ion of 1918. Reports on the Scutel-
leroidea and the Orthoptera and Dermaptera
Barbados-Antigua

FIRST SERIES NO 59 MARCH 15, 1922

UNIVERSITY OF IOWA STUDIES

STUDIES IN NATURAL HISTORY

VOLUME X NUMBER 1

REPORTS ON THE SCUTELLEROIDEA *and* THE ORTHOPTERA AND DERMAPTERA *of the Barbados-Antigua Expedition of 1918*

SCUTELLEROIDEA OF THE DOUGLAS LAKE REGION

PUBLISHED BY THE UNIVERSITY, IOWA CITY

Issued semi-monthly throughout the year. Entered at the post office at Iowa City, Iowa, as second class matter. Acceptance for mailing at special rates of postage provided for in section 1103, Act of October 3, 1917, authorized on July 3, 1918.

UNIVERSITY OF IOWA STUDIES IN NATURAL HISTORY

PROFESSOR CHARLES CLEVELAND NUTTING, M. A., Editor

VOLUME X NUMBER 1

REPORTS ON THE SCUTELLEROIDEA *and* THE ORTHOPTERA AND DERMAPTERA *of the Barbados-Antigua Expedition of 1918*

SCUTELLEROIDEA OF THE DOUGLAS LAKE REGION

PUBLISHED BY THE UNIVERSITY, IOWA CITY

REPORT ON THE SCUTELLEROIDEA

Collected by the Barbados-Antigua Expedition from the University of Iowa in 1918

DAYTON STONER
Assistant Professor of Zoology, University of Iowa

INTRODUCTION

The material which serves as the basis for the present paper was secured mainly by the writer and Mrs. Stoner who were members of the scientific party from the University of Iowa which visited some of the West India Islands, Barbados and Antigua, in particular, during the spring and summer of 1918. Collecting was done on Barbados at irregular intervals and as time afforded from other duties between May 16 and June 11, and at Antigua between June 19 and July 19.

To the best of the writer's knowledge no systematic collecting of this group of insects has heretofore been indulged in on either Barbados or Antigua, although extensive general collecting has been undertaken on these as well as on certain other islands of the West Indies, namely Trinidad, Jamaica, St. Vincent and Grenada. Indeed, considerable intensive collecting has been done in some of these places. Of course various species have been reported from time to time on different islands of the group and on some islands certain species are of considerable economic importance.

At Barbados, only members of the family Pentatomidæ were secured, but, without doubt, representatives of the families Cydnidæ and Scutelleridæ also occur on the islands. Fortunately we were able to take two species of Scutelleridæ at Antigua, but representatives of the Cydnidæ were not discovered.

Most of the pentatomids here discussed have been hitherto recorded from the "West Indies" and some more specifically from Grenada and St. Vincent, but few from either Barbados or Antigua. Several of the present records are, therefore, new

and all will either supplement or aid in the verification of the distributional data of the species concerned.

Keys for the identification of the species are not given, for it is probable that additional forms should be included in the fauna of the islands, and a key without embracing all the species would scarcely be justifiable. However, not much difficulty should be encountered in the determination of the forms discussed here, for in the case of the more obscure ones the brief diagnosis appended should be sufficient for ready delimitation.

The collection of pentatomids consists of approximately eight hundred pinned specimens, of which about one-fifth are *Edessa meditabunda*. In addition, many duplicates of the seven commonest species were taken. In all, seventeen species are represented in the lot. Nine of the seventeen were taken on Barbados and all the forms found on that island were also discovered at Antigua. Seventeen species are here recorded for the latter island.

Of the nine species taken at Barbados seven occur in the United States north of Mexico. The other two are exclusively Neotropical. Of the seventeen Antigua species fourteen occur also in the United States and three are strictly Neotropical.

By way of indicating something of the relative abundance, the following table showing the number of specimens taken of the eight least common forms, irrespective of the island upon which they were found, is appended.

Podisus fuscescens	1 specimen
Podisus sagitta	3 specimens
Sphyrocoris obliquus	3 "
Arvelius albopunctatus	13 "
Berecynthus deliirator	15 "
Thyanta casta	19 "
Thyanta antiguensis	24 "
Vulsirea violacea var. *nigrorubra*	64 "

Each of the remaining nine forms is represented by a greater number of specimens than the last above mentioned.

It will be seen that the collection comprises a great number of borderline species, that is, forms which are commonly found between temperate and equatorial America. As a whole, the

pentatomid fauna of the two islands seems to be Central American and Mexican in its affinities rather than South American.

A number of host and food plants of several of the species of pentatomids herein mentioned were preserved and brought back to the States for determination. However, through no fault of the writer, the package containing these plants was unfortunately lost so that this phase of the work must of necessity, be slighted.

The writer is indebted to Dr. L. O. Howard and to Mr. W. L. McAtee for the privilege of having access to specimens of Scutelleroidea in the United States National Museum, where Uhler's and other collectors' West Indian material is housed, and with which many of the specimens in the present collection were compared. Acknowledgement is also herewith tendered these men and other officials of the Museum who made available the use of a desk in the building during a part of the summer of 1921, when a number of comparative studies were made.

The following brief discussion concerning certain topographic, climatic and other conditions existing on Barbados and Antigua is quoted from a previous general account by the writer which dealt with some terrestrial arthropods occurring on these islands.[1]

"The island of Barbados is situated in 13° 4′ North latitude and 59° 37′ West longitude, and is the most easterly of the Antillean chain. It is about twenty-one miles long by fourteen broad, with an area of 166 square miles and a population of about 200,000, nine-tenths of which is black. The strata forming the basement series of Barbados consist of siliceous and calcareous sandstones and clays. About six-sevenths of the total area of the island is covered by a cap of coral rock which is more or less flat, and rises in a series of terraces to Mt. Hillaby in the "Scotland district," which is 1,104 feet in height. An area of approximately 6,000 acres at the northern and eastern side of the island has received that name on account of its peaked and hilly character. The remainder of the island is low and flat or, at most, slightly rolling, with few swamps and marshes and but two or three fresh water streams of any im-

1. Canadian Entomologist, Vol. LI, No. 7, 1919, 173-178 and Vol. LI, No. 8, 1919, 217-220.

portance. Practically all the tillable land is under sugar cane, and but few remnants of the forests which once covered the island now remain. The annual rainfall is about sixty inches, and usually comes in the form of showers during the summer months. The dry season occurs in the winter and early spring months.

"On account of the slight physiographic differentiation, the almost uniform state of cultivation and the density of the population, Barbados is not a particularly favorable place for collecting insects. In addition, practically all the grass land is closely grazed by goats and cattle, so that dense growths of vegetation are much restricted. In general, the affinities of the insect fauna are with that of South America, but a number of North American and closely allied forms are to be found. A few indigenous forms also occur.

