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HEMIPTERA FROM BERRIEN COUNTY, MICHIGAN<sup>1</sup>

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The region about the southern end of Lake Michigan holds a peculiar interest for students of the distribution of animals and of plants. Zoologists and botanists alike find there a few forms which are characteristic of the southern states, or even of the coastal region of the Atlantic seaboard. The phytogeographic evidence indicates that the plants which fall in this class came in from the Atlantic coast during one of the later interglacial periods, and that the route which they followed led up the valleys of the Hudson and the Mohawk rivers to the forerunner of Lake Erie, around the southern shore of the lake and up the eastern side of Michigan to the "Thumb" region, and westward across the state through the valleys now occupied by the Saginaw and Grand rivers.<sup>2</sup> But when the ani-

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<sup>1</sup> Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 193.

<sup>2</sup> I am indebted to Mr. Donald C. Peattie, of Harvard University, for this information, which was given in an address before the New

mals are considered the case is much less simple. In certain cases we find a distribution which parallels that of the "coastal plain" plants, but often the forms in the Lake Michigan region have become sufficiently distinct from their relatives on the Atlantic coast to warrant their separation into geographical races: witness the Orthoperan species *Trimerotropis maritima* and *Paroxya clavuliger*, which are represented in the Lake Michigan region by *T. m. interior* and *P. c. hoosieri*, respectively. A large part of the southern element in the fauna of this region has undoubtedly followed up the Mississippi Valley.

Though botanical investigations have been carried on here for nearly half a century, faunistic work has largely been neglected. However, the Michigan Biological Survey has recently begun a study of the animals of Berrien County, which lies within this interesting region. In connection with this survey in Berrien County, I was asked to make collections of Hemiptera, and the present report is based on field work done during the summers of 1919 and 1920. The actual dates covered by my collections fall between June 19 and July 5, 1919, August 30 and September 3, 1919, and July 3 and July 28, 1920. The specimens secured are deposited in the Museum of Zoology of the University of Michigan.

Berrien County is located in the extreme southwestern part of the Southern Peninsula of Michigan, bordered on the west by Lake Michigan and on the south by Indiana. The region in which my collections were made comprises a strip about twenty miles long and three miles wide, extending parallel to the lake shore from New Buffalo, near the state line, northeast to a series of small, marshy lakes near Stevensville, which

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England Botanical Club, May 6, 1921. Mr. Peattie discusses the coastal plain element in the flora at the head of Lake Michigan in a paper which is appearing in *Rhodora*, Vol. xxiv, 1922.

are known locally as the Grand Marais. Most of my collecting was done in three localities: the marshy regions at New Buffalo; the region about the Warren Woods, near Three Oaks; and the dune region along Lake Michigan between Harbert and Bridgman, together with a narrow strip of the flat, sandy country immediately behind the dunes. I use the general term "Sawyer Dunes" for this dune region, since the little village of Sawyer lies about midway between Harbert and Bridgman.

Berrien County is characterized by level land with a rather sandy soil. Streams are few and sluggish, and the larger ones are heavily laden with silt. The whole region is shut off from Lake Michigan by a wall of sand dunes, which are best developed between Sawyer and Bridgman: here they reach a height of nearly four hundred feet above the level of the lake, in one or two cases, and extend back from the shore for a distance of a mile or more, forming two or three series of dune ridges with deep valleys between them. At intervals of three or four miles there are small creeks of clear water, which break through the dunes to the lake shore only to sink into the beach sands and disappear. All the streams which flow into Lake Michigan in this region broaden out just above their mouths to form small pools or extensive ponds, depending on the amount of water that they carry. Thus the Galien River widens out at New Buffalo to form a large marsh, which figures even on recent maps as Lake Pottawattamie; and the smaller creeks form quiet little backwaters in the fore-dunes or shallow pools on the beach itself, directly connected with the lake only for brief periods following heavy on-shore winds when the water driven across the beach by the waves unites with the water in the pools to cut temporary outlets across the sand.

Even on the highest dunes the soil a foot below the surface is always moist and the dune flora is surprisingly luxuriant. There is a splendid series of transition stages from the xerophytic habitats of the beach and the fore-dunes, where the evaporation is greatest, though subject to excessive variation, to the climax forest of beech and maple.<sup>3</sup> The first plants appear just above the line which is ordinarily reached by the waves during strong on-shore winds: these plants are principally the sea rocket (*Cakile edentula*), species of *Artemisia*, and *Potentilla anserina*. Close behind them follows the fore-dune association, where, in addition to the beach plants, are found the sand cherry (*Prunus pumila*), the beach pea (*Lathyrus maritima*), willows, milkweeds, and such grasses as *Calamovilfa longifolia* and *Ammophila breviligulata* Fernald (= *A. arenaria* of American authors). This is easily the best developed of the bare-sand associations on the Sawyer Dunes, and the plant associations found on the inland slopes of some of the traveling dunes show some resemblance to it, consisting chiefly of grasses and milkweeds, together with some creeping vines. The last of the associations characteristic of the bare sand is typified by the cottonwood (*Populus deltoides*), together with the puccoon (*Lithospermum gmelini*), various species of wild grapes, the poison ivy (*Rhus toxicodendron*), and the plants of the fore-dunes. And here is found the

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<sup>3</sup> The following papers dealing with the dune flora are of particular interest:

Fuller, G. D., 1917, The Vegetation of the Chicago Region, pp. 3-12. University of Chicago Bookstore.

Fuller, G. D., 1914, Evaporation and Soil Moisture in Relation to the Succession of Plant Associations. *Bot. Gaz.*, 58: 193-234.

Cowles, H. C., 1899, The Ecological Relations of the Vegetation of the Sand Dunes of Lake Michigan. *Bot. Gaz.*, 27: 117, 169-202, 281-308, 361-391.

flowering spurge (*Euphorbia corollata*), following the edges of the blow-outs from near the beach almost to the dune crests. The cottonwood association is typical of rapidly moving dunes.

The fourth association is characterized by the white pine (*Pinus strobus*); here, for the first time, we find undergrowth, chiefly dogwoods (*Cornus* spp.), the bearberry (*Arctostaphylos uva-ursi*), various species of wild roses, and a few sumacs (*Rhus* spp.). Poison ivy is abundant, and such climbing plants as the bitter sweet (*Celastrus scandens*), the Virginia creeper (*Psedera quinquefolia*), and various wild grapes occur here. Apart from the grasses, the most important herbaceous plants are the false Solomon's seals (*Smilacina stellata* and *S. racemosa*). The pine association is poorly developed on the Sawyer Dunes, and in fact a distinct pine-dune habitat was found in only one place within our limits. In some places the oak forest follows directly after the cottonwood association, but more commonly there is a thin strip of dogwood and sassafras between the two.

The fifth association, characterized by the black oak (*Quercus velutina*), is by far the most extensive of all the sand-dune habitats. The oak forest on the Sawyer Dunes has been almost entirely cut over, so that it is now represented largely by second growth; this is very dense in many places and is often thickly tangled with bitter-sweet and green brier (*Smilax* sp.). The choke cherry (*Prunus virginiana*) is abundant throughout the black-oak association, and in the deeper dune valleys there are numerous hemlocks. Small openings in the woods are not uncommon, and here there are abundant grasses and other herbaceous plants, together with sumacs and berry bushes (*Rubus* spp.). The undergrowth of the more open parts of the black oak forest is still suggestive of xerophytic conditions, consisting principally of sumacs,

blueberries (*Vaccinium* spp.), sassafras, the bush honeysuckle (*Diervilla lonicera*), and other plants of similar habits; the prickly pear (*Opuntia rafinesquei*) occurs on the dunes at New Buffalo, but does not appear to pass the Galien River.

