scoparius* with *A. furcatus* as a minor constituent. At one place immediately adjoining the woods was an extensive patch of *Tridens flava*. Within the outer edge of the woods on some level stretches where the less eroded parts of the bluff project out into the ravine, were a few scrubby

areas containing only scattered grasses, but with many low saplings and some herbaceous undergrowth. The woods on the upper portions of the ravine slopes adjoining the upland were of the mixed hardwood type. The dominant tree was the white oak, but with it were many hickories, elms, sugar maples, lindens, red oaks, beeches and dogwoods.

Collections were made in the open fields above the woods, along the borders of the woods and in the woodland scrub areas. In the more open areas, farthest from the woods, wherever the blue grass or its congener, *Poa compressa*, was thick and luxuriant, common species were *Melanoplus femur-rubrum*, *Encoptolophus sordidus* and *Conocephalus strictus*; *Syrbula admirabilis* was of frequent occurrence. Where the grass was shorter and coarser with some interspaces a number of additional species were common such as *Melanoplus allanis*, *Arphia xanthoptera*, *Dissosteira carolina* and *Hippiscus rugosus*. Of *Arphia xanthoptera* and *Hippiscus rugosus* both the yellow-winged and the red-winged types appeared to be about equally frequent. Both of these species were common in the more barren areas along the very edge of the woods, where they were associated with *Spharagemon bolli* and *Melanoplus luridus*, each of which was of frequent occurrence, but did not appear to spread any appreciable distance from the immediate vicinity of the trees. Within the woods in the scrub areas previously referred to the two last-mentioned species were the only ones found. Other species occurring at this locality were *Chortophaga viridifasciata* and *Orchelimum vulgare*, long-winged phase. Nymphs of the former were frequent in some areas of dwarfed blue grass in spring and again in the fall, while a smaller number of the latter were found in a scrub area along the borders of the woods.

6. This includes the outer edge of the Wabash bottoms a short distance south of West Lafayette. The outer edge of the bottoms at this point is marked by a gently sloping bluff which leads up to the second bottoms of West Lafayette. Near the base of the bluff is a road and below the road, between it and the level surface of the present bottom, is a short slope which was partially wooded, the common trees being cottonwoods, honey-locust, hackberry, elm and shingle oak. The woodland here formed a narrow fringe and beyond it, occupying all the level areas, were the usual corn fields of the bottoms. Beneath the trees was a fairly dense undergrowth of shrubs and tall grasses of which species of *Elymus* were most frequent, especially *E. virginicus*. The soil was a mixture of the gravel derived from the material of the bluff itself and alluvium depos-

ited by the river during periods of overflow. Owing to its position, the presence of the rank vegetation and of the resulting humus the soil was in most places moderately damp, but not actually wet. This, however, was not the case in one spot where the ground was perpetually moist on account of the constant seepage from the bluff. The substratum at this spot was a black or dark grey muck with much gravel in its deeper levels. Trees were absent from these wetter areas and they were accordingly occupied by a rank growth of the usual herbaceous swamp plants the more conspicuous of which in this swamp were *Typha latifolia*, *Homalocenchrus oryzoides* and *Ambrosia trifida*. South of the swamp was a small bit of open woodland in which there was a rich undergrowth of grasses. Of these the species of *Elymus*, chiefly *E. virginicus* with some *canadensis*, occupied the better lighted areas while in the more shaded spots such forms as *Homalocenchrus virginicus*, *Muhlenbergia* apparently *M. tenuiflora*, *Korycarpus arundinaceus* and *Hystrix hystrix* were common. Adjoining this woodland on the south was an open pasture in which there was a good stand of *Tridens flava*.

Quite a number of interesting Orthoptera were taken in this locality. In the drier situations the patches of *Elymus canadensis* yielded such species as *Dichromorpha viridis*, *Melanoplus viridipes*, *Melanoplus atlantis*—an unusually humid environment for this form—*Melanoplus femur-rubrum*, *Melanoplus femoratus*, *Amblycorypha rotundifolia* and *Conocephalus nemoralis*. With the exception of *Melanoplus femur-rubrum* none of these were common or widespread, being in most cases represented only by scattered individuals or an occasional colony. Other grasses besides the *Elymus* were searched for Orthoptera, but, excepting *Tridens*, proved to be barren. In the dense thickets of ragweed, *Ambrosia trifida*, surrounding the more boggy spots *Melanoplus femur-rubrum* and *Melanoplus differentialis* were abundant, while in the same tracts a few examples of *Melanoplus scudderi* were also taken. In the swamp the Orthoptera were most numerous in the *Homalocenchrus oryzoides* and the immediately adjoining thickets; they were apparently quite infrequent in the cat-tails. The most abundant swamp species were in order of relative numbers *Melanoplus femur-rubrum*, *Conocephalus beripennis*, *Melanoplus differentialis*, *Orchelimum nigripes*, *Orchelimum vulgare* and *Conocephalus nigropleurum*; in much smaller numbers were found such species as *Oecanthus fasciatus*, *Oecanthus quadripunctatus*, *Scudderia furcata*, *Neoconocephalus palustris*, *Orchelimum gladiator*, *Conocephalus fasciatus*, *Conocephalus nemoralis*

and *Conocephalus attenuatus*. In the pasture in which *Tridens flava* was a common plant *Syrbula admirabilis* and *Conocephalus strictus* were of frequent occurrence along with larger numbers of the ubiquitous *Melanoplus femur-rubrum*. Close to the border of the same field, where there were some extensive patches of *Elymus virginicus*, several examples of *Dichromorpha viridis* were observed.

7. This was a level tract of very open woodland located on top of the bluff overlooking the bottom lands included in locality 6. The ground here had been used for pasturing cattle and the herbaceous vegetation was accordingly quite short and scanty. Orthoptera were scarce. Each *Melanoplus atlantis* and *Melanoplus femur-rubrum* were frequent, while in one place where there was considerable slope and a fair amount of scrub growth a few examples of *Spharagemon bolli* were seen. Late in June *Atlanticus testaceus* occurred in small numbers, several being captured one night on low shrubs and tall weeds.