"The island of Antigua is situated in latitude 17° 6′ N., and is the principal island of the Leeward group, of which it is the political capital. It is roughly oval in outline, twenty-four miles long by about fifteen broad, with an area of 108 square miles and a population of about 36,000. The central part of the island is low and flat and the soil more or less clayey; the southern and southwestern parts, in the vicinity of English Harbor, where a large share of the collecting was done, are volcanic and mountainous and covered, in many places, with dense forests. The greatest elevation is about 1,500 feet. To the north and northeast the soil is composed of calcareous marls and coarse sandstones.

"Extended periods of drought often visit the island, and the average annual rainfall is a little less than fifty inches. As a result of the nature of the soil and the protracted dry periods, the uncultivated vegetation is largely of a xerophytic nature. However, the soil, where it can be worked at all, is fertile and retains well the small amount of moisture. Sugar is the principal industry, although corn, yams and pineapples are cultivated on a small scale.

"Antigua is not under so high a state of cultivation as is Barbados; neither is it so thickly populated as that island. Natural enemies of insects are not numerous. All these con-

ditions make for a more abundant and varied insect fauna than we found at Barbados.''

List of species collected on Barbados and Antigua:

Family **Scutelleridæ**

Diolcus irroratus	A.[1]
Sphyrocoris obliquus	A.

Family **Pentatomidæ**

Mecidea longula	A.
Mormidea ypsilon	B.[2] and A.
Solubea pugnax	A.
Euschistus crenator	B. and A.
Berecynthus delirator	A.
Thyanta perditor	B. and A.
Thyanta casta	B. and A.
Thyanta antiguensis	A.
Vulsirea violacea var. *nigrorubra*	A.
Nezara viridula	B. and A.
Piezodorus guildingi	B. and A.
Arvelius albopunctatus	B. and A.
Edessa meditabunda	B. and A.
Podisus sagitta	B. and A.
Podisus fuscescens	A.

ANNOTATED LIST OF THE SPECIES COLLECTED

Family **Scutelleridæ**

Diolcus irroratus (Fabricius)

Plate I, Figs. 1 and 2

1775. *Cimex irroratus* Fabricius, Syst. Ent., 699.

This was the first species of scutellerid taken by us on the islands, the only other being *Sphyrocoris obliquus*. Both species were captured at Antigua, the present form being much the commoner of the two, and is represented by a considerable series of specimens.

The point of greatest abundance was on the top of Monk's Hill about seven hundred feet above sea level. Here, on all sides, grass and other dense vegetation thickly covered the rapid-

A.1=Antigua.

B.2=Barbados.

ly crumbling walls of the ancient structures and fortifications on this historic spot, and a good series of both adults and nymphs in various stages of development was taken on June 24.

Again, on June 26 several specimens were taken at Blizard's Mill. This structure, as indicated by the legend on a stone slab above the doorway, was erected in 1758 by G. Blizard, and was once used for grinding sugar cane, the motive power being derived from the wind. Nothing now remains of the old windmill except for ruins of the stone foundation, and the place is grown up in weeds and grass affording both food and shelter for these as well as many other insects.

In former years, small plots on the hills northeast of the village of English Harbor had been under cultivation, but more recently they have been permitted to grow up in grass and weeds. In such areas collecting was good, and Heteroptera in particular were common. On the guinea grass, a common plant in such situations, the present form, in both adult and nymphal stages, was taken in some numbers on July 5 and 10.

The females are larger, on the average, than the males; but two or three of the latter form exceptions in that they are as large as the largest females. Both the large and small males are uniformly punctured with brown on a yellowish or yellowish green background; the brown patches and fascia are pronounced in all the females.

A number of specimens of this species collected in Porto Rico by Mr. August Busck are in the collections of the United States National Museum.

Sphyrocoris obliquus (Germar)

Plate I, Fig. 3

1839. *Pachycoris obliquus* Germar, Zeitschr. Ent., Vol. 1, 94.

Of this form but three specimens were taken on the following dates and under the circumstances indicated: July 3, guinea grass near the village of English Harbor; July 5, abandoned and reverted field northeast of English Harbor; July 8, Falmouth.

I have also a specimen from St. Vincent and one from the island of Bequia, both in about the same latitude as Barbados, but approximately one hundred miles west of it. We did not

find *S. obliquus* at Barbados, although Uhler recorded it from Grenada. In view of the foregoing records it seems likely that this form may have escaped us at Barbados. It can readily be told from the preceding form, for the ostiolar canal is bent forward at a right angle near the broadly expanded tip.

Family **Pentatomidæ**

Mecidea longula Stal

Plate I, Fig. 4

1854. *Mecidea longula* Stal, Œfv. Vet. Akad. Förh., Vol. xi, 233.

This peculiar, elongate linear pentatomid is represented by a goodly number of specimens from a few restricted localities on Antigua only. It seems to prefer more or less open grassy areas well exposed to the sunlight.

At Point Barclay on the morning of June 21 a number of specimens, both adults and nymphs in all stages of development, were taken on *Chloris radiata;* again at about four o'clock in the afternoon the same spot was visited, when adults and nymphs in all stages were to be found feeding upon this grass after the heat of the day. Indeed, I believe that I have never found any pentatomid in greater abundance in a limited area than this species on the occasion just mentioned. (See Plate II, Fig. 2) Adults and nymphs were still abundant on the Chloris on July 5, on which date also a single adult was taken at the light in our dining room by Mrs. Stoner. Our quarters were about one-half mile from the nearest point where specimens were secured by sweeping, so the insect no doubt was attracted by our lamps. On this date a few specimens were taken in uncultivated areas among the hills adjoining the village of English Harbor.

In the West Indies this species seems to have been recorded from St. Bartholomew Island only in about 18° N. latitude.

Mormidea ypsilon (Linnæus)

Plate I, Fig. 5

1758. *Cimex ypsilon* Linnæus, Syst. Nat. (X Ed.) 443.

Undoubtedly this form is more common in Barbados than our single record would indicate, but it seems that if it were present in any considerable numbers we should have taken a

larger series of examples. A female only was taken in an open weedy place. This specimen differs only from the Antigua specimens in having shorter and blunter humeri.

More than fifty specimens are at hand from Antigua, taken mostly at Monk's Hill, June 24; at Golden Grove, in a low lying, swampy, uncultivated field near a quarry, June 26; very common in a solanaceous weed patch near Falmouth, July 1 and 8. None are of the form *inermis* Dallas, the pronotal angles in all being drawn out into acute spines. I have a specimen of the latter form taken by H. A. Ballou on St. Lucia, and also specimens of typical *ypsilon* from Nevis and St. Lucia. Several half-grown nymphs taken at Antigua during July are also in our collection.

Uhler records the species from Grenada.

Solubea pugnax (Fabricius)

Plate I, Fig. 6

1775. *Cimex pugnax* Fabricius, Syst. Ent., 704.

A large series of this species from Antigua only is at hand. It is one of the most abundant pentatomids on the island. Considerable difference in size between the sexes is apparent; the smallest male being but 9.0 mm. in length, the largest female 11.5 mm. long. I can see no appreciable difference between a series of specimens from Antigua and a series made up of individuals secured in different parts of the United States, except that the tropical series averages a little smaller, specimen for specimen. Dates and localities are as follows:

Golden Grove, June 26; low, uncultivated area near quarry. Falmouth, July 1; abundant in grassy places cleared of brush and along edges of cultivated fields.