The transition stages from the black oak to the beech-maple forest are more gradual than the stages which precede the oaks, and the associations are less clearly defined. At first the stand of black oak is almost pure, but farther from the lake other trees appear, such as the chestnut oak (*Quercus muhlenbergii*), the blue beech (*Carpinus caroliniana*), the basswood (*Tilia americana*), and the hop hornbeam (*Ostrya virginiana*). The white oak (*Quercus alba*) becomes more and more plentiful as the black oak disappears, until finally an association is formed in which the white oak is predominant. This is the last association which is found in a typical form on the Sawyer Dunes, but even here numerous maples (*Acer saccharum*) and occasional beeches (*Fagus grandifolia*) foreshadow the climax forest.

The climax forest is splendidly represented in the Warren Woods, about three miles north of Three Oaks and two or three miles back from the dunes. Mature beeches and maples form at least ninety per cent of the forest on the higher ground, and undergrowth is very scanty. The Galien River flows through the woods, and its flood plain supports a more varied flora: here, besides the beeches and maples, there are elms, butternuts, and sycamores; elders (*Sambucus* spp.) and dogwoods are numerous, and the herbaceous vegetation is plentiful. Occasional sandy beaches by the river are excellent habitats for *Gelastocoris* and the Saldids, and numerous shaded pools in the woods offer their attractions for some of

the aquatic bugs. The shady glens at the southern edge of the woods are splendid collecting localities: here there are quiet pools and intermittent streams, dense beds of lizard's tail (*Saururus cernuus*) and luxuriant grasses, shaded by sycamores, butternuts, elms, ash trees, and sour-gum (*Nyssa sylvatica*). In one of these glens nearly sixty species of Hemiptera were taken. Other types of habitats occur on the borders of the woods, such as upland pastures, meadows, orchards, cultivated fields, cat-tail marshes, and buttonbush swamps; and collecting conditions here were almost ideal.

*Acknowledgments:* An expression of sincere appreciation is due to several of my friends and co-workers on Hemiptera for their assistance in the determination of many of the species listed below: to Dr. H. H. Knight, who has examined all the Miridae of the 1919 collection and many of those taken in 1920; to Professor C. J. Drake, who has named several species of the Tingidae; to Mr. J. R. de la Torre Bueno, who has looked over the Saldid species of the collection; and to Dr. H. M. Parshley, who has kindly identified some of the other forms. Acknowledgments are also due to Messrs. M. H. Hatch, of Detroit, and Carrol Rawcliffe, of Cicero, Ill., who very generously gave me several Hemiptera taken from the June beach-drift at New Buffalo and at the Sawyer Dunes; to my co-worker in the field, Mr. T. H. Hubbell, who turned over to me many Hemiptera which he chanced upon while collecting Orthoptera; and to Mr. George R. Fox, of Three Oaks, whose intimate knowledge of the region and whose interest in our work greatly facilitated our field studies.

## REMARKS ON THE HEMIPTERA OF SOUTHERN MICHIGAN

The fauna of southern Michigan is in general similar to that of the other northeastern States, and this holds true for the Hemiptera as well as for other groups of animals. The great majority of the species are wide-ranging forms which are generally distributed throughout the northeast, but there are other elements which enter into the composition of the fauna. A few northern species, such as *Gerris rufoscutellatus* and *Notonecta insulata*, occur in all parts of Michigan; but other northern forms, though common near the tip of the Peninsula, do not range southward far enough to come within our limits: as examples we may cite *Homæmus æneifrons*, *Phytocoris lasiomerus*, and *Notonecta borealis*.

On the other hand, there are several species whose ranges barely enter Michigan from the south: such forms are *Thyanta custator*, *Lygæus turcicus*, *Sirihenea carinata*, *Atrachelus cinereus*, and *Tenagogonus hesione*. Enough is known of the distribution of these forms to make it clear that they have come into the State either directly from the south, through Ohio and Indiana, or through the Mississippi Valley. No Hemiptera were taken in Berrien County which can be definitely cited as examples of the "coastal plain" type of distribution discussed above.

## THE BEACH DRIFT

The shores of Lake Michigan have long been noted for the remarkable nature of their insect drift. Professor Needham, more than twenty years ago, called attention to the fact that occasionally one finds myriads of insects washed ashore, forming regular windrows which sometimes extend for miles along the beach. In a later paper<sup>4</sup> he gives a more extended account

<sup>4</sup> The Insect Drift of Lake Shores. *Can. Ent.*, 49: 129-137, 1917.



of the Lake Michigan beach drift as observed on the Illinois shore, together with a discussion of the factors which contribute to the phenomenon. Other contributions, dealing principally with the drift on the ocean beaches, have been made by Bueno<sup>5</sup> and by Parshley.<sup>6</sup>

My camp on the Sawyer Dunes was very favorably situated for observations on the beach drift, and I watched the beach daily during the three weeks of my stay there. Although a considerable number of insects were washed ashore at various times, I was not so fortunate as to witness any such remarkable drifts as have been reported by Needham.

The most extensive beach drift which occurred during the early summer in 1920 took place before my field work was begun, probably some time about June 20, and even on July 4, when I first visited the dune region, the remains were very evident. The insects were not piled up in masses, but merely formed uneven lines along the beach, from two to four inches wide, mixed with cinders and other flotsam from the lake steamers. Rhynchophora, Scarabaeidae, and Carabidae were predominant: in fact, none but hard-bodied forms had persisted until this date. Of the Hemiptera, *Podisus maculiventris* was easily the most abundant species, though other Pentatomidae were also common, and some forms belonging to other families were found.

During the first half of July insects were found on the beach in fair numbers, but later in the month the drift became negligible. Coleoptera continued to hold first place, with the Rhynchophora, Scarabaeidae, and the larger Carabidae espe-

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<sup>5</sup> Hemiptera in Beach Drift. *Ent. News*, 26: 274-279, 1915.

Remarks on Heteroptera in Beach Drift. *Bull. Brookl. Ent. Soc.*, 15: 142-145, 1920.

<sup>6</sup> Insects in Beach Drift. I—Hemiptera Heteroptera. *Can. Ent.*, 49: 45-48, 1917.

cially well represented: there were also numerous individuals of *Hydrophilus* and of the larger Dytiscid species. Soft-bodied forms were extremely rare, and small species were not numerous: they were found chiefly on the days when the lake was comparatively calm. Even the heavily chitinized forms were often badly mutilated by the pounding to which they had been subjected in the surf, which is very heavy here at times. The effect of tides is negligible in Lake Michigan, and there is a strong undertow when the waves are high, so that oftentimes the insects remain in the surf for a considerable time before they are finally washed up beyond the reach of the waves.

The great majority of the insects do not survive their immersion in the lake, and after they have been washed up on the sand and have dried they are at the mercy of the winds. Thus, following any considerable drift, insects may be found scattered over the sands in the blow-outs for a distance of half a mile or more from the lake. Mr. D. H. Peattie tells me that in August, 1920, he found several accumulations of insects and miscellaneous debris on the inland slope of a low dune (about 50 feet high) near Mineral Springs, Indiana, over a quarter of a mile from the shore.

Twenty-seven species of Hemiptera were taken from the beach drift during July, 1920. Eleven of these have not been reported by previous writers, and the total number of American Hemiptera now known from the drift line is raised to 118 species. The Berrien County list is given below, together with the number of days on which each species was found. An asterisk indicates a species not previously reported from beach drift.