8. This locality was a small open grove at the top of the highest line of bluffs at the north end of a ravine situated nearly half way between West Lafayette and the mouth of Indian Creek. The soil was the Miami silt loam which in this exposed situation was quite dry and barren and had a decided sandy appearance. Along a recently cut roadside I found at this point a young specimen of the black-jack oak, the presence of which naturally indicates the barren character of the location. The soil here at the time of my visit—August 24th—was formed of blue-grass sod with occasional patches where the ground was bare or but sparsely covered with vegetation. In such places the common woodland Panicum, *P. huachuca*, was frequent. In two or three places erosion had worn slight gulleys from which most of the finer soil particles had been washed away leaving a very hard and stony soil on which very little vegetation had as yet obtained a foothold. These gulleys were the favorite habitats of the more geophilous Orthoptera such as *Arphia xanthoptera*, *Spharagemon bolli* and *Dissosteira carolina*.

Only about a half hour was spent in collecting at this spot, during which examples of the following species were taken or identified: *Syrbula admirabilis*, *Arphia xanthoptera*, both yellow-winged and orange-winged types, *Encoptolophus sordidus*, *Sphragemon bolli*, *Dissosteira carolina*, *Melanoplus femur-rubrum* and *Melanoplus luridus*.

9. This locality is about half a mile southeast of Battle Ground in a region covered by Miami fine sand. Practically the whole country is under

cultivation. The only collecting was done in a limited bit of roadside where the banks were occupied by a mixed growth of two tall bunch-grasses, *Tridens flava* and *Andropogon furcatus*. My visit to this spot was made August 30. At that time the following species were taken or observed, all being fairly frequent: *Melanoplus femur-rubrum*, *Melanoplus atlantis*, *Conocephalus strictus*, *Dissosteira carolina*, *Syrbula admirabilis* and *Arphia xanthoptera*.

10. This locality is on the east side of the Wabash about three miles north of Lafayette and a mile southwest of Wild Cat Creek. At this point there is a well-marked bluff marking the dividing line between the upland, here formed by Sioux sandy loam, and the Wabash bottoms. At the base of the bluff is an extensive marsh, shown on the Bureau of Soils map as a crescent-shaped patch of muck. The upland immediately bordering the bluff is occupied by a cemetery in which there are many large trees, the whole forming an open grove with no undergrowth except the ordinary blue-grass sod. In this cemetery, frequenting the relatively dry blue grass were numerous examples of *Melanoplus scudderi* and *Melanoplus luridus* along with the usual *Melanoplus femur-rubrum* and *Encoptolophus sordidus*. On the steeper slopes, where there was a considerable amount of herbaceous undergrowth and some patches of *Andropogon furcatus*, a few examples of *Spharagemon bolli* were seen and, near the base of the slope, in a shallow depression, where there was a thick growth of a bright green, succulent grass, a small number of *Stauroderus curtippennis* were found. *Dissosteira carolina* was as usual common on paths and driveways both on the upland and in the bottom. The swamp at the base of the bluff was quite open and was of the type usual to the bottoms with rice cut-grass, *Homalocenchrus oryzoides*, forming the dominant vegetation of the wetter areas. On the side toward the bluff this growth was bordered by a thicket formed mostly by tall herbaceous plants among which sunflowers and goldenrods were conspicuous; while on the opposite side toward the open bottom lands it was bordered by a weed vegetation in which a tangled growth of smart-weed (*Polygonum*) predominated. In the rice cut-grass the common Orthoptera were *Melanoplus femur-rubrum*, *Conocephalus brevipennis*, *Orchelimum nigripes*, *Orchelimum vulgare* and *Melanoplus differentialis*. Both of the last-named species and also *Conocephalus nigropleurum* were frequent in the surrounding thickets, while *Orchelimum vulgare* and *Melanoplus femur-rubrum* swarmed in the *Polygonum* areas. In addition to the two forms last mentioned other species tak-

en in the bordering thicket in fair numbers were *Melanoplus obovatipennis* and *Conocephalus nemoralis*. With them were found occasional examples of *Dichromorpha viridis*, and *Melanoplus femoratus*. In the *Homalocenchrus oryzoides* two specimens of *Neoconocephalus palustris* and one each of *Scudderia texensis* (a ♂ apparently this species) and *Orchelimum vulgare* long-winged type were taken. Collecting was done at this place on September 6th.

11. At this place collections were made on July 19 and October 3. The locality was the low alluvial tract along the Wabash at the mouth of Wild Cat Creek. Most of the land is under cultivation, but there is some open woodland on the adjoining bluffs. Along the roadside were the usual weedy tracts inhabited by *Melanoplus atlantis* and *Melanoplus femur-rubrum*, the latter being by far the most abundant. In the ranker herbage and weedy tracts *Melanoplus differentialis* was of frequent occurrence. On the bare paths and in the plowed fields *Dissosteira carolina* was common. The remaining species were few in number and were found only in grassy depressions close to the river. In one of these which contained an almost pure stand of *Elymus virginicus* a few examples of *Stauroderus curtipennis* were observed on July 19; in the same place a single specimen of each of the following was taken: *Melanoplus walshii*, *Orchelimum gladiator*, *Conocephalus fasciatus* and *Conocephalus nigropleurum*. In another depression, examined on October 3, the dominant growth was a species of *Muhlenbergia*; in this *Orchelimum vulgare* and *Conocephalus brevipennis* were common, a single specimen of *Conocephalus nigropleurum* was also taken here.

12. While on an inspection trip on the upland between West Lafayette and Montmorenci on August 12 I made a rapid examination of several small areas in which the ground was more or less damp and covered either with thick succulent blue grass or species of *Carex*. Orthoptera did not appear to be very common in such places, except such ubiquitous forms as *Melanoplus femur-rubrum* and *Orchelimum vulgare*. In one rather wet depression, where there was a nearly pure growth of *Carex*, *Conocephalus fasciatus* was rather common: it also occurred, though in small numbers, in blue-grass depressions. In one of the latter bordering a small grove a small number of *Stauroderus curtipennis* were observed. A male *Scudderia furcata* was taken near here in some thick grass at the side of a small stream.