Euschistus crenator (Fabricius)

Plate I, Fig. 7

1794. *Cimex crenator* Fabricius, Ent. Syst., Vol. IV, 101.

This common form, somewhat variable in depth of coloration and in acuteness of the humeri, was taken at both Barbados and Antigua. At Barbados it was found in some numbers in almost every place that collecting was done, particularly where

the vegetation was partly shaded. In June, adults were much more abundant than nymphs.

E. crenator can scarcely be confused with any other pentatomid of the region. With its subacute humeri directed upward and slightly backward and the black, concavely arcuated, finely and rather regularly denticulated antero-lateral pronotal margins. Length 8.5-10.0 mm.

On the afternoon of July 1 at the foot of Monk's Hill, Antigua, not far from the little village of Falmouth, in a small, low, swamp-like area not more than sixty feet in diameter, but perfectly dry at this time, although well shaded by small trees, Mrs. Stoner discovered great numbers of this species on a thickly growing solanaceous plant. Some of the plants were literally overrun with the insects. After a few strokes of the hand net fifty-two adults, along with several nymphs, were taken from the bag. About a hundred specimens were taken and as many more could very easily have been secured. A few examples were also taken near this place from the grassy edges of small cultivated fields. On the morning of July 8 I again visited the patch of Solanaceæ with fair returns for my efforts, but what was my surprise, on again beating the same plants about four o'clock in the afternoon, to find the species as abundant as it was a few hours previously. A few *M. ypsilon* were also taken at the same time.

Northeast of English Harbor, in uncultivated areas formerly cultivated to cotton and other plants, but recently permitted to grow up in weeds and grass, the species was not uncommon on July 5.

Berecynthus delirator (Fabricius)

Plate I, Fig. 8

1787. *Cimex delirator* Fabricius, Mantissa Insect., Vol. II, 286.

Fourteen adult specimens of this species which is widely distributed in South and Central America and Mexico were taken at Antigua between July 1 and 15. The acutely pointed anterior extremity of the tylus is considerably produced beyond the anterior margin of the head, and the specimens show no tendency to vary in this regard, the nymphs also sharing in this character.

Localities and dates are as follows: Falmouth, July 1, 8 and

9; uncultivated areas in the hills northeast of English Harbor. On July 12, following a heavy rain, I again visited the uncultivated areas northeast of English Harbor, where, on the tall, coarse grass growing in the little gullies on the hillsides which had been much refreshed by the recent downpour, five adults and several nymphs of this form were taken.

Thyanta perditor (Fabricius)

Plate I, Fig. 9

1794. *Cimex perditor* Fabricius, Ent. Syst., Vol. IV, 102.

Our collection contains numerous examples from Barbados which were swept from succulent vegetation growing in low or more or less protected situations.

The specimens vary from dark green to testaceous with the sanguineous median line on tylus and interhumeral band well marked. Pronotal angles very acute and inclined sharply forward. Connexivum pale yellowish to fulvous alternated with black or green. Basal portion of membrane with a greater or less number of brownish or blackish dots.

About forty specimens were also taken at Antigua; more than one-third of these depart from the usual dark greenish coloration in that they are pale testaceous.

This is a widely distributed and, in some places, a common species occurring in most of the West India Islands and on the continent from northern Brazil to Georgia and Colorado.

Thyanta casta Stal

Plate I, Fig. 10

1862. *Thyanta casta* Stal, Stett. Ent. Zeit., Vol. XXIII, 104.

But two specimens were taken at Barbados. In these the punctuation is coarse, and the pronotum and hemelytra have a somewhat calloused appearance. There is a slender black line on the extreme edge of each pronotal angle. Length, 8.75 mm.

About twenty examples were taken by us at Antigua.

Uhler records this as the least common of the three species of the genus taken by him on Grenada.

Thyanta antiguensis (Westwood)

Plate I, Fig. 11

1837. *Pentatoma antiguensis* [Westwood], Cat. Hope, Vol. 1, 36.
1851. *Pentatoma taeniola* Dallas, List Hem., Vol. 1, 250.
1894. *Thyanta taeniola* Uhler, Proc. Zool. Soc. London, 173.

We have about twenty-five examples of this species from Antigua only, taken on June 11 and 21, and on July 1, 8 and 12. Seven of the specimens are of a distinctly testaceous tinge; all have the sanguineous band on the pronotum more or less apparent.

Vulsirea violacea var. *nigrorubra* Spinola

Plate I, Fig. 12

1837. *Vulsirea nigrorubra* Spinola, Ess. Hém., 351.
1843. *Vulsirea nigrorubra* Amyot and Servile, Hém., 143.

This most strikingly colored metallic blue and red species, of which more than fifty specimens, including nymphs in two different instars are at hand, was taken at Antigua only. The variation in coloration among this series of specimens is exceedingly pronounced, scarcely any two of the lot being marked exactly the same.

The first specimens of the species that came to my hands were secured by Prof. A. O. Thomas, the geologist of the expedition, from a spot about half way up the thickly wooded side of Monk's Hill at an elevation of about four hundred feet, June 22. On June 24 I took about twenty specimens, among them a few nymphs, from a slender, willow-like tree which, as proved later to be the case, was the same one from which the former specimens had been secured. I also took one specimen at the old fort on the summit of Monk's Hill on the same date. On July 1 two nymphs and two adults were seen on the tree visited on June 22. But one of the adults were taken, the remainder being left in the hope that their progeny might serve to augment other collections.

In the National Museum collections there repose specimens from Florida, Cuba and Trinidad. The latter is a nymph two-thirds grown.

Nezara viridula (Linnæus)

Plate I, Fig. 14

1758. *Cimex viridulus* Linnæus. Syst. Nat. (X Ed.) 444.

It was no surprise to find this cosmopolite among the Scutelleroidea on both the islands visited, and on Barbados it was surpassed in abundance only by *Edessa meditabunda*.

The shores along the west coast of this island rise in a series of terraces, each of which extends inland for approximately a half mile. Along the sides of these more or less precipitous slopes the vegetation often grows in considerable profusion for, when the rains come, the moisture is not evaporated so quickly as in the open. In addition to the present species, several other pentatomids and many kinds of plant-feeding bugs here find habitats suitable to their needs. *N. viridula* was also found on weeds and various kinds of herbage growing in other protected places, for example the sides of the terraces on the Hawkins Estate. Collecting dates: May 16, 22, 28, 29 and June 3 and 6.

Recent studies of this bug have shown that in both nymphal and adult stages it is a carrier and distributor of an internal fungous disease of the cotton boll on Barbados and neighboring islands, and it has, on this account, attracted considerable attention and study.*

This species was not by any means so abundant at Antigua and but ten specimens represent our efforts during the months spent there. Most of these were taken from grass growing in an open, swampy field near Golden Grove, June 26.