<i>Chlorochroa uhleri</i> .....	I	<i>E. euschistoides</i> .....	3
<i>Euschistus variolarius</i> .....	II	* <i>Meneclis incertus</i> .....	I

<i>Thyanta custator</i> .....	1	* <i>Stenopoda culiciformis</i> .....	1
<i>Acrosternum hilare</i> .....	5	* <i>Reduvius personatus</i> .....	1
* <i>Rhacognathus americanus</i> ...	1	<i>Nabis ferus</i> .....	1
* <i>Perillus bioculatus</i> .....	2	<i>Lygus pratensis oblineatus</i> ....	1
* <i>P. b. claudus</i> .....	1	* <i>Lopidea caesar</i> .....	1
<i>Apateticus bracteatus</i> .....	3	<i>Gerris marginatus</i> .....	3
<i>A. cynicus</i> .....	11	<i>Gerris rufoscutellatus</i> .....	5
<i>Podisus maculiventris</i> .....	7	* <i>Notonecta irrorata</i> .....	2
* <i>Oncopeltus fasciatus</i> .....	3	<i>Ranatra americana</i> .....	1
* <i>Lygæus turcicus</i> .....	1	* <i>Benacus griseus</i> .....	7
<i>Lygæus kalmii angustomargi-</i>		<i>Lethocerus</i> sp. ....	2
<i>natus</i> .....	4	<i>Belostoma flumineum</i> .....	6
		* <i>Gelastocoris</i> sp. ....	1

After considering carefully the nature of the drift material, the physiography of the region, and the correlation between weather conditions and the extent of the drift, I came to the conclusions that most of the insects which were washed ashore near my camp, west of Bridgman, came from the region west of Stevensville, six or seven miles to the north; that the insects had flown far out over the lake, had fallen in, and had been slowly washed in onto our shore; and that only the larger, more heavily chitinized forms had endured their long immersion and the heavy pounding of the surf. The drift was negligible at the Sawyer Dunes when the wind was from the southwest, and reached its maximum when a bright, comparatively calm morning was followed by an afternoon with a strong northwest wind. The marshy lakes near Stevensville, which are known as the Grand Marais, are the only suitable habitats near the Sawyer Dunes for the Belostomatidae and the larger water beetles, and the only probable habitats for such Orthoptera as *Mecostethus lineatus*—all of which were found commonly on our beach. And the dunes are much lower and narrower in the Grand Marais region than they are farther south, and thus present less of a barrier to insects of the region behind the dunes. It is noteworthy that only two

of the twenty-seven beach-drift species, namely, *Chlorochroa uhleri* and *Lopidea caesar*, were found commonly on the dunes proper, the others occurring for the most part in the inland regions.

## LIST OF SPECIES

## SCUTELLERIDAE

*Eurygaster alternatus* (Say). Moderately common in marshy localities, where it occurs among the grasses and sedges. Specimens were taken at New Buffalo (June 30), near the Sawyer Dunes (July 21), and at the Grand Marais (July 22).

## CYDNIDAE

No species of the subfamily Cydninae were taken, though doubtless some occur here. Members of the *Corimelæniinae*<sup>7</sup> were taken only occasionally.

*Galgupha atra* A. & S. One specimen was swept from a tangle of grasses and vines on the flood plain of the Galien River, in the Warren Woods, September 7 (T. H. Hubbell).

*Galgupha aterrima* Malloch. One was swept from ground vegetation on the dunes near Harbert, June 22.

*Galgupha nitiduloides* (Wolff). One was taken from roadside grasses near Three Oaks, June 21, and another was beaten from vegetation in a clearing behind the Sawyer Dunes, July 26.

*Corimelæna pulicaria* (Germ.). Several specimens were taken from ragweed (*Ambrosia*) and a few were found in marsh grasses near the Warren Woods, July 5-6; several were collected from roadside grasses near Bridgman, July 20.

<sup>7</sup>If *Thyreocoris* and *Corimelæna* are to be regarded as distinct genera, the name of this subfamily reverts from *Thyreocorinae* (Van D. 1907) to *Corimelæniinae* (Uhl. 1872). This point was overlooked by Malloch (*Bull. Ill. Nat. Hist. Surv.*, xiii, p. 206, 1919).

PENTATOMIDAE

*Podops cinctipes* (Say). Two specimens were taken from *Carex* and *Scirpus* in the marsh at New Buffalo, June 30.

*Peribalus limbolarius* Stål. Moderately common in the fields about the Warren Woods, July 4 to September 3.

*Trichopepla semivittata* (Say). Two adults were taken, from the same situation as the last species, June 21, and nymphs were fairly common, June 30 to July 5.

*Chlorochroa uhleri* Stål. A few adults and numerous nymphs were taken during July, on *Euphorbia corollata* on the Sawyer Dunes, and nymphs were moderately common on milkweeds, August 31. One specimen was taken from the June beach-drift.

*Mormidea lugens* (Fabr.). Moderately common throughout the summer, especially in grasses in shady localities, though specimens were also taken from raspberry, from *Saururus* beds, and from the sedge zones in the marshes. Specimens were secured in all of my collecting regions.

*Euschistus euschistoides* (Voll.). A moderately common Pentatomid in the grassy localities about the Warren Woods, especially in the hay fields and by the roadsides, where specimens were taken throughout the summer. This species was also secured at New Buffalo, at Bridgman, and, more rarely, in clearings on the dunes; it was fairly common in the beach drift.

*Euschistus variolarius* (P. B.). The most abundant Pentatomid in southern Michigan, and found everywhere in Berrien County, though less common on the dunes than in the other collecting localities. It occurred chiefly in the hayfields and on golden-rod, ragweed, and mullein; and during the second half of July it was the most abundant hemipteron found in the beach drift.

*Euschistus tristigmus* (Say). Fairly common about the Warren Woods, June 27 to September 3, especially in damp localities; specimens were taken from *Saururus cernuus*, from marsh grasses, and from *Benzoin aestivale*. This species was also collected at New Buffalo from wild rose and from the button-bush (*Cephalanthus occidentalis*). No specimens were taken in the dune region, nor were any found in the beach drift.

*Euschistus ictericus* (Linn.). This species was taken at New Buffalo, at the Warren Woods, and near Stevensville, June 29 to September 3. Most of the specimens were collected by sweeping sedges and grasses in more or less marshy localities, but a few were secured from *Saururus cernuus*.

*Cænis delius* (Say). Rather uncommon. Specimens were taken from grass by a creek near Harbert, June 20; from the Warren Woods, July 15 (Hubbell); at the edge of a cranberry bog near Livingston, July 22; and at Klute's Lake, near Three Oaks, September 4 (Hubbell).

*Hymenarcys nervosa* (Say). Three individuals were collected, one from a hayfield, June 27; one from fresh herbage by a spring near the Warren Woods, September 3; and one from under the bark of a beech stump at the edge of the woods, August 31.

*Neottiglossa undata* (Say). Surprisingly few individuals of this species were seen. Specimens were taken at Livingston, at Harbert, and at the Warren Woods, June 19 to September 3.

*Cosmopepla bimaculata* (Thomas). Somewhat more plentiful than the last species, but still surprisingly uncommon. Specimens were taken at the Warren Woods, June 26 to September 2, and also at Bridgman and at New Buffalo.

*Meneclis incertus* (Say). One specimen was found in the June beach drift at the Sawyer Dunes.

*Thyanta custator* (Fabr.). One, swept from ragweed at Bridgman, July 12. A second specimen was found in the June beach-drift (Carrol Rawcliffe).