13. This was a very limited tract on the edge of the bluff overlook-

ing the Wabash valley about three miles southwest of Lafayette. Collecting was done only along the right of way of the Wabash Railroad. This locality was visited only once, and that on October 12, when many species had died out or become very scarce. Only five species were noted, four of which were common in the waste lots adjoining the railroad. They were *Melanoplus femur-rubrum*, *Eucop¹olophus sordidus*, *Dissosteira carolina* and *Melanoplus atlantis*, the last-named being the least frequent. The only other species observed on this trip was a male *Schistocerca americana* which was found in a local growth of *Andropogon furcatus*.

14. This was a very interesting undrained depression of considerable size situated in an open field on the upland about two miles northwest of West Lafayette. The substratum in the depression was a dark muck. At the time of my visit, October 13-14, it was quite dry and crisp at the surface, but within a fraction of an inch below was still quite moist and sticky. The centre of the swamp was nearly devoid of vegetation: doubtless in times of normal rainfall it is submerged. Surrounding this is a wide fringe of reedy vegetation formed of cat-tails, *Typha latifolia* and a tall species of rush, which was similar in general aspect to *Juncus effusus*, though owing to the lateness of the season I was unable to certainly identify it. Intermixed with both of these was a luxuriant growth of rice cut-grass, *Homalocenchrus oryzoides*. Surrounding these again was an outer thicket of tall herbaceous plants, such as asters, goldenrods, iron-weeds, sunflowers and their associates.

The Orthoptera of this swamp were unlike any found elsewhere in the extreme abundance of two Tettigoniids, a peculiar color-phase of *Orchelimum nigripes* and *Conocephalus attenuatus*, both of which simply swarmed throughout the *Typha-Homalocenchrus* areas although they largely avoided the rush and were entirely lacking in the herbaceous marginal thicket. The large numbers of *Conocephalus attenuatus* in this place was surprising, for, although it has been known for a long time to be native to the state, I had, previous to my discovery of this marsh, been able to procure only a single example in the region about Lafayette and was accordingly inclined to look upon it as a very rare species in this particular part of the State.

Other species associated with the two species just mentioned in the cut-grass-cat-tail formation were *Conocephalus nigropleurum*, *Conocephalus saltans* and a small *Orchelimum* which Mr. Rehn has assigned to *O. agile*. All of these were quite scarce at the time I examined the place, only a

single example of each of the last two species being seen and only a single pair of *Conocephalus nigropleurum*. Noteworthy was the entire absence in this marsh of the two most frequent marsh "long-horned" grasshoppers of this region, *Conocephalus brevipennis* and the typical phase of *Orchelimum nigripes*.

In the herbaceous thickets forming the marginal vegetation of the marsh Orthoptera were not very common, the only species taken there being *Melanoplus differentialis* and *Melanoplus oboutipennis*, both of which were only moderately common. In the open clover field surrounding the marsh the only species observed was *Melanoplus femur-rubrum*.

15. This was a small lateral ravine which opened into the valley of Indian Creek close to where it empties into the Wabash. It was visited June 28. Orthoptera were very scarce at this time, but on a steep wooded slope where there was much bare ground with scattered growth of the woodland *Panicum*, *P. huachuca*, I captured a male *Melanoplus fasciatus*. The woods here were denser than usual and were cool and shady with only few scattered openings where the direct rays of the sun reached the ground. The soil at this spot is mapped as Miami silt loam.

16. This includes the east bank of the Wabash and the adjoining bottoms about 2½ miles southeast of Battle Ground examined August 30th. The river bank here slopes very gently and at the time of my visit was covered next the river with a growth of sedge, apparently *Scirpus americanus*, and landward of this by *Homalocenchrus oryzoides*. Above this on higher ground was a fringe of woodland with a dense undergrowth of *Muhlenbergia*. Beyond this were the flat cultivated lands of the bottoms. At this point the bottoms are about a quarter of a mile wide. At their outer edge—the edge away from the river—they are characterized by the usual line of high bluffs forming the edge of the neighboring upland. At the base of the bluffs was the usual seepage zone, which at this place was represented by an extensive marsh in which *Homalocenchrus oryzoides* formed the bulk of the vegetation. Bordering it were the accompanying thickets of tall composites.

The Orthoptera of the river bank at this place were disappointingly scarce. The only species at all common was *Orchelimum nigripes* which was observed only in the cut-grass. A single specimen of *Neoconocephalus palustris* was taken in the sedge, but it had apparently strayed there from the cut-grass areas. No other species were noted on the river margins. On the cultivated parts of the flood plain there were in several places rank

growths of common weeds and in these *Melanoplus femur-rubrum* and *Melanoplus differentialis* were abundant. The best collecting from the standpoint of variety was afforded by the marsh at the base of the bluffs. Here in the cut-grass I found considerable numbers of *Paŕoxya hoosieri*, the only place where I obtained this interesting species. With it were large numbers of *Orchelimum nigripes*, *Conocephalus brevipennis* and *Conocephalus nigropleurum*. In the marginal thickets were observed such forms as *Melanoplus differentialis*, *Conocephalus fasciatus*, *Melanoplus scudderi* and *Melanoptus obovatipennis*.

17. This was a small open groove on rather dry barren soil. It is located on a gentle slope just above the Wabash bottoms on the west side of the river about three miles southwest of West Lafayette. The soil is Sioux sandy loam. In the groove at this point it supports a rather weak growth of blue grass. In the driest parts the blue grass is sparse and in such places *Panicum huachuca* becomes a noticeable constituent of the herbaeous flora. The Orthoptera taken here were the usual species of dry open woodland. In July and early August *Spharagemon bolli* was quite frequent while later in the season *Melanoplus scudderi* and *Melanoplus luridus* were common.

ANNOTATED LIST OF SPECIES.¹

Diaperomera femorata Say. A single specimen, a male, taken in low woods on Burnett Creek near Battle Ground (2), August 9.

Aerydium (Tettix) ornatus Say. Moderately frequent in spring on dry hillsides and in stubble fields on the upland near West Lafayette.

Truxalis brevicornis (Linnæus). Two specimens; a female nymph taken July 27 in upland deciduous woodland about one mile northwest of West Lafayette (1) in a grassy tract a short distance from a bog dominated by buttonbush, *Cephalanthus occidentalis*; a mature male taken August 9 in low woods along Burnett Creek (2) near Battle Ground at the edge of a bog containing cat-tail (*Typha latifolia*), sedges (species of *Carex*, *Scirpus atrovirens*), *Sagittaria*, *Panicularia nervata*, *Helianthus* spp. Species apparently quite scarce as no other examples were seen.