Piezodorus guildingi (Westwood)

Plate I, Fig. 13

1837. *Raphigaster Guildinii* [Westwood] Cat. Hope, Vol. i, 31.

A moderately common pentatomid in most places where we collected on both islands. It is a trimly built and very active species somewhat variable as to size, convexity and coloration. Fully colored adults are of a clear green with a narrow, reddish impunctate, or sparsely punctate band across the pronotum. Length, 8.0-10.0 mm.

The best collecting ground on Barbados was in the vicinity

* Nowell, William, West Indian Bulletin, Vol. xvi, No. 3, 1917, 203-235.

of the Hawkins Estate where both nymphs and adults were taken on several occasions during June.

Localities and collecting dates for Antigua are as follows: Monk's Hill, one specimen, June 24; Golden Grove, low-lying, uncultivated field, June 26; Falmouth, July 1; vicinity English Harbor, July 12.

The species was first described from the island of St. Vincent.

Arvelius albopunctatus (deGeer)

Plate I, Fig. 15

1773. *Cimex albopunctatus* deGeer, Mém., Vol. III, 331, Pl. 34, fig. 6.

From Barbados I have two adult males, four females and several nymphs in the third instar, all taken on the Hawkins Estate from a species of Solanum, which is common along the bluffs where some moisture is retained by the trees and vegetation. (See Plate II, Fig. 1) It appears to be an uncommon species on the island and is not found out in the dry, sun-baked fields. But two specimens, a male and a female, were taken at Antigua. I am indebted to Dr. J. C. Hutson of the Imperial Department of Agriculture for two additional specimens taken on the island of St. Vincent in November and December.

In life, the general color above is bright green, with a narrow transverse band across the anterior third of the pronotum light yellow; this color extends out over the basal portion of the humeral spines, which are tipped with green. There are a few white calloused spots on the hemelytra, scutellum and basal one-half of the pronotum, among which are sparsely placed minute black dots. My specimens show little tendency to vary in these respects. Unfortunately, the color fades on drying, when the insect assumes a yellowish green appearance, the black dots, somewhat variable in abundance, standing out rather conspicuously thereon.

This form is widely distributed in the Neotropical region, occurring from Southern United States south through Mexico and several South American states into Argentine. It is also recorded from Cuba, Haiti, Jamaica, Grenada, St. Vincent and Trinidad.

Edessa meditabunda (Fabricius)

Plate I, Fig. 16

1794. *Cimex meditabundus* Fabricius, Ent. Syst., Vol. IV, 113.
1894. *Edessa rugulosa* Uhler, Proc. Zool. Soc. London, 177.

This is the most common pentatomid on Barbados and was taken in considerable numbers on every trip. It is commonly called "Pea Chink" by the native Barbadians who, being more or less familiar with its odoriferous qualities, and upon seeing us take the bugs, frequently inquired if we intended to make medicine of them. Apparently the ill taste of certain medicines with which they were familiar was associated with the ill smell of the bugs.

On May 20 a few examples were taken from the bare hills in St. Michael's Parish, about five miles from Bridgetown. The region is very rough with some bushes, low trees and grass, but the place is so thickly populated and so closely grazed by goats and cattle that the vegetation is not profuse and plant feeding insects are not numerous.

North of Bridgetown on and near the Hawkins Estate, along sheltered terraces where rapid evaporation of the rather meager amount of precipitation is prevented, the vegetation is more profuse and this species was found abundantly in this and similar situations. In low places and small ditches grown up in vegetation over which the water flows in torrents during the rains *E. meditabunda* and many other plant-feeding insects find a plentiful supply of food. The former seemed to be especially fond of a solanaceous plant of some sort and on May 28 in six sweeps of the hand net fourteen adults and one nymph of this species were taken. Again, a little farther on, in a half dozen sweeps of the net, thirteen adults were captured.

A few examples were taken in the vicinity of Christ Church, Oistin Bay.

A deep gully along the railroad tracks about two miles out of Bridgetown, in spite of the fact that it is kept closely pastured by goats and cattle, supports an abundant vegetation. Here, on the afternoon of June 3, we took considerable numbers of the present species as well as examples of most other pentatomid species which occur on the island.

At Antigua, the species was much less common, although a

goodly number of specimens are at hand from Monk's Hill, Falmouth and vicinity.

The bug is recorded from most of the West India Islands and it also enjoys a wide distrubution in South America.

Podisus sagitta (Fabricius)

Plate I, Fig. 17

1794. *Cimex sagitta* Fabricius, Ent. Syst., Vol. IV, 99.

But a single specimen, a male collected along a protected terrace on the Hawkins Estate, came to our hands in Barbados.

In an uncultivated area northeast of the village of English Harbor, Antigua, two specimens were taken. These are our only records.

In appearance, this form resembles our northern *P. maculiventris*, but the humeri are somewhat emarginate behind and turned upward and forward a little more than in that species.

P. Sagitta has been recorded from the Amazon northward through Mexico and in Texas,, as well as generally throughout the West Indies.

Podisus fuscescens (Dallas)

1851. *Arma fuscescens* Dallas, List. Hém., Vol. I, 102.

Bue one specimen of this fine species was taken; it is a female, collected by Prof. A. O. Thomas at Half Moon Bay, six miles east and a little north of English Harbor, Antigua.

There are specimens in the United States National Museum from Costa Rica. The type specimen was taken in Mexico.

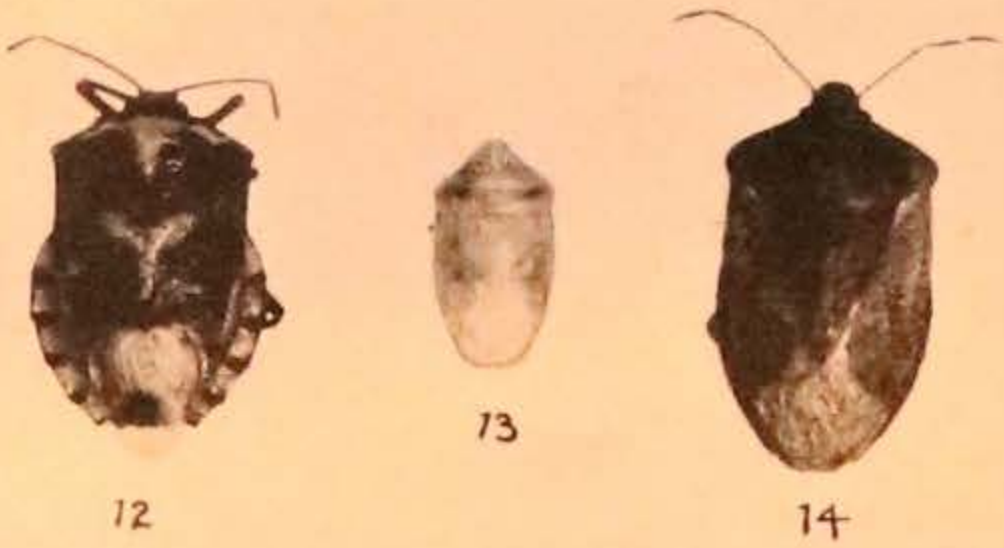
PLATES

PLATE I

Fig. 1. *Dioleus irroratus*, female
2. *Dioleus irroratus*, male
3. *Sphyrocoris obliquus*
4. *Mecidea longula*
5. *Mormidea ypsilon*
6. *Solubea pugnax*
7. *Euschistus crenator*
8. *Berecynthus delirator*
9. *Thyanta perditor*
10. *Thyanta casta*
11. *Thyanta antiguensis*
12. *Vulsirea violacea* var. *nigrorubra*
13. *Piezodorus guildingi*
14. *Nezara viridula*
15. *Arvelius albopunctatus*
16. *Edessa meditabunda*
17. *Podisus sagitta*


1
2
3
4
5
6


7
8
9
10
11


12
13
14


15
16
17

PLATE II

Fig. 1. Collecting pentatomids along protected terrace, Hawkins Estate, Barbados, B. W. I.