*Acrosternum pennsylvanicum* (De Geer). A single individual of this species was swept from low vegetation at the base of a dune at New Buffalo, September 2, 1919. No other specimens have been taken in Michigan, as far as I am aware.

*Acrosternum hilare* (Say). Nymphs were fairly common in the Warren Woods during early July, and a number of adults were beaten from trees of various species, August 31 to September 3. This species occurred in the beach drift in fair numbers during the first half of July, but no individuals were taken after July 22.

*Banasa dimidiata* (Say). One specimen from the Warren Woods, July 15, 1920 (T. H. Hubbell).

*Perillus bioculatus* (Fabr.). Two specimens were taken from the beach-drift, July 1 (C. Rawcliffe) and July 4 (Hussey). One individual of the variety *P. b. claudus* (Say) was also taken on the beach, July 14.

*Rhacognathus americanus* Stål. One mutilated individual of this very rare species was found in old beach-drift near Sawyer, July 4, 1920. This is the easternmost record for the species.

*Apateticus cynicus* (Say). Nymphs which probably should be referred to this species were common on the maples in the Warren Woods during early July, and one adult female was beaten from a maple there on August 31. No other specimens were taken by ordinary collecting methods, yet this form was by far the most abundant of the beach-drift of early July: it was estimated that 80 per cent of the Hemiptera washed up between July 7 and July 15 were *A. cynicus*, and on some

days the number of individuals of this species on the beach was estimated at about 250 per mile.

*Apateticus bracteatus* (Fitch). This more northern species was much less common than the preceding, only three specimens being found in the beach drift, and none being taken elsewhere.

*Podisus maculiventris* (Say). Rather common on various bushes and in the grass about the Warren Woods, June 23 to September 3, and also found in the dune region. This was one of the most common species in the beach drift.

*Podisus modestus* (Dallas). Found in the same situations about the Warren Woods as was the preceding, but not found either in the dune region or in the beach drift. This species was much less common than *maculiventris*.

#### COREIDAE

*Acanthocephala terminalis* (Dallas). Adults were taken occasionally from dense tangles of herbage in damp localities, June 29 to September 1, and some were also found on the white ash (*Fraxinus americana*). Nymphs were beaten from a number of different trees, but were found in numbers only on the ash. I have not been able to find any description of these nymphs, which differ very strikingly in their early stages from the adults.

The first instar nymphs are metallic blue, shining, head and thorax with a pale median line above, the thorax terete, the pronotum with narrow, pale lateral lines. Thorax with eight spines above, which are directed forward: four of these are on the pronotum, two on the mesonotum, and two on the metanotum; abdomen scabrous above, its margin foliaceously lobed, especially on the posterior segments, and varied with yellow. Antennae one-half longer than the body, yellow, the



apical segment reddish, the distal half of the third and the base and apex of the fourth segments dark blue. Legs compressed, the tibiae of all three pairs similarly dilated, the outer dilatation broader than the inner, not scalloped; femora with broad basal and narrow median bands of yellow, the tarsi and the apical half of the tibiae also yellow. Length, 6 mm.

The second instar is much like the first in general appearance. The head and thorax are not shining and have scattered hairs. There is a slight indication of a vertical ridge on the frons; the thoracic spines are shorter; the fore tibiae are noticeably less dilated than the other pairs. Length,  $7\frac{1}{2}$  mm.

The third instar is much larger, the body being subequal in length to the antennae. General color dark brownish; thorax flattened and declivous before, noticeably more hairy than in the second instar; thoracic spines reduced to small tubercles; abdominal scallops much reduced. Antennae with only the base of the third and the middle of the fourth segments noticeably paler than the rest; femora with only the median pale band persisting. Length,  $10\frac{1}{2}$  mm.

Unfortunately, the fourth instar is missing from my material. In the fifth instar the form and aspect are essentially those of the adult, save for the undeveloped wings. There are still some traces of the nymphal coloring of the antennae and of the pale bands on the femora, and the abdominal margin is still very slightly scalloped. The frontal spine is smaller than in the adult. Length, 12 mm.

*Euthochtha galeator* (Fabr.). Two specimens were taken from ragweed in a pear orchard near the Warren Woods, September 3; and one was taken in flight at Harbert, July 13.

*Chariesterus antennator* (Fabr.). This is the most characteristic bug of the fore-dunes, where it appears to be restricted to a single food-plant, the flowering spurge (*Euphorbia corol-*

*lata*). Nymphs and adults are abundant here through the summer.

*Anasa tristis* (De Geer). Mr. Hubbell took one individual of this common species at Klute's Lake, near Three Oaks, September 4, and a number of specimens were taken at light in our camp on the lake shore early in July. A winter-killed individual of the preceding year was found under the bark of a dead pine on the fore-dune, July 7.

*Anasa armigera* (Say). Two specimens, from the grasses in an alder-buttonbush swamp at New Buffalo, September 2.

*Coriomerus humilis* Uhler. One, beaten from willow in a gravel pit at Harbert, July 13. I have compared this specimen with others from Wyoming (determined by Van Duzee) in the Museum of Comparative Zoology, and find no differences.

*Protenor belfragei* Haglund. A few individuals were taken from grasses in a marshy locality behind the Sawyer Dunes; others were taken at Stevensville and at Klute's Lake. The first adults were found July 21.

*Megalotomus quinquespinosus* (Say). One specimen, from roadside grasses in the Warren Woods, July 2, 1919.

*Coriscus*<sup>8</sup> *conspersus* Mont. Abundant in the fields and meadows about the Warren Woods during June and July, 1919. No individuals were taken here during the later part of the summer, nor was this species taken anywhere in Berrien County during the summer of 1920.

*Coriscus eurinus* (Say). From the same localities as the preceding, but much less numerous. One individual was taken in 1920, from a clump of beach grass on the fore-dune near Sawyer, September 6 (Hubbell).

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<sup>8</sup> Horváth has recently shown (*Ann. Mus. Nat. Hung.*, 15, p. 378) that *Alydus* Fabr. 1803 is a strict synonym of *Coriscus* Schrank 1796, since both were established for the same species. *Cimex calcaratus* Linn. = *Coriscus dauci* Schrank.

*Harmostes reflexulus* (Say). Two individuals were taken in the fields about the Warren Woods, June 23 and July 1; and one was swept from roadside grasses at Lakeside, July 13.

*Corizus bohemannii* Sign. Two specimens were taken at Lakeside, July 13.

*Corizus lateralis* (Say). Very abundant in the grassy fields around the Warren Woods from late June to September, and in similar localities in the dune region during July. In several of the specimens the connexivum is nearly or quite as heavily spotted as in *C. bohemannii*.

ARADIDAE

*Aradus robustus* Uhl. A single specimen was taken, from the bark of a large fallen beech in the flood-plain forest in the Warren Woods, July 5.

*Aradus implanus* Parsh. One, under the bark of a dead elm just within the Warren Woods, July 1.

*Aneurus fiskei* Heid. Rather common under the bark of the dead beeches in the Warren Woods, but found only on fallen trees. Specimens were taken late in June and early in July.

NEIDIDAE

*Jalysus spinosus* (Say). Fairly common among the *Juncus* and *Equisetum* near the edge of the New Buffalo Marsh, July 5. This species was also taken occasionally from the undergrowth in the dune forests, July 4 to 26.

LYGÆIDAE

*Oncopeltus fasciatus* (Dall.). Three specimens were taken in the beach-drift, July 2 (C. Rawcliffe), July 14, and July 19.

*Lygæus turcicus* Fabr. Two individuals, still alive, were washed up on the beach on the morning of July 26, 1920.

*Lygæus kalmii angustomarginatus* Parsh. Very common.