Syrbula admirabilis (Uhler). Of frequent occurrence in all relatively dry grassy areas at higher levels and locally at least, where conditions are suitable, not uncommon in bottom lands. The species is prevailingly campestral in its habitat, being especially fond of open grass lands; less fre-

¹The nomenclature used here is that given in an unpublished list of unsynonymized terms compiled by Mr. Morgan Hebard.

quently it may occur along the grassy borders of open woodland. I have taken it in areas occupied by blue grass (*Poa pratense*), timothy (*Phleum pratense*), red-top (*Tridens flava*) and bunch-grass (*Andropogon scoparius* and *furcatus*). I have the following records: July 23, 2 nymphs in dense patch of *Bromus* on Purdue Experimental Grounds (3); July 26, nymphs fairly frequent in timothy stubble on Purdue Experimental grounds (3); August 1, adults, especially males, frequent and nymphs common in grassy roadside patch (timothy-blue grass) on upland slope (4) north of Lafayette; also in dry blue grass and *Poa compressa* in field at "the tank" (5); August 20, several males in open field dominated by *Tridens flava* along outer margin of the Wabash bottoms below West Lafayette (6); August 24, frequently within the borders of dry open woodland on the top of the bluffs at the head of a ravine (8) about half-way between West Lafayette and the mouth of Indian Creek, chiefly in dry blue-grass, and associated with *Arphia xanthoptera*, *Spharagemon bolli*, *Encoptolophus sordidus* and *Melanoplus luridus*; August 30, frequent in roadside and fence-row grasses, especially in a patch of *Tridens flava* and *Andropogon furcatus* about a half mile southeast of Battle Ground (9); September 1, of common occurrence in grassy uplands at head of "Happy Hollow" (5) occurring in blue grass, wire-grass (*Poa compressa*) and *Andropogon furcatus* and *scoparius*; October 4, appears to be getting scarce now on the Station grounds (3); October 26, a single female seen in dense patch of *Poa compressa* in locality 5; October 31, a dead female found on cement sidewalk on Experimental Station grounds (3).

Orphulella speciosa (Scudder). Apparently very rare, only four specimens having been seen or taken throughout the entire season. These occurred in dry, open, grassy tracts on untilled land.

July 22, two females taken in timothy stubble in waste lot on Purdue Experimental Grounds (3); in both of these the tegmina are longer than the abdomen and their tips reach the tips of the hind femora. One female has the discoidal area of the tegmina occupied in part by a double row of cells, a character of its congener *pelidna*; the specimen, however, is unquestionably *speciosa*. August 1, a male taken in *Poa compressa* in a field at "the tank" (5). September 1, a male taken in patch of *Andropogon* on upland at the head of Happy Hollow (5).

Dichromorpha viridis (Scudder). Appears to be only moderately frequent and is largely restricted to damp situations within or along the

edges of open woodlands. It is more frequent in bottom lands than in more elevated tracts.

July 27, frequent in grassy and sedgey spots in humid upland woods (1); August 9, in small numbers in low woods and thickets along Burnett Creek (2); August 20, occasional in a low field along the outer edge of the Wabash bottom near West Lafayette (6) occurring in *Tridens flava* and *Elymus virginicus*; September 6, occasional in the undergrowth on a wooded slope near a *Homalocenchrus oryzoides* marsh (10); September 13, a female taken in low woods along Burnett Creek (2).

Chlocaltis conspersa Harris. Occasional in grassy spots in damp woodlands; very local.

July 27, several males and one female observed in humid upland woods northwest of West Lafayette (1), in a grassy clearing where the prevailing herbaceous vegetation consisted of *Carex*, *Elymus* and *Hystrix*; September 13, a single male taken in low woods along Burnett Creek (2), at the edge of a cat-tail bog.

Stauoderus (Stenobothrus) curtipennis (Harris). Apparently only moderately frequent and rather local, occurring in humid tracts well covered with succulent grasses.

July 19, in small numbers in the bottoms near the mouth of Wild Cat Creek (11), in dense growth of *Elymus virginicus*; August 12, a female taken in patch of fox-tail (*Chatochloa viridis*) in a waste lot on the Purdue Experimental Grounds (3); July 12, a small colony in a moist grassy depression along the edges of woodland on the upland between Lafayette and Montmorenci (12); September 6, quite scarce in grassy areas on a wooded slope south of Wild Cat Creek (10).

Arphia sulphurea (Fabricius). Found only once in late April in a sparse growth of blue grass (*Poa pratense*) at the top of a high bluff at Happy Hollow (5). It was at this time in the nymph stage. No others were observed during the season, but it is doubtless more frequent in the spring months than my very meagre field observations made at that season would indicate.

Arphia xanthoptera (Burmeister). Frequent in untilled areas in numerous dry situations, chiefly in upland localities. Both yellow-winged and orange-winged examples occur in nearly equal numbers. The species appears to occur only occasionally on fully cultivated land.

August 1, frequent on the bluffs at the head of Happy Hollow (5), occurring in dry grassy areas and on bare ground on the gentle inclines

adjoining the wooded ravine slopes. Both sexes were represented, also yellow-winged and orange-winged examples in approximately equal numbers; August 24, several examples of both color types observed in open woodland at the head of the ravine between West Lafayette and the mouth of Indian Creek (8), occurring in blue grass areas and in a dry gully; August 28, several of the orange-winged type observed in timothy stubble on a waste lot of the Purdue Experimental Grounds (3); August 30, several observed in an open clover field on dry sandy ground about a half mile east of Battle Ground (9); September 1, both yellow-winged and orange-winged individuals nearly equally common on the bluffs at the head of Happy Hollow (5); October 4, scarce in cultivated ground on Purdue Experimental Grounds (3).

Chortophaga viridifasciata (DeGeer). Only moderately frequent, chiefly in dry upland grass lands. Nymphs were observed in late April, adults from early May to late June and nymphs from early October to the end of November. The species appeared to be most frequent in sparse blue grass areas on the barren slopes at the top of the bluffs.

Encoptolophus sordidus (Burmeister). Abundant in all open dry areas or in quite open woodland.