2. Habitat of *Mecidea longula*, old powder house in center, Point Barclay, Antigua, B. W. I.

Figure 1

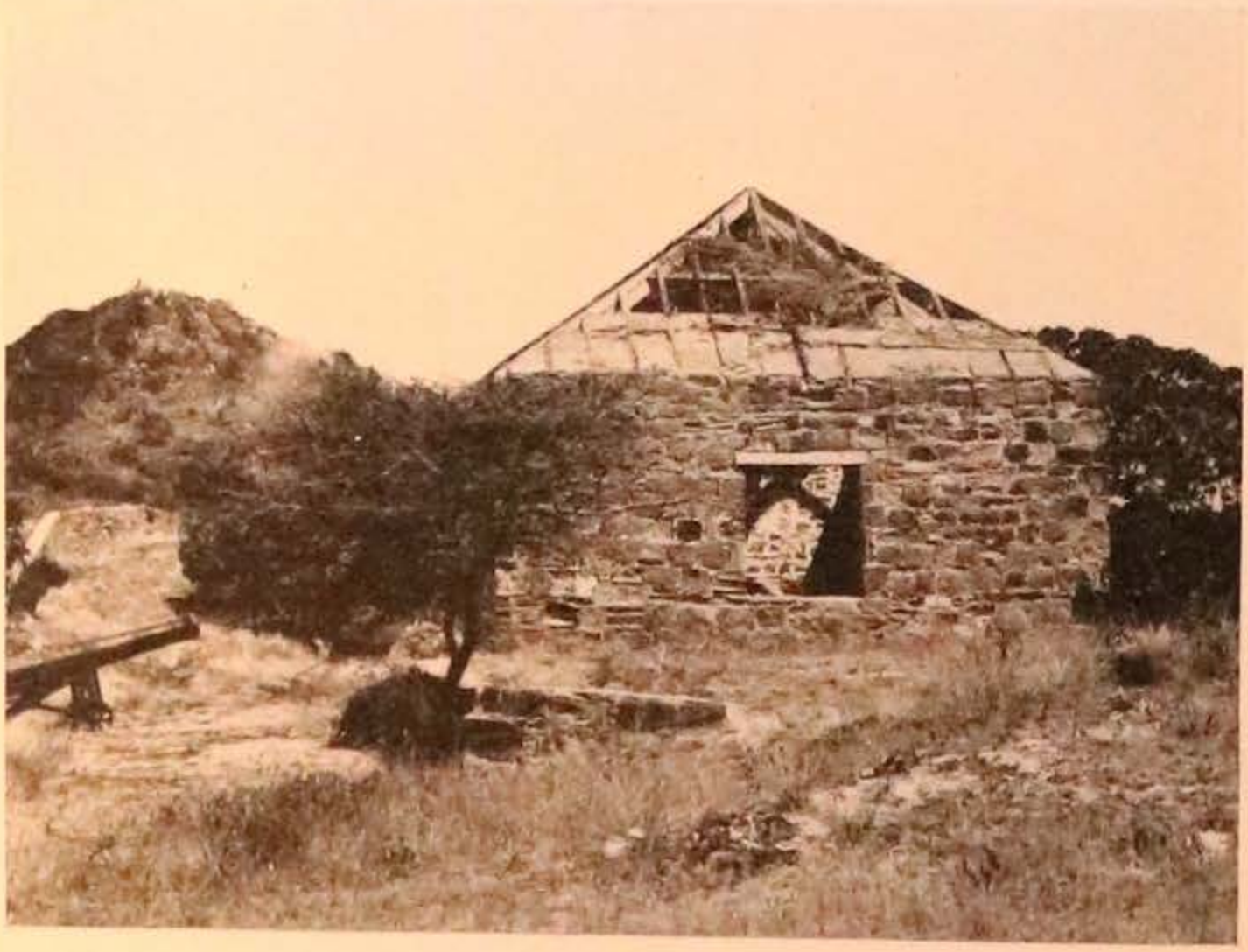


Figure 2

PLATE III

Fig. 1. Collecting grounds showing xerophytic conditions near English Harbor, Antigua, B. W. I.