This species occurred in a number of situations in the Warren Woods area; it was taken at Lakeside, at Harbert, at Stevensville, and elsewhere; and it was frequently found on the dunes, especially on the milkweeds (*Asclepias syriaca*). A number of specimens were taken from the beach-drift.

*Lygaeus bicrucis* Say. One specimen was taken at Three Oaks, September 4 (Hubbell).

*Ortholomus longiceps* Stål. Common in the fields about the Warren Woods during the summer of 1919. No specimens were taken in the dune area during 1920.

*Nysius ericae* (Schill.). This species was common in the Warren Woods area, where it was taken from a number of species of Compositae, such as ragweed, dog-fennel, and *Rudbeckia hirta*. It was also abundant in the dune area, especially in the sandy fields immediately behind the dunes, where it was seen running about on the sand among the roots of the sparse grasses.

*Ischnorrhynchus geminatus* (Say). Several specimens were taken from ground vegetation in moist localities about the Warren Woods in June and September, and a few were beaten from red maple.

*Cymus luridus* Stål. All my Berrien County specimens came from the marshes at New Buffalo (June 30, September 2), where they were swept from sedges.

*Cymus angustatus* Stål. Common in the marshes about the Warren Woods throughout the summer, and also in the moist meadows behind the dunes.

*Cymus discors* Horv. More common than the preceding in one small marsh beside the Galien River at the edge of the Warren Woods. One specimen was taken in a moist meadow behind the Sawyer Dunes, July 17.

*Blissus leucopterus* (Say). One specimen only, from the

stem of a beach grass, *Calamovilfa longifolia*, on a fore-dune near Sawyer, July 3.

*Geocoris bullatus bullatus* (Say). Very common in the sand-dunes, where numbers of individuals were seen running about on the ground among the sparse grasses. I watched with interest the behavior of two of these bugs in a disused road at the back of the dunes: an adult was running about among the grasses, and in all its erratic course it was closely followed by a nymph of about the third instar.

*Geocoris uliginosus limbatus* Stål. One individual was swept from ragweed and *Polygonum* in a sandy field beside the Warren Woods, September 3; one was taken at Lakeside, July 13; one was swept from grasses in a moist meadow in the dune region, July 20; and several were taken from the ground in a small clearing on the dunes, July 16.

*Hypogeocoris piceus* (Say). A single specimen was taken in a sandy field behind the dunes, July 12.

*Phlegyas abbreviatus* (Uhl.). One of the most abundant Hemiptera in the grassy fields in all the collecting areas. Nymphs were very numerous in July, and adults were taken throughout the summer.

*Oedancala dorsalis* (Say). Common among the sedges and cat-tails in marshy localities about the Warren Woods, in moist meadows behind the dunes, and also in the marshes at New Buffalo and at Stevensville.

*Myodochus serripes* Oliv. One nymph which undoubtedly should be referred here was swept from luxuriant herbage near a spring in one of the dune valleys, July 27.

*Heræus plebejus* Stål. One individual only, taken at light on the dunes near Bridgman, July 12, in the sassafras strip between the pine and the black oak associations.

*Ligyrocoris diffusus* Uhler. Abundant during the summer

of 1919, less common in 1920. A long series of individuals was taken in various fields about the Warren Woods, June 20 to September 3, especially from the goldenrods and ragweeds; and a few specimens were taken from similar situations in the Sawyer Dune area.

*Perigenes constrictus* (Say). One was found on the sand in a road near Harbert, June 22; two were taken from ragweed near the Warren Woods, September 3; and one was collected at Klute's Lake, September 4 (Hubbell).

*Orthæa basalis* (Dall.). One only, from the marsh near the Warren Woods, which has been mentioned in connection with *Cymus discors*. This specimen was taken on June 29.

*Sphragisticus nebulosus* (Fallén). Rather common near the sand dunes, and found in the same situations as *Geocoris bullatus*. Two specimens were also taken on ragweed at Bridgman, July 12.

*Emblethis vicarius* Horv. Several specimens were secured in a sandy field behind the dunes, July 12 to 20.

#### PIESMIDÆ

*Piesma cinerea* (Say). One, beaten from willow beside a small creek in the dunes near Bridgman, July 9.

#### TINGIDÆ

*Gargaphia tiliæ* (Walsh). Abundant throughout the summer on the basswood, *Tilia americana*, both in the Warren Woods and on the Sawyer Dunes.

*Leptoypha mutica* (Say). Rather common on *Fraxinus americana* on the dunes, both adults and nymphs being found in fair numbers late in July. This species appeared to favor the seedlings of the ash, and, as far as I could observe, occurred only on the upper side of the leaves, near the mid-rib.

*Leptostyla clitoria* Heid. One specimen was swept from herbage at the foot of a low dune at New Buffalo, September 3. The occurrence of this "southern" species here is a matter of considerable interest.

*Corythucha marmorata* Uhler. By far the most abundant Tingid in Michigan. In some places in Berrien County this species occurred in almost unbelievable numbers on the golden-rods, but it was rarely taken on other plants.

*Corythucha arcuata* (Say). Common on the white oaks (*Quercus alba*) on the dunes, and found occasionally on the chestnut oak (*Q. muhlenbergii*).

*Corythucha ciliata* (Say). Common on the sycamores in the Warren Woods area, but rather scarce on this tree where it occurred beside the dune creeks. This Tingid was most abundant late in the summer: in early July, though nymphs were numerous, adults were rather scarce.

*Corythucha pruni* O. & D. A few individuals were taken from a *Prunus serotina* beside a dune creek west of Bridgman, July 25.

*Corythucha pergandei* Heid. Fairly common on *Alnus incana* beside the dune creek near Bridgman, July 25.

*Corythucha mollicula* O. & D. (= *C. salicis* O. & D.). Abundant on a single species of willow which grew rather commonly beside Bridgman Creek in the dune region. July 17 to 28.

*Corythucha* sp. Generally distributed over the dunes, occurring on the blue beech (*Carpinus caroliniana*). This species is much less gregarious than the other *Corythuchæ* found on the dunes: rarely are there more than half a dozen specimens found on a single branch, or more than one individual on a leaf.

*Corythucha* sp. A second species which cannot be named

at present. This form was by far the most abundant hemipteron on the Sawyer Dunes, where it occurred on *Prunus virginiana*, and also to some extent on *Amelanchier canadensis*. Scarcely a choke cherry was seen which did not show the effects of the ravages of this Tingid; but the *Amelanchier* was relatively free from infestation.

## PHYMATIDAE

*Phymata erosa wolfii* Stål. Moderately common. Adults were taken during the first week in September, at New Buffalo, at Three Oaks, and in the Warren Woods area. Nymphs were found as early as June 30.

*Phymata erosa fasciata* (Gray). Two specimens are at hand from New Buffalo, September 3.

## REDUVIDAE

*Barce annulipes* (Say). One individual was taken June 30 at New Buffalo, where it was seen on the surface of the water among the bulrushes in the old outlet of the Galien River. It may be worth noting that all the specimens of this species that I have taken in Michigan were found in similar situations; Mr. Banks<sup>9</sup> states that "it is usually taken in dry meadows."

*Stenopoda culiciformis* (Fab.). One individual was found in the remnants of an old beach-drift on the Sawyer Dunes, July 4.

*Reduvius personatus* (Linn.). At least one of these bugs came to light almost every evening at the Warren Woods, June 19 to July 5, and several specimens were taken at light on the dunes during July.

*Zelus ersanguis* Stål. This species was beaten from various trees and bushes during July, both in the Warren Woods and on the dunes.