July 22, nymphs common in timothy stubble in a waste lot on the Purdue Experimental Farm (3); August 1, nymphs common in dry blue grass and *Poa pratensis* areas on the bluffs at the head of Happy Hollow (5); August 19, adult males observed today for the first time on the Purdue University Farm (3) in blue grass areas; August 24, occasional in open woodland on the bluffs at the head of a ravine between West Lafayette and the mouth of Indian Creek (8) in blue grass; September 1, both sexes common in open grassy fields on the bluffs at the head of Happy Hollow (5); September 6, occasional in an open grove on bluffs (10) near Wild Cat Creek; September 13, common in blue grass borders of paths and fences on Purdue Experimental Farm (3); October 4, common on Purdue Experimental Farm (3); October 12, common in waste ground along Wabash Railroad south of Lafayette (13); October 25, occasional on roadside vegetation at the outer edge of the Wabash bottoms near West Lafayette (6); October 26, November 2, small numbers in grassy fields at head of Happy Hollow (5).

Hippiscus rugosus (Scudder). Common in one locality, but not observed elsewhere. It was found August 1 and again on September 1 on the tall bluffs at the head of Happy Hollow (5) where it occurred on unfilled

ground in short blue grass and *Poa compressa* areas in dry fields and along the edges of woodlands. It was represented by both yellow-winged and vermilion-winged individuals, the two forms being present in apparently equal frequency.

Spharagmon bolli (Scudder). Frequent in dry open woodland in scrubby and grassy clearings; also along woodland borders, but never in open country.

July 12, a few observed on a hillside covered with open scrub near the borders of woods south of West Lafayette (7); July 23, moderately frequent in an open oak woods south of West Lafayette (17); August 1, frequent along the borders of woods on the bluffs at the head of Happy Hollow (5) in sparse grass and scrub areas; August 9, a male taken in low, humid woods on Burnett Creek (2), probably a stray example from the neighboring upland; August 24, several, in open woodland on the bluffs at the head of the ravine between West Lafayette and the mouth of Indian Creek (8); September 1, several observed in clearings in the woods on top the bluffs at the head of Happy Hollow (5); September 6, few seen in a dry grassy area, largely occupied by *Andropogon furcatus*, on a wooded slope (10) near Wild Cat Creek.

Dissosteira carolina (Linnaeus). Common everywhere on bare ground and in dry grassy areas, where the grass is short, with patches of bare earth intervening. Appeared as adults about July 7 and persisted until the end of October.

Schistocerca americana (Drury). Of sporadic occurrence from late March until at least the middle of October, apparently most frequent in early fall.

March (late), a male taken on a building lot at West Lafayette, in blue grass (3); July 22, a female taken in a field of soybeans on Purdue Experimental Farm (3); September 10, observed a female on Purdue Experimental Farm (3) in blue grass; September 30, a male observed on Purdue Experimental Farm (3); October 4, a male observed on roadside in West Lafayette (3); October 12, a male observed in bunch grass, *Andropogon furcatus*, on bluff along Wabash bottoms south of Lafayette (13).

Schistocerca alutacea (Harris). Evidently very rare and sporadic. I captured a female on August 5 in a field on the Purdue Experimental Farm (3) near the Lake Erie and Western R. R., at a point where there was a fence border growth of elder (*Sambucus*) and melilotus (*M. alba*).

Subsequently, September 24, another specimen, also female, was taken near the same spot by Mr. P. W. Mason.

The specimens were of a much duller tint than those which I have taken in the New Jersey cedar bogs. The latter are typically a bright greenish-olive with a very conspicuous bright yellow mid-dorsal stripe and purplish tegmina. The Lafayette specimens were of a dull olive-brown or leather color with a distinct, but not especially conspicuous, mid-dorsal stripe of pale yellow. The place where the specimens were taken was relatively quite dry.

Melanoplus scudderi (Uhler). Moderately common, at least, locally, in grassy tangles and herbaceous undergrowth in or near woodland.

July 27, nymphs common in grassy clearings in upland woods (1), northwest of West Lafayette; August 9, an adult male taken in low woods in a thicket at the edge of a bog on Burnett Creek (2); August 20, a male taken in tall herbaceous thicket near a bog at the outer margin of the Wabash bottoms near West Lafayette (6); August 30, a male taken in open thicket at the edge of a bog at the base of a bluff on the outer margin of the Wabash bottoms opposite Battle Ground (16); September 6, frequent in blue grass in an open grove on the bluff near Wild Cat Creek (10), associated with *M. luridus*; October 4, several observed in the grassy thickets of roadside adjoining an open patch of woodland (17), south of West Lafayette; October 26, two females observed in grassy fields on the bluff at the head of Happy Hollow (5).

Melanoplus viridipes Scudder. Apparently very local, only a single specimen, a male, having been taken on June 24 in a patch of *Elymus virginicus* in the fringe of trees marking the outer limits of the Wabash bottoms near West Lafayette (6).

Melanoplus obovatipennis (Blatchley). Frequent locally in the herbaceous thickets surrounding marshes or damp spots generally.

August 9, an adult male and female and four nymphs taken in the thickets surrounding a small bog in low woods on Burnett Creek (2); August 30, a male taken at the edge of a marsh characterized by *Homalocenchrus oryzoides*, *Impatiens* and *Ambrosia trifida* at the base of a bluff at the outer edge of the Wabash bottoms opposite Battle Ground (16); September 6, fairly common in herbaceous thickets (goldenrod, sunflowers, etc.) along the edge of a *Homalocenchrus oryzoides* marsh at the base of a wooded bluff near Wild Cat Creek (10); September 13, a pair taken in swamp border thicket. (*Eupatorium purpureum*, *Solidago* spp., etc.) in

low woods on Burnett Creek (2); October 13-14, frequent in herbaceous thickets (asters, goldenrod, ragweed, etc.) surrounding a cat-tail marsh on the upland northwest of West Lafayette (14).

Melanoplus gracilis (Bruner). Apparently moderately frequent locally in moist or slightly humid woodland locations, frequenting grassy and sedgey tangles and herbaceous thickets in the vicinity of bogs.