2. High grassy collecting ground overlooking English Harbor, Antigua, B. W. I.

Figure 1

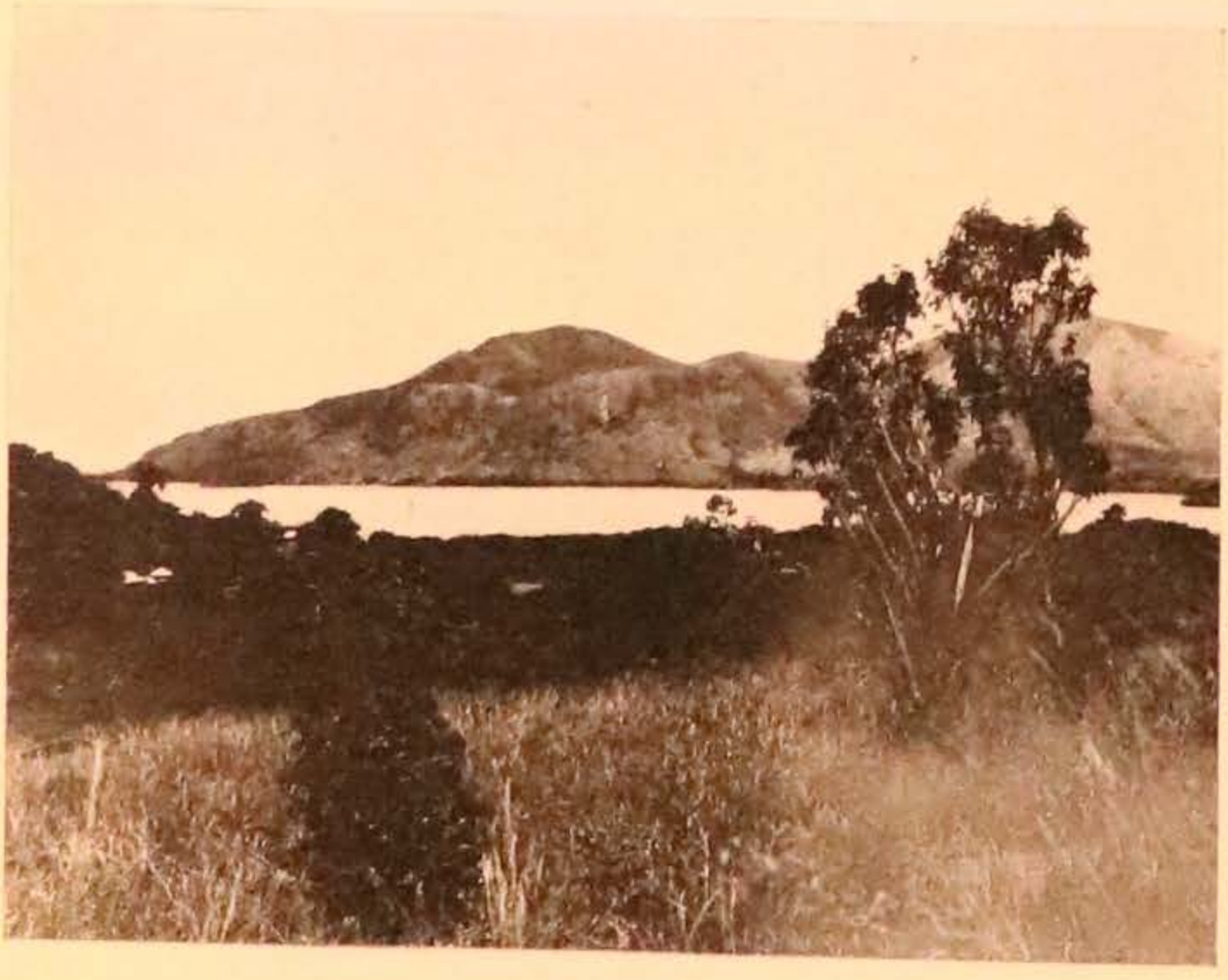


Figure 2

REPORT ON ORTHOPTERA AND DERMAPTERA

Collected by the Barbados-Antigua Expedition from the University of Iowa in 1918

A. N. Caudell

Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.

The orthopterous and dermapterous insects taken on the above expedition, sent out by the University of Iowa, were mostly collected by Prof. Dayton Stoner, who submitted them to the writer for determination and report. At first glance the collection did not appear promising, but upon more thorough examination it proved unexpectedly interesting, as will develop, the writer hopes, in the following report. Not only are there several apparently undescribed forms represented, but certain facts of geographical distribution, morphological variation, etc., have been brought out by the studies made.

By previous arrangement the material here reported upon is divided between the collection of the U. S. National Museum and that of the University of Iowa, uniques, where desired, and types of new species going to the former collection.

In the following pages the original references are quoted and also references to Kirby's *Synonymical Catalogue of Orthoptera*, published by the British Museum, where one interested may find other pertinent references. Additional references are sometimes given and the more important synonyms are enterd, with the original reference to each.

The entire collection as submitted to the writer consisted of 334 specimens comprising 31 species, distributed in the various families as follows:

Family	*No. of species*	*No. of specimens*
Forficulidæ	2	16
Blattidæ	8	50

Mantidæ	2	20
Phasmidæ	2	27
Acrididæ	7	149
Tettigonidæ	3	34
Gryllidæ	7	38
	31	334

DERMAPTERA

Family **Forficulidæ**

(The earwigs)

Genus ANISOLABIS Fieber

Anisolabis minuta Caudell

Anisobalis minuta Caud., Journ. N. Y. Ent. Soc., vol. XV, p. 168 (1907).

Borellia minuta Burr. Proc. U. S. Nat. Mus., vol. XXXVIII, p. 448, 465 (1910).

Euborellia minuta Burr. Trans. Ent. Soc. Lond., p. 180, foot-note (1910).

Euborellia minuta Rehn and Hebard, Bull. Amer. Mus. Nat. Hist., vol. XXXVII, p. 639 (1917).

Two males and four females of this small earwig were taken; one male and two females on Antigua in June and one male and two females on Barbados in May.

This species, together with the following one, as well as certain other allied forms, are by many recent writers placed in the genus *Euborellia* of Burr. This genus, however, as now characterized, rests wholly on internal characters of the male. As such characters are deemed by the writer as wholly unsuited for generic differentiation, this genus is not accepted.

Anisolabis ambigua Borelli

Anisolabis ambigua Borelli, Boll. Mus. Torino, vol. XXI, No. 531, p. 3 (1906).

Borellia ambigua Burr. Deutsch. Ent. Zeitschr., p. 325 (1909).

Euborellia ambigua Burr, Trans. Ent. Soc. Lond., p. 180, pl. XLVI, fig. 7 (1910).

Euborellia ambigua Rehn and Hebard, Bull. Amer. Mus. Nat. Hist., vol. XXXVII, p. 638 (1917).

Ten specimens of this species were taken, two males and eight females, all from Barbados in May, except one female from Antigua in June. The male from Barbados is immature.

This insect superficially very much resembles the former

species, *A. minuta*, but inspection will show *minuta* to have some antennal segments pale, the small tegmina well separated and the femora ringed with black, while in *ambigua* the antennæ are unicolorous, the tegmina overlapping and the femora more broadly blackish, less distinctly ringed.

Two other species of *Anisolabis*, *A. maritima* Linn., and *A. annulipes* Lucas, are found in the West Indies, but none appear to have been taken on this expedition.

ORTHOPTERA

Family **Blattidæ**

(The cockroaches)

Genus Blattella Caudell

Blattella germanica Linnæus

Blatta germanica Linn., Syst. Nat. ed., 12, p. 668 (1767).
Phyllodromia germanica Kirby, Syn. Cat. Orth., vol. 1, p. 87 (1904).
Blatella germanica Caudell, Proc. Ent. Soc. Wash., vol. v. p. 234 (1903).
Blatta bivittata Serv., Ins. Orth., p. 108, (1839).
Blatella bivittata Caudell, Journ. N. Y. Ent. Soc., vol. xii, p. 183 (1904).
Blattella bivittata Hebard, Mem. Amer. Ent. Soc., No. 2, p. 57 (1917).

A single specimen, a male, of this cosmopolitan house roach was taken on Barbados on May 16. No notes accompany the specimen, but it may be safely assumed that it was taken indoors.

Genus Symploce Hebard

Symploce capitata Saussure

Blatta capitata Sauss., Rev. Mag. Sool. (2), vol. xiv. p. 167 (1862).
Ischnoptera capitata Kirby, Syn. Cat. Orth., vol. 1, p. 82 (1904).

Two female specimens of this roach are in the collection, both from Antigua and are very surely among the ones referred to in a manuscript note by Prof. Stoner as finding a safe and cool retreat among small epiphytes, resembling small pineapples, growing on trees in a wooded portion of Monk's Hill. This note is quoted at the end of the Blattidæ.