<sup>9</sup> Notes on our Species of Emesidae. *Psyche*, 16: 43-48, 1909.



*Acholla multispinosa* (De Geer). Several specimens were beaten from a hickory at the edge of the Warren Woods, August 31.

*Sinea diadema* (Fabr.). The most abundant Reduviid in Michigan, found in all grassy localities from late July till October.

NABIDAE

*Nabis subcoleoptratus* (Kirby). Plentiful in the grass in moist situations about the Warren Woods, and in similar places in the dune region. This species was most abundant during the early summer; no specimens were taken after July 27.

*Nabis sordidus* Reut. Rather uncommon; taken sparingly from undergrowth in the woods and from woodland grasses, both in the Warren Woods and in the dune forests.

*Nabis annulatus* Reut. Two individuals, beaten from alder in a swamp at New Buffalo, September 3.

*Nabis propinquus* Reut. Moderately common on bulrushes and sedges in the marshes at New Buffalo and at Stevensville.

*Nabis ferus* (Linn.). One of the most abundant Hemiptera of the grasslands in Berrien County. The specimens taken late in June appear to average somewhat smaller than those taken later in the summer. This species was very active at night: several specimens came to light, and large numbers could be taken by sweeping the grasses after dark: many of these were feeding when taken.

*Nabis roseipennis* Reut. Fairly common. Specimens were secured at Bridgman and in the Warren Woods area, July 5 to September 1.

*Nabis rufusculus* Reut. A few were beaten from bushes at the edge of the Warren Woods, September 1.

## CIMICIDAE

*Cimex lectularius* Linn. I took one individual of this species in a shack on the shore of Lake Michigan, near Bridgman, July 22; and I have seen a second specimen from Berrien County, taken at St. Joseph in August, 1918 (C. Blashill).

## ANTHOCORIDAE

*Xylocoris ?cursitans* (Fall.). Common under the bark of dead trees in the Warren Woods, particularly on fallen beeches.

*Anthocoris* sp. One individual came to light near the Warren Woods, June 30.

*Triphleps insidiosus* (Say). Abundant on dog-fennel and other Compositæ about the edges of the Warren Woods, and also taken in the dune region. The dark variety *tristicolor* was rarely taken.

## MIRIDAE

*Collaria meilleuri* Prov. Moderately common in the grasses in moist situations, both at the Warren Woods and in the dune region, June 23 to July 20; one specimen was taken from the margin of a cranberry bog near Livingston, July 22.

*Collaria oculata* (Reut.). This species was taken only in the dune region, where it was about as common as *C. meilleuri*.

*Miris dolobratius* (Linn.). Abundant everywhere in grassy situations during June and early July.

*Stenodema vicinum* (Prov.). A very common grass bug in all of the localities studied, occurring most abundantly in marshy places.

*Trigonotylus ruficornis* (Fall.). Another very common grass-dwelling Mirid in all my collecting localities, but, unlike the last, this form was found most commonly in dry fields and pastures, and in sandy uplands where the grasses were rather scanty.

*Teratocoris discolor* Uhl. Common in the Juncus-Equisetum zone at the edge of the New Buffalo marsh, July 5.

*Platytylellus* spp. One or two species of this genus were found sparingly in grasses in the more open parts of the Warren Woods, June 24 to July 3, especially in a bushy flat enclosed in an ox-bow of the Galien River.

*Neurocolpus nubilus* (Say). A common Mirid in marshes and swales; it was swept from grasses and herbage of various kinds, and in the Warren Woods region I found it especially numerous on buttonbush (*Cephalanthus occidentalis*).

*Phytocoris eximius* Reut. Three specimens were taken: one from roadside grasses in the Warren Woods, August 31; one from grasses near Bald Tom Pond in the dune region, July 26; and one from willow beside Bridgman Creek, July 17.

*Phytocoris neglectus* Knight. One, beaten from hazel (*Corylus americanus*) at New Buffalo, September 2.

*Phytocoris salicis* Knight. Several specimens were taken in various situations about the Warren Woods, June 20 to July 4, 1919.

*Phytocoris ?infuscatus* Reut. Two teneral individuals have been referred doubtfully to this species by Dr. Knight. They were taken on hickory at the Warren Woods, July 3.

*Phytocoris conspurcatus* Knight. One, beaten from hard maple in the dune forest by Bridgman Creek, July 18.

*Adelphocoris rapidus* (Say). Common everywhere and at all times during the summer.

*Stenotus binotatus* (Fabr.). A common grass dwelling form in the Warren Woods region during the early summer. No specimens were taken after June 28.

*Garganus fusiformis* (Say). This agile Mirid was common in the grass in damp localities about the Warren Woods, June 20 to September 1.

*Paracalocoris scrupeus scrupeus* (Say). A few specimens were taken at the Warren Woods, June 21, from grasses and from wild grape.

*Paracalocoris scrupeus bidens* McAtee. One, beaten from sumac (*Rhus glabra*) at the edge of the Warren Woods, July 3.

*Paracalocoris adustus* McAtee. One was beaten from willow by Bridgman Creek, July 12, and a second specimen was taken from willow by a small pond behind the dunes, July 19.

*Pæciloscytus basalis* Reut. An abundant form on ragweed (*Ambrosia*) and also on dog-fennel (*Anthemis cotula*), and taken in all the localities where collecting was done.

*Pæciloscytus venaticus* Uhler. Common in the grass in moderately damp situations about the Warren Woods, June 20 to July 5; one specimen was taken on ragweed at Bridgman, July 12.

*Pæciloscytus* n. sp. Abundant in beds of *Saururus cernuus* in the shady glens at the southern edge of the Warren Woods, June 20 to September 3, and also found on the same plant in the marshes at New Buffalo.

*Horcias dislocatus* (Say). Common in shady localities about the Warren Woods, and along Bridgman Creek behind the dunes. The varieties *nigrita* Reut. and *goniphorus* (Say) were most numerous, and the variety *affinis* (Reut.) was also taken. Typical *dislocatus* was not found.

*Pæcilocapsus lineatus* (Fabr.). More abundant than the preceding, and found in similar situations everywhere that I collected.

*Capsus ater* (Linn.). A common bug in the hayfields and meadows during the early summer; specimens were taken until about July 10. All three of the color forms listed by Van Duzee were collected, the var. *tyrannus* (Fabr.) being the most abundant, while *semiflavus* (Linn.) was comparatively rare.

*Coccobaphes sanguinarius* Uhler. A common Mirid on the hard maples in the Warren Woods and in the dune forests. My specimens were collected between June 24 and July 28.

*Lygidea rubecula obscura* Reut. One from ragweed near the Warren Woods, July 5, and one from willow near the mouth of Bridgman Creek, July 9.

*Lygus pratensis oblineatus* (Say). Abundant in the grasses in dry situations in all parts of Berrien County, and occasionally taken on bushes.

*Lygus plagiatus* Uhler. A common species on ragweed and on dog-fennel. Specimens were taken at the Warren Woods, June 24 to July 5, and at Bridgman, July 12.

*Lygus rubicundus* (Fall.). A few specimens were taken on *Fraxinus* sp. and on willow near the Warren Woods early in July, and this species was found uncommonly on *Betula lutea* beside Bridgman Creek later in the month.

*Lygus campestris* (Linn.). One, from roadside grasses at the edge of the Warren Woods, July 5.

*Lygus pabulinus* (Linn.). Moderately common on the spotted touch-me-not (*Impatiens biflora*) in the Warren Woods, June 21 to July 3, and also taken at New Buffalo, July 5.