July 27, males moderately frequent in grassy and sedgey areas and surrounding thickets in humid upland woods northwest of West Lafayette (1); August 9, adults of both sexes found in small numbers in a bog occupied by *Homalocenchrus oryzoides*, *Carex* spp., *Scirpus atrovirens*, *Sagittaria* sp., *Salix* thickets, etc., in low woods on Burnett Creek (2); September 13, a female taken in a bog border thicket in the same locality (2), associated with *M. obovatipennis*.

Melanoplus fasciatus (Walker). Probably quite rare. A single male specimen was taken June 28 in an exceptionally dense bit of woodland near the base of a steep bluff not far from the mouth of Indian Creek (15). The ground where it was taken was quite bare, except for a few scattered plants of *Panicum huachucae* and a few other forms not determined. My determination of this specimen was kindly verified by Prof. Blatchley.

Melanoplus walshii Scudder (*M. Blatchleyi* Scud.). Only a single specimen, a female, was taken July 19 in a dense growth of *Elymus virginicus* on the flood plain of the Wabash near the mouth of Wild Cat Creek (11).

Melanoplus atlantis (Riley). Abundant, though somewhat local, in open grassland in relatively dry situations. Most frequent in upland localities, but it also occurs in small numbers in the bottoms wherever the conditions allow the formation of dry grassland. The species reaches maturity the latter part of June and persists through the summer and well into the fall. The adults appeared to be most abundant about July 20; they apparently decreased in numbers in late summer and early September, but in some places they seemed to increase again in early October. At the latter period a number of copulating pairs were taken and the individuals were found in localized groups, facts which would perhaps indicate the recent maturing of the specimens and the possibility of a second or fall brood of adults. It is conceivable at least that some of the earlier laid eggs might under favorable conditions hatch out in the fall and thus pro-

duce the apparent increase of adults at this time. Mature examples of this species were seen as early as June 16 and as late as October 25.

Melanoplus femur-rubrum (DeGeer). The most abundant grasshopper, swarming everywhere, except in woodland locations and on very dry and barren ground. Its predilections are for relatively humid areas, and it is in consequence especially abundant in the bottom lands, and about ditches and other moist spots. It avoids dense herbaceous thickets and favors open grasslands and clover fields. It reached maturity by the last of July and was found continuously from then until frost. The last record I have is November 2.

Melanoplus luridus (Dodge). Of regular occurrence, though not always common on grassy spots in dry woods or in their immediate vicinity. Usually associated with *Spharagemon bolli*.

August 1, a male taken in blue grass close to the edge of the woods on the bluffs at the head of Happy Hollow (5), nymphs also found here; August 24, several of both sexes found in mixed blue grass and *Panicum huachuca* in open woods on a bluff at the head of the ravine (8) between West Lafayette and the mouth and Indian Creek; September 1, a small number in a clearing in the woods on the bluff at the head of Happy Hollow (5); September 6, frequent in blue grass in a dry open grove on the bluffs near Wild Cat Creek (10), associated here with *Melanoplus scudderi*.

Melanoplus bivittatus (Say). All specimens seen were of the red-legged or *femoratus* type. The species is only moderately frequent and more or less local. It was found in fair numbers about the middle of July on the grounds of the Purdue Experiment Station, but it soon became quite scarce and after the early part of August only occasional individuals were noted and that only in the more or less rank vegetation that flourishes in neglected spots along the stream bottoms.

July 22, moderately frequent in timothy in a waste lot and in the nearby corn and soybean patches on the Purdue Experimental farm (3); August 9, fairly common in thickets in or near low woods on Burnett Creek (2); August 20, occasional in marshes and surrounding thickets at outer margin of Wabash bottoms below West Lafayette (6); September 6, a female observed in tall herbaceous thickets at the base of a bluff near Wild Cat Creek (10).

Melanoplus differentialis (Thomas). Abundant in sheltered situations in all humid situations; less frequent, but not uncommon in upland

localities. The species is especially characteristic of the dense thickets of tall ragweeds, *Ambrosia trifida*, which abound in all moist areas and are especially frequent about the boggy spots at the foot of the bluffs along the outer edge of the stream bottoms. The earliest nymph stages appear to be limited entirely to bogs and the surrounding thickets, but as the grasshoppers increase in size they wander from these haunts into the adjoining fields and uplands. The adults appeared early in August and persisted to about the middle of October.

August 9, adults noted in thickets bordering a bog along the outer edge of the Wabash bottoms near West Lafayette (6); also in thickets of *Melilotus alba* on the upland (3); August 9, common in bog border vegetation in or near low woods on Burnett Creek (2); August 20, common in *Homalocenchrus oryzoides* bog and adjoining thickets of *Ambrosia trifida* and associated plants at the base of the bluff at outer margin of the Wabash bottoms near West Lafayette (6); August 30, abundant in similar situations and corn fields on the Wabash bottoms near Battle Ground (16); September 6, abundant in the same kind of environment at the base of the bluffs near Wild Cat Creek (10); September 13, common in thickets and grassy tangles along Burnett Creek (2); October 13, common in herbaceous thickets surrounding a cat-tail swamp on the upland north-west of West Lafayette (14).

Paroxya hoosieri (Blatchley). Found August 30 in considerable numbers in a bog dominated by *Homalocenchrus oryzoides* and *Impatiens* at the base of a bluff along the outer margin of the Wabash bottoms opposite Battle Ground (16); not found elsewhere.

Scudderia texensis Saussure-Pictet. Apparently scarce as only a few specimens were secured.

July 22, a male taken in timothy patch on waste lot on Purdue Experimental Farm (3); July 26, a female taken, location not recorded; September 6, a female, apparently this species, taken in high thicket at the base of wooded bluff near Wild Cat Creek (10).

Scudderia furcata Brunner. Only a few examples found. August 9, two males taken in tall herbaceous thickets about the edge of a small bog in low woods along Burnett Creek (2); August 12, a male taken in a grassy roadside ditch near a small stream between Lafayette and Mountmorenci (12); August 20, two males and an equal number of females taken in a *Homalocenchrus oryzoides* bog at outer edge of Wabash bot-

toms near West Lafayette (6); September 13, a male taken in a swamp border thicket in low woods on Burnett Creek (2).

Amblycorypha oblongifolia (DeGeer). Only a single specimen, a male, was taken on the night of July 23 in a grove of young silver maples at a nursery two miles southeast of Lafayette. The species is, however, much more frequent than the single capture would indicate since its notes were frequently heard at night throughout midsummer.