Genus Periplaneta Burmeister

Periplaneta americana Linnæus

Blatta americana Linn., Syst. Nat., ed 10, p. 424 (1758).
Periplaneta americana Kirby, Syn. Cat. Orth., vol. 1, p. 140 (1904).

Represented by a single specimen, a male from Barbados, taken

in June. The species noted under this name by Prof. Stoner in Canadian Entomologist, vol. LI, p. 217 (1919) were, at least for the most part, the *P. brunnea* listed below.

Periplaneta australasiae Fabricius

Blatta australasiae Fabr., Syst. Ent., p. 271 (1775).
Periplaneta australasiaes Kirby, Syn. Cat. Orth., vol. I, p. 141 (1904.)

One male and two females were taken by Prof. Stoner on Barbados, one being labelled "Pelican Island."

Periplaneta brunnea Burmeister

Periplaneta brunnea Burm., Handb. Ent., vol. II, p. 503 (1838).
Periplaneta brunnea Kirby, Syn. Cat. Orth., vol. I, p. 142 (1904).
Periplaneta truncata Krauss, Zool. Anz., vol. XV, p. 165 (1892).

This large brown roach is represented by three adult, one male and two female, and three immature specimens all taken on Barbados, the male and the nymphs on Pelican Island.

Hebard, Mem. Amer. Ent. Soc., No. 2, p. 178-188 (1917), treats the above species of *Periplaneta* very fully, and on pages 14 and 20 of the same publication keys for their separation will be found.

Genus EURYCOTIS Stal

Eurycotis similis n. sp.

Specimens representing both sexes of a roach referable to the genus *Eurycotis* were taken on Antigua, which, while apparently related to certain variegated forms of that genus, as the *decipiens* of Kirby, do not agree sufficiently well with any described species, either of *Eurycotis* or the closely allied *Pelmatosilpha*, to be considered identical with any of them. This species is accordingly here characterized as new.

Description.—Size medium for the genus. Head not quite hidden beneath the pronotum; color yellow with three transverse black bands of various widths, one vertical, one betwen the antennæ and one between the last and the base of the clypeus, the last often somewhat narrower than the others, the vertical and interantennal bands rarely more or less interrupted mesially, the lower bar turning up laterally along a deep lateral facial fold to almost meet the lower edge of the eyes; eyes ashy gray, narrow, reniform, separated by a space a little broader than that between th antennal scrobes; ocelli obscure, subcutaneous; antennæ much longer than the body, uniformly dark reddish brown.

Pronotum truncate posteriorly, where it is somewhat broader than the

length; color bright yellow with a very narrow piceous margin all around, broader posteriorly and with a conspiculus crescent-shaped black area on the anterior two-thirds which reaches the anterior margin of the disk; meso- and metanotum yellow. Organs of flight abbreviated as in all species of the genus; tegmina subquadrate, just barely longer than the pronotum and overlapping somewhat when closed, the apical margin truncate with rounded angles; color yellow with the anal margin a little infuscated, that of the right one with a very distinct longitudinal submarginal stripe limiting that portion covered by the left tegmina when closed; wings shorter than the tegmina, folded once longitudinally when at rest.

Legs short and moderately stout; trochanters, coxæ and femora mostly yellowish or yellowish brown, the femora with dark spines and the trochanters lined basally with black; anterior and intermediate tibiæ and tarsi yellowish brown, the posterior ones darker, all with blackish spines; all femora armed beneath on both margins with several stout spines, the anterior ones with 8 to 11 and two longer apical ones on the anterior margin and four on the posterior margin; tarsi with conspicuous, usually light colored, pulvulii and with very large and thick apically truncate arolia.

Abdomen heavy, black in color, with the basal five or six segments marked above and below with a small lateral yellow spot and the basal dorsal segment partly yellowish on the basal half or more; supraanal plate fully twice as long as broad in the male, less than twice as long as broad in the female, the posterior margin broadly notched, more roundly so in the female; subgenital plate of the male about four times as broad as long, the basal width being about equal to the apical width of the preceding segment of the abdomen; apical margin almost straight, notched at each side at the point of origin of a pair of strong apical styles, which are gradually pointed and about five times as long as the basal width; subgenital plate of the female with the valves occupying over one-half their length and terminating at a deep transverse incision, the valvular area very distinct from the broad basal portion by reason of the lateral margins of the valvular portion being turned under so as to almost meet, forming a chitinized triangular funnel, the inner side of which is divided by two submesial longitudinal membraneous partitions, the base of the channel thus formed having a covering of very fine yellow hair of considerable length on the surface formed by the plate, and some similar but shorter hairs outside this channel on the undersurface of the plate itself, and the entire surface, the outer walls of the membraneous channel and all, with numerous short and very small, but sharply pointed, tubercles.

Cerci broad and short, but moderately surpassing the supraanal plate, especially in the female, and consisting of about ten segments, all of which are transverse except the apical one which is slightly elongate and sharply pointed.

Concealed genital organs: The genital chamber[1] of the male has what appears to be a rather complete and fully chitinized armature, consisting of various plates, spines and projections. The sinistral hook, fig. 1, a, is a

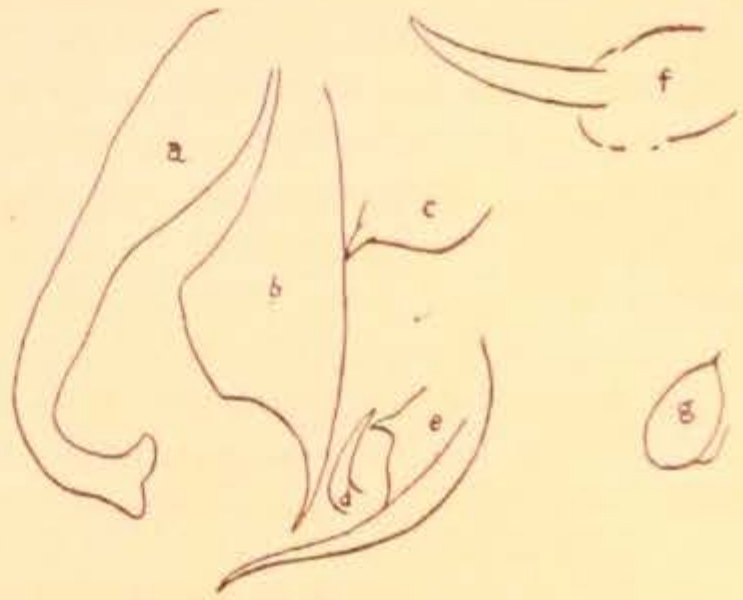


Figure 1

rather slender projection with the basal half broadly flattened vertically, thence but slightly flattened and gradually tapered to a more flattened, apically incurved and briefly furcate tip; this hook very likely projects somewhat, the tip not being wholly concealed within the chamber. Partly overlying the sinistral hook basally is a laterally broadly flattened projection, gently twisted inwards, the outer surface convex and the inner surface concave and the upper apical margin prolonged and narrowed to form a sharp, slender spine extending to about the apex of the sinistral hook; this organ is illustrated at Fig. 1b. To the right of the last noted organ, and at about the middle of its length, is a thick subquadrate apically

1. The taxonomic importance of the concealed genital organs of roaches, especially of the males, is becoming more appreciated, and the use of such characters has been encouraged by the recent studies of Mr. Hebard, who has introduced a few special terms for certain of these organs. The three following are now in use, and their significance is as follows:

Genital chamber. The space between the subgenital and supraanal plates in which are contained the concealed genital organs. By cutting transversely along the base of the subgenital plate with a sharp scalpel or fine pointed scissors, that plate may be, in fresh or alcoholic speciments, laid over sideways, preferably to the right, or the left as the roach lies on the back; the incision at the base of the plate is not made quite across the entire width, thus leaving a small portion to act as a hinge when it is laid over.