*Lygus invitus* (Say). A common form on the elms in the Warren Woods area, and also found occasionally on other trees, June 20 to July 3.

*Lygus inconspicuus* Knight. Two, beaten from elm at the Warren Woods, June 28.

*Lygus tilie* Knight. A single specimen was found dead at the base of a mullein stalk, in a small clearing in the white oak association on the Sawyer Dunes, July 16.

*Lygus caryæ* Knight. Common on hickory at the edge of the Warren Woods, June 21 to July 3.

*Lygus communis* Knight. This species was taken on elm

at the Warren Woods, June 28, and on herbaceous vegetation under elms at the edge of Bald Tom Pond in the Sawyer Dune area, July 11.

*Lygus quercalbae* Knight. Several specimens were beaten from white oak on the dunes, July 3 to 13.

*Lygus omnivagus* Knight. A common Mirid on the dunes during July; it was found on a number of plants, including white oak, hard maple, and green brier (*Smilax hispida*).

*Lygus hirticulus* Van D. Another common form on the dunes throughout the month of July, and specimens were also collected in the Warren Woods during the last week of June. This species was most abundant on hard maple.

*Tropidosteptes cardinalis* Uhl. Several individuals were taken on ash (*Fraxinus*) at the Warren Woods, June 28 to July 3.

*Neoborus palmeri* (Reut.). A common species on the ash trees at New Buffalo and in the Warren Woods region, June 28 to July 5.

*Neoborus canadensis* (Van D.). Much less common than the preceding. Taken on ash, and also on basswood and on button-bush, June 28 to July 3.

*Neoborus amœnus* (Reut.). Taken from ash and from *Cornus* sp., June 21 to July 4.

*Neoborus amœnus scutellaris* (Reut.). Somewhat more common than the typical *amœnus*; commonly found on ash, but also taken on maple and wild grape.

*Neoborus pubescens* Knight. This was the only *Neoborus* which was common on the black ash (*Fraxinus niger*) on the dunes, where numerous specimens were secured, July 4 to 28. Other individuals were taken at the Warren Woods, June 21 to July 3, chiefly on ash.

*Xenoborus pettiti* (Reut.). A teneral individual was taken on ash at the Warren Woods, July 3.

*Deræocoris grandis* (Uhler). Common on elms in the Warren Woods, June 28 to July 3, 1919.

*Deræocoris fasciolus castus* Knight. Common on aphid-infested elms by Bridgman Creek in the dune region, July 23 and 25, 1920.

*Deræocoris aphidiphagus* Knight. A number of specimens were taken on elm at the Warren Woods, July 3, 1920.

*Deræocoris histrio* (Reut.). Several specimens were taken from the semi-aquatic vegetation about Bald Tom Pond in the Sawyer Dune region during July, and one specimen was beaten from willow at the mouth of Bridgman Creek, July 9.

*Fulvius imbecilis* (Say). Three individuals were taken from under the bark of a large fallen beech in the Warren Woods, July 5, and on the same date Mr. Hubbell secured two from a pile of cut wood nearby.

*Hyaliodes vitripennis* (Say). Moderately common on various trees, both in the Warren Woods and on the Sawyer Dunes, July 21 to August 31. Specimens were taken from yellow birch, beech, basswood, and hard maple, but the species was most commonly found on the maple.

*Dicyphus agilis* (Uhl.). Several specimens were taken from berry bushes (*Rubus* spp.), both in the Warren Woods and in the dune region, June 20 to July 27; and one individual was beaten from elm, June 28.

*Dicyphus famelicus* (Uhl.). One individual, on raspberry at the Warren Woods, July 3.

*Halticus citri* (Ashmead). Common in the grass in damp, shady localities in the Warren Woods, August 31 to September 3.

*Halticus intermedius* Uhler. Two specimens were swept

from grass beside Bridgman Creek, July 9. This species has apparently been known previously only from Pennsylvania and New Mexico.

*Strongylocoris stygicus* (Say). One of the most abundant grass bugs in damp, shady localities, both in the Warren Woods, and in the dune region, from June to September.

*Ceratocapsus pumilus* (Uhler). Two specimens were taken, one from willow at Harbert, July 13, the other from wild rose under tall willows by Bald Tom Pond in the dune region, July 11.

*Ceratocapsus modestus* (Uhler). Rather common on hickory at the edge of the Warren Woods, July 3.

*Lopidea cæsar* (Reut.). One of the characteristic Hemiptera of the black oak association on the dunes. Nymphs were numerous early in July, and the first adults were taken July 20.

*Lopidea media* (Say). Three specimens, taken at New Buffalo, June 30.

*Lopidea confluens* (Say). A few specimens were taken at the Warren Woods, June 26 and August 31.

*Lopidea staphyleæ* Knight. Very common on Staphylea and other bushes on the flood plain at the edge of the Warren Woods, June 28 to July 3. Two specimens were also taken on the hop tree (*Ptelea trifoliata*) near the crest of Bald Tom dune, July 26.

*Pseudoxenctus scutellatus* (Uhler). One, at light near the Warren Woods, June 21.

*Diaphnidia provancheri* (Burque). Found commonly on hickory at the edge of the Warren Woods early in July, and also taken on oaks on the dunes, July 12 and July 24.

*Diaphnidia pellucida* Uhler. A few were taken on maple on the dunes, July 4.



*Reuteria irrorata* (Say). One, from elm beside Bridgman Creek, July 24.

*Orthotylus viridis* Van D. Several specimens were taken from luxuriant vegetation in a small, marshy spot by the Warren Woods, July 5.

*Orthotylus flavosparsus* (Sahlb.). Swept from vegetation beside the railroad at New Buffalo, July 5.

*Orthotylus fumatus* Van D. One, at light in Three Oaks, July 5.

*Inacora malina* (Uhler). One, from grass in a ravine by the Warren Woods, June 25.

*Inacora stáli* Reuter. A number of specimens were swept from ragweed at Bridgman, July 12, and at Lakeside, July 13.

*Reuteroscopus ornatus* (Reuter). This agile species was taken several times on ragweed, at the Warren Woods and at Bridgman, July 5 to September 1.

*Plagiognathus albatrus* (Van D.). A fairly common species about the Warren Woods, where it occurred on butternut, sycamore, and sour-gum, June 28 to July 4, and at New Buffalo it was found on *Alnus*, July 5.

*Plagiognathus politus* Uhler. An abundant species everywhere that I collected.

*Chlamydatus associatus* (Uhler). Another very common species, especially in the late summer.

*Microsynamma bohemanii* (Fall.). Two specimens were beaten from willow beside Bridgman Creek, July 9.

Several other species of Miridæ, especially of the subfamily Phylinae, are represented in the Berrien County collections, but cannot be named definitely at present.

## HYDROMETRIDAE

*Hydrometra martini* Say. Several specimens were collected at a small pond at the base of Bald Tom dune, June 23 to July 26. Others were taken from the New Buffalo marsh (June 30) and from a small pond in the Warren Woods (July 4).

## GERRIDAE

*Gerris remigis* Say. Abundant on the Galien River in the Warren Woods, and on all the small creeks which flow through the dunes to Lake Michigan.

*Gerris marginatus* Say. Abundant and widespread in Berrien County. Specimens were collected at New Buffalo, the Warren Woods, Harbert, the dune region, Bridgman, and the Grand Marais.