Amblycorypha rotundifolia (Scudder). A female specimen was taken July 12 in a patch of *Elymus virginicus* in a narrow fringe of woodland at the base of the bluff on the outer edge of the Wabash bottoms below West Lafayette (6).

Microcentrum laurifolium (Linnaeus). This, or the related species, *retinerve*, appears to be common in trees at Lafayette since its notes were heard continuously throughout late July and August. Only one specimen was actually taken and identified as belonging to *laurifolium*.* It flew into the office at the Experiment Station.

Neoconocephalus robustus crepitans (Scudder). Late in August three males were heard stridulating in the corn plats on the Purdue University Farm (3) and on the evening of August 26 two of these were captured, one being taken in some crab grass (*Syntherisma sanguinalis*), the other on a corn tassel. According to Blatchley this species has hitherto been noted in Indiana only in Laporte County along the shore of Lake Michigan.

Neoconocephalus palustris (Blatchley). Of regular occurrence in open *Homalocenchrus oryzoides* bogs, but not especially frequent.

August 20, one male, two females, in *Homalocenchrus oryzoides* bog at base of bluff on Wabash bottoms near West Lafayette (6); August 30, a female taken in mixed *Scirpus americanus* and *Homalocenchrus oryzoides* on low banks of the Wabash River opposite Battle Ground (16); September 6, one specimen of each sex taken in *Homalocenchrus oryzoides* bog at base of bluff near Wild Cat Creek (10).

Orchelimum vulgare Harris. Abundant everywhere in tender succulent grasses; uncommon in woodland situations.

July 22, males and nymphs abundant in growth of *Chatochloa viridis* on a waste lot of the Purdue Experiment Farm (3); August 9, one male and a female taken in woodland bog in low woods on Burnett Creek (2), far from common here; August 20, common in *Homalocenchrus oryzoides* at base of bluffs along margin of the Wabash bottoms near West Lafayette

*Based on description in Blatchley, Orthoptera of Indiana.

(6); August 28, common in tall roadside vegetation, about ditches, etc., at West Lafayette; September 4, abundant in mixed growth of *Muhlenbergia* sp. and *Chatochloa viridis* in a neglected field at West Lafayette; September 6, common in *Homalocenchrus oryzoides* bog and in adjoining weed areas at base of the bluffs near Wild Cat Creek (10); September 13, small numbers observed in swamp border thickets in low woods on Burnett Creek (2); October 13, rather scarce at West Lafayette (3).

Orchelimum vulgare, long-winged phase. This is the form which has commonly been called *glaberrimum* by Blatchley and the majority of recent writers. Rehn and Hebard, however, have recently reached the conclusion that this term correctly applies to the entirely different red-faced *Orchelimum* of the Middle and South Atlantic States which Davis has called *erythrocephalum* and which I have so designated in my paper on New Jersey Orthoptera. In the last-mentioned work the form termed *glaberrimum* has since been recognized to be a distinct species which Rehn and Hebard are about to describe. Occurs in the same situations as the preceding species, but is much less frequent though by no means uncommon.

July 22, a male taken in patch of *Chatochloa viridis* in a waste lot on the Purdue Experimental Farm (3); August 20, a male and female taken in a *Homalocenchrus oryzoides* bog at the base of the bluffs on the edge of the Wabash bottoms near West Lafayette (6); August 24, a male taken in corn plat at Purdue Experimental Farm (3); August 28, several males observed at night while stridulating on young trees and tall herbs on the bluff at the head of Happy Hollow (5); September 4, one female taken in thick grass on a neglected lot at West Lafayette; September 6, a male taken in *Homalocenchrus oryzoides* at base of bluff near Wild Cat Creek (10); October 4, several seen on Purdue University Farm (3).

Orchelimum gladiator (Bruner). Only two specimens, both males, taken during the season. Both were found in bottom lands in thick grass.

July 12, a male taken in a *Homalocenchrus oryzoides* bog at the base of the bluff on the outer edge of the Wabash bottoms below West Lafayette (6); July 19, a male taken in a thick growth of *Elymus virginicus* on the east bank of the Wabash at the mouth of Wild Cat (11). Professor Blatchley kindly verified my determination of these specimens.

Orchelimum agile (DeGeer). A single individual (female) was taken October 14 in the cat-tail marsh on the upland northwest of West Lafay-

ette. It was in the company of large numbers of *O. nigripes*. Professor Blatchley, to whom the specimen was submitted, assigned it to his *O. campestre*. Mr. Rehn, to whom the same specimen was also sent and who with Mr. Hebard has recently revised the entire genus, informs me it is *O. agile*.

Orchelimum nigripes Scudder. An abundant and characteristic species of open grassy bogs and damp situations generally, being especially abundant in rice cut-grass, *Homalocenchrus oryzoides*.

August 20, moderately frequent in a *Homalocenchrus oryzoides* bog at the base of a bluff along the Wabash bottoms near West Lafayette (6); August 30, abundant in wet places covered with *Homalocenchrus oryzoides* on river bank and bottoms on the east side of the Wabash opposite Battle Ground; September 6, common in *Homalocenchrus oryzoides* in a marsh at the foot of the bluff near Wild Cat Creek (10); September 13, a few specimens observed in a sedgey bog in low woods along Burnett Creek (2); October 3, a few observed in a humid depression covered with *Muhlenbergia* near mouth of Wild Cat Creek (11).

Orchelimum nigripes Scudder (variety). On October 13 and 14 I found a form of this genus in the cat-tail marsh on the upland northwest of Lafayette which I was unable to determine, but which Mr. Rehn to whom I submitted specimens informs me is a race of *O. nigripes* from the typical form of which it differs in the absence of black from the tibiæ and, so far as my Lafayette material is concerned, in its somewhat greater size. On the dates mentioned it literally swarmed in the mixed cat-tail and rice cut-grass areas of the marsh, but was entirely lacking in the marginal thickets.

Conocephalus (Xiphidium) fasciatus (DeGeer). Local and, as a rule, not very common; found typically in open wet or damp locations thickly covered with succulent grasses and sedges.

July 19, a male taken in a thick growth of *Elymus virginicus* on the east bank of the Wabash near mouth of Wild Cat Creek (11); July 22, a male taken in a patch of *Elymus virginicus* on a waste lot on the Purdue Experimental Farm (3); August 12, both sexes moderately common in roadside gulleys and in wet depressions covered with low sedges (*Carex* spp.) on the upland between Lafayette and Montmorenci (12); August 20, a female taken on *Homalocenchrus oryzoides* in a bog at the foot of the bluffs along the margin of the Wabash bottoms below West Lafayette (6); August 30, several examples observed along the margin of a *Homalocen-*

chrus oryzoides bog at the base of the bluffs on the Wabash opposite Battle Ground (16).

Conocephalus (Xiphidium) brevipennis (Scudder) (incl. *ensiferum* Scudder). Abundant in the bottom land marshes, in both open and wooded situations.

August 9, adult males and nymphs frequent in grassy and sedgey swamps in low woods along Burnett Creek (2); August 20, abundant in open *Homalocenchrus oryzoides* bog at foot of the bluffs along edge of Wabash bottoms near West Lafayette (6); August 24, common in a similar type of bog in a ravine near the mouth of Indian Creek (15); August 30, common along the margin of a *Homalocenchrus oryzoides* bog at the base of bluffs on the edge of the Wabash bottoms opposite Battle Ground; September 6, common in a *Homalocenchrus oryzoides* bog at the foot of the bluffs near Wild Cat Creek (10); September 13, frequent in bogs and bog border thickets in low woods along Burnett Creek (2); October 3, common in swamps and humid situations generally on the bottoms near the mouth of the Wild Cat (11), occurring in thick growths of *Muhlenbergia* and *Elymus*.

Conocephalus (Xiphidium) nemoralis (Scudder). Locally present in moderate frequency, occurring in grassy and herbaceous tangles usually in the vicinity of woodlands.

Aug. 20, a male taken in dense growth of *Homalocenchrus oryzoides* in a bog at the foot of the bluffs along the margin of the Wabash bottoms near West Lafayette (6); also nine other individuals composed of both sexes taken in a small patch of *Elymus virginicus* along the border of an adjoining woods; September 6, moderately frequent in thicket undergrowth at the foot of a wooded bluff near Wild Cat Creek (10); September 13, several observed in a thick growth of sumac and *Elymus virginicus* on a waste lot on Purdue University Farm (3).

Conocephalus (Xiphidium) nigropleurum (Bruner). Frequent in herbaceous thickets, especially those forming the margins of bogs dominated by *Homalocenchrus oryzoides*, in both open and woodland situations and usually associated with *Orchelimum nigripes*.

July 19, an immature male taken in a thick growth of *Elymus virginicus* on the east bank of the Wabash at mouth of Wild Cat Creek (11); also an adult male at the edge of a *Homalocenchrus oryzoides* bog at the foot of the bluffs along the east side of the Wabash about half way between localities 11 and 16; August 9, both sexes moderately frequent in the herb-

aceous thickets bordering a small bog in low woods along Burnett Creek (2); August 20, in small numbers in a *Homalocenchrus oryzoides* bog along the outer edge of the Wabash bottoms below West Lafayette (6); August 30, frequent in a *Homalocenchrus oryzoides* marsh at the base of the bluffs on the east side of the Wabash opposite Battle Ground (16); September 6, several observed in border thickets surrounding a *Homalocenchrus oryzoides* bog at base of the bluff near Wild Cat Creek (10); September 13, frequent in border thickets (joe-pye weed, boneset, etc.) surrounding a grassy bog in low woods on Burnett Creek (2); October 2, a male taken in *Muhlenbergia* patch on east bank of Wabash near mouth of Wild Cat (11); October 14, a male and a female taken along the edge of a mixed *Typha latifolia* and *Homalocenchrus oryzoides* marsh on the upland northwest of West Lafayette (14).

Conocephalus (Xiphidium) strictus (Scudder). Abundant in dry, open grass land; most frequent at higher elevations, but occasionally in suitable locations in the bottoms. A common associate of *Syrbula admirabilis*.

July 22, nymphs abundant in timothy and *Elymus virginicus* in waste lot on the Purdue Experimental Farm (3); July 31, adults and nymphs common in tangles of blue grass and bindweed along a fence on the Purdue Farm (3); August 1, nymphs and adults common in blue grass on roadside north of West Lafayette (4); August 5, common in thick blue grass and foxtail areas on Purdue Farm (3); August 20, frequent in an open pasture, dominated by *Tridens flava*, on the outer edge of the Wabash bottoms near West Lafayette (6); August 30, common in a roadside growth of *Tridens flava* and *Andropogon furcatus* near Battle Ground (9); September 1, frequent in grassy fields on bluffs at the head of Happy Hollow (5); October 3, now scarce on Purdue University Farm.

Conocephalus (Xiphidium) saltans (Scudder). Only a single specimen, a male, taken October 14 in a cat-tail cut-grass marsh on the upland (14) northwest of West Lafayette. It was associated with *Xiphidium attenuatum*.

Conocephalus (Xiphidium) attenuatus Scudder. Abundant October 13 and 14 in the upland marsh (14) just referred to, where it swarmed in the mixed cat-tail and *Homalocenchrus oryzoides* formation, but appeared to be entirely lacking in the surrounding herbaceous thickets of asters, goldenrods and associated plants. Only a single specimen was seen elsewhere, a female taken August 20 in a rice cut-grass bog at the foot

of the bluffs on the outer edge of the Wabash bottoms below West Lafayette (6).

Atlanticus testaceus (Scudder) [*pachymerus* Burm.]. Moderately frequent locally in open undergrowth of dry upland woods.

June 17, a male taken by J. J. Davis in a scrub area on the bluff at the head of Happy Hollow (5); June 26, three males taken on tall weeds in open woods on "second bottom" south of West Lafayette (7).

Occanthus fasciatus Fitch. August 20, several taken in grassy bog at base of the bluffs bordering the Wabash bottoms near West Lafayette (6).

Occanthus quadripunctatus Beutenmüller. Several taken in same locality and on the same date as the preceding.

Nemobius fasciatus DeGeer. Abundant in grassy places in both dry and moist areas.

Nemobius carolinus Scudder. A female collected October 9 by Mr. P. W. Mason on a road near West Lafayette was identified as this species by Mr. Morgan Hebard.