*Gerris alacris* Hussey.<sup>10</sup> This species was taken in only one locality, a small pond at the east base of Bald Tom dune, near Sawyer, where specimens were taken July 19 and July 26, 1920. This pond is about sixty yards in length, comparatively narrow, roughly crescent-shaped, and has a maximum depth of five or six feet. On the west it is bordered by the steep slope of the bare dune; on the north it is fringed with willows growing on a narrow strip of damp sand; and on the east and south it is shut in by a small stand of elms and other trees. A small brook connects this pond with another larger one a short distance to the north. The water is turbid and supports an extensive growth of aquatic vegetation in which the cow-lily (*Nymphaea advena*) is conspicuous.

This *Gerris* was the most plentiful member of the genus here on these dates, and even at first glance it was recognized as distinct from its congeners. I have subsequently taken it at Ann Arbor.

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<sup>10</sup> *Psyche*, 28, p. 11, 1921.

*Gerris buenoi* Kirk. Apparently the least common *Gerris* in this region. Several specimens were taken from a pool in the Warren Woods, June 23, and a few were found at New Buffalo, June 30 and September 3.

*Gerris argenticollis* Parsh. The most abundant *Gerris* in the Warren Woods, with the possible exception of *G. remigis*. The present species occurred abundantly on all the woodland pools as well as on the quiet stretches of the Galien River in the woods.

*Gerris rufoscutellatus* Latr. Very common in several places in this region. Specimens were taken at New Buffalo, in the Warren Woods, and in the dune region; and this species occurred rather frequently in the beach drift.

*Metrobates hesperius* Uhler. Common in the Warren Woods, where it occurred on the Galien River, June 20 to August 31.

*Rheumatobates rileyi* Bergr. Common on the Galien River and also on the woodland pools in the Warren Woods. The specimens taken here were of the darker variety typical of more northern latitudes.

#### VELIADAE

*Microvelia americana* Uhler. Very common on the damp sand beside the Galien River, at the margins of the small brooks in the Warren Woods, and beside the creeks in the dune region.

*Microvelia borealis* Bueno. Rather uncommon among the bulrushes in the New Buffalo marsh in June, but exceedingly numerous there early in September. This species was not taken elsewhere in Berrien County.

*Microvelia fontinalis* Bueno. One specimen was taken at New Buffalo, June 30.

*Microvelia buenoi* Drake. Moderately common on one of the woodland pools in the Warren Woods, June 23 to July 4. One specimen was taken from a pasture pool, June 25.

*Rhagovelia obesa* Uhler. Common on moderately rapid portions of the Galien River in the Warren Woods.

## MESOVELIADAE

*Mesovelia mulsanti* White. This species was found commonly at New Buffalo, and other specimens were taken in the Warren Woods, at Harbert, and near the Sawyer Dunes.

## HEBRIDAE

*Hebrus burmeisteri* L. & S. Several specimens were taken at the Warren Woods, some from the margins of the Galien River and some from among the matted grasses in swamp meadows; and a few were taken at New Buffalo. About half the specimens secured were apterous!

*Merragata brunnea* Drake. One specimen was taken at New Buffalo, September 2.

## SALDIDAE

*Salda coriacea* Uhler. One specimen was taken at the Warren Woods, July 15 (Hubbell), and another was collected from the margin of Bald Tom Pond, June 24.

*Lampracanthia anthracina* (Uhler). One specimen was taken from the matted grasses in a pasture pond at the Warren Woods, June 25.

*Saldula major* (Prov.). Abundant on the margins of the Bald Tom Pond, where specimens were taken from June 24 to July 19.

*Saldula confluens* (Say). One specimen was taken at New Buffalo, June 30, and a second at Bald Tom Pond, July 3.

*Saldula orbiculata* (Uhler). Rather uncommon. This species was collected on the shore of the Galien River in the Warren Woods, June 25 to 29, and at New Buffalo, June 30.

*Saldula interstitialis* (Say). By far the most common and widespread Saldid found in Berrien County. This was the only member of the family that I found on the beach of Lake Michigan: and even in this case the bugs were confined to a narrow strip about the broad pool which Bridgman Creek formed on the lake beach.

*Saldula reperta* (Uhler). Moderately common on the sandy shores of the Galien River in the Warren Woods, June 20 to July 5.

*Micracanthia humilis* (Say). This species was also found in fair numbers beside the Galien River, but it was most abundant among the grasses and on the damp sand flat about the edges of the Bald Tom Pond, June 20 to July 11.

#### NOTONECTIDAE

*Notonecta undulata* Say. Abundant at New Buffalo, where it was found in the marsh and also in a large concrete tank at the edge of town. Other specimens were taken at Harbert and in the Galien River at the Warren Woods, but this species was not collected in the dune region.

*Notonecta irrorata* Uhler. Partial to the sluggish plant-free streams and pools in shady situations, and found both at the Warren Woods and in the dune region. This is the only *Notonecta* that I took from beach drift.

*Notonecta variabilis* Fieb. A few specimens were taken from a sluggish stream in one of the glens at the edge of the Warren Woods, and several others were taken from Bald Tom Pond.

*Buenoa margaritacea* Bueno. Abundant in the large concrete tank at New Buffalo, September 2.

*Buenoa elegans* (Fieb.). Very common in the same locality as the last, June 30 and September 2; a few specimens were also taken from the New Buffalo marsh on June 30.

*Plea striola* Fieb. This little species was abundant in the algal growths on the sides of the concrete tank at New Buffalo, both in June and September. Other specimens were taken from the Bald Tom Pond, July 19, and from a small woodland pool in the Warren Woods, July 4.

#### NEPIDAE

*Nepa apiculata* Uhler. Two, from a cow-track pool in a marshy pasture at the edge of the Warren Woods, June 28.

*Ranatra americana* Mont. I took one individual of this species in the outlet of a creek at New Buffalo, June 30, and Mr. M. H. Hatch has given me one which he took from beach drift near the same place, June 22. Nymphs which probably were of this species were found on several dates during the early summer in the ponds about the Warren Woods.

*Ranatra kirkaldyi* Bueno. Mr. Hatch has kindly given me three specimens of this species which he took from a small creek flowing out of the Bald Tom Pond, June 16, 1920.

#### BELOSTOMATIDAE

*Benacus griseus* (Say). My only Berrien County specimens, some thirty in number, were picked up on the beach of Lake Michigan during July, and Mr. Hatch has a good series which he obtained from beach drift at New Buffalo on June 22. The New Buffalo specimens probably came from the broad, marsh-like expanse of the lower portion of the Galien River, while those which came ashore in the Sawyer Dune region

probably came from the marshy lakes near Stevensville. The Berrien County specimens vary greatly in size, ranging from 45 to 63 mm. in length, and from 17 to 24 mm. in maximum width.

*Lethocerus* sp. Apparently much less abundant than *Benaucus*. One individual was found in a small pasture pool near the Warren Woods, July 3, and I took two specimens in the beach drift on the Sawyer Dunes in mid July. I prefer not to name this (or these?) species at present.

*Belostoma flumineum* Say. Numerous individuals were found on the beach, and a few were taken from the Bald Tom Pond and from various pools about the Warren Woods.

#### GELASTOCORIDAE

*Gelastocoris* n. sp. Abundant on the sandy margins of the New Buffalo marsh, on the banks of the Galien River in the Warren Woods, and about the Bald Tom Pond. Specimens were taken from June 20 to September 3; one individual was found in beach drift, July 19.

#### CORIXIDAE

*Palmacorixa gillettei* Abb. Abundant in the Galien River in June and in September, occurring in the shallow water, where they rested on the muddy bottom and darted quickly away if disturbed.

*Corixa verticalis* (Fieb.). Found with the preceding, in early September, and likewise very common. The superficial resemblance between these two forms is very striking.

Several other species of Corixidae were collected in Berrien County, which had best be left unnamed at present.