Sinistral genital hook. A more or less slender, often incurved, organ projecting more or less conspicuously on the left side of the genital chamber of the male, usually wholly concealed before the subgenital plate is laid over, but sometimes projecting somewhat beyond that plate. There is much variation in the shape of this hook, as will be seen by the figure 1 of the present report and figures on plate ix of Hebard's work on the United States Blattidæ in Mem. Amer. Ent. Soc., No. 2.

Dextral genital hook. A usually more or less thickened broad plate lying in the right side of the genital chamber of the male, also variable in shape. Illustrations of those of *Arenivaga* sps. will be found on the above mentioned plate by Hebard.

Some roaches, the new *Eurycotis* here described being a good example, have various other very remarkable chitinized spines, spurs, plates, etc., and eventually a number of various terms will be necessary for their proper designation. More extensive com-

chitinized piece with the left hand apical part forming a short, sharp, apically slightly decurved tooth, Fig. 1c. Below this last described piece, projecting from a fleshy base, is a sharp upwardly directed chitinized spine, Fig. 1d, and to its right lies a large basally folded plate, fully chitinized, and with the rgiht portion developed into a very long, sharp and slender sinuate spine, directed caudad and to the left, and extending out fully as far as the tip of the sinistral hook; Fig. 1e shows this structure, and illustrates, as well as may be, how the chitinized base forms on the left a blunt tooth-like projection, but does not show the deep transverse folding. Far back in the right hand side of the chamber is seen a long, slender, recurved, fully chitinized, cycle-like blade curving to the left near the dorsal wall of the chamber and apparently arising from a fleshy unchitinized base of considerable size; this is the dextral hook and is shown at Fig. 1f. Below the base of the above noted appendage there is a large, thick, apically truncate, partly chitinized mass, as roughly indicated from an apical view at Fig. 1g. The unchitinized or partly chitinized portions of the genitalia, as noted above, may be noticeably different in fresh specimens, but the chitinized portions, so far as visible and here described, will probably prove stable, though more of them may possibly be found if fresh or alcoholic material be more thoroughly dissected, as they may lie wholly concealed by tissue.

In the genital chamber of the female we see the six valves of the ovipositor grouped about the middle of the chamber, and on either side of the ovipositor is a thin, horizontal, bluntly subtriangular plate with the surface sparsely covered with coarse short bristly spinules; above the back of these plates and extending to the base of the ovipositor are thick chitinized areas of definite shape.

Measurements.—Length, entire insect from front of head to tip of supraanal plate, ♂, 29 mm., ♀, 25 to 29 mm.; pronotum, ♂ 8 to 9 mm.; tegmina, ♂ and ♀, 9 mm.; width, pronotum at hind margin, ♂ 11 mm., ♀ 11 to 12 mm.; tegmina at middle, ♂ 8 to 9 mm.

Type ♂, Antigua, June 29, 1918; allotype, ♀, same data as the type; paratypes a, b, and c, adult ♀ ♀, a and b same data as types and c dated July, and d, e and f, ♂ nymphs, same data as type.

Type, allotype and paratypes c and d in collection of the United States National Museum, the rest of the material in the University of Iowa.

Catalogue No. 25141 U. S. N. M.

---

parative studies of different genera and groups is desirable, however, before attempting to formulate a satisfactory terminology.

The genital chamber of the female, so far as now known to the writer, contains no such complicated structures as found in the males. In the chamber of the female is found a rudimentary ovipositor consisting of six grouped valves, short and not, or but little chitinized, extending out from the posterior portion of the cavity and there may be on each side of this ovipositor a broad partly chitinized plate. On the inner surface of the subgenital plate, and thus in the genital chamber, there may be a channel formed by longitudinal partitions, as described herein under *Eurycotis similis*. But in no species examined have I found chitinized organs corresponding to the genital hooks and other fully chitinized structures of the male.

Genus Pycnoscelus Scudder

Pycnoscelus surinamensis Linnæus

Blatta surinamensis Linn., Syst. Natur., ed. XII, p. 687 (1767).
Leucophaea surinamensis Kirby, Syn. Cat. Orth., vol. I, p. 151 (1904).
Pycnoscelus surinamensis Hebard, Mem. Amer. Ent. Soc., No. 2, p. 193, pl. VIII, fig. 1 (1917).

This cosmopolitan roach, which has a number of synonyms recorded in literature, is represented in this collection by thirteen specimens, six adults and seven nymphs of various sizes, all females. Two of the adults are from Antigua, the others from Barbados.

This species, the males of which are extremely rare, has been recorded from various of the West Indian Islands and is a roach quite generally met with throughout the warmer regions of the world.

Genus Hemiblabera Saussure

Hemiblabera granulata Saussure

Hemiblabera granulata Sauss., Soc. Ent., vol. VII, p. 68 (1893).
Hemiblabera granulata Kirby, Syn. Cat. Orth., vol. I, p. 166 (1904).
Hemiblabera granulata Sauss. and Zehnt., Biol. Cent. Amer., Orth., vol. I, p. 122, plate V, fig. 21 (1894).

Sixteen specimens of a roach which I refer to this species were taken by the expedition, four adult and two immature males and nine adult and one immature females, all from Antigua on the 24 and 29 of June.

The above specimens agree too well with the description of *granulata* to allow of their being considered other than that species, in spite of their occurrence so far from the type locality, which is given in the original diagnosis as merely "Mexico." But in the following year, Biol. Cent. Amer., Orth., vol. I, p. 122, the more exact locality "La Antigua in Vera Cruz" is given. The type is said to be in the Geneva Museum, but how many specimens there were is not recorded.

The male of this species appears to be as yet undescribed. This sex may be easily distinguished from the female, not by the number of abdominal segments, which appear to be the same in both sexes, but by the generally, but not invariably, smaller size of the male and by the subgenital plate, which is in the female almost as broad basally as the apical width of the preceding

segment while in the male it is but little more than one-half as broad. In the male there is also a small slender apical style on each side of the subgenital plate near the circus; in the female there are no such styles. There are other external differences and the concealed genital structure differ greatly.

In the genital chamber of the male there are a number of chitinized or partly chitinized structures, the most conspicuous of which are the following: On the right hand side of the chamber, and situated high up near the supraanal plate is a yellow subchitinized organ shaped as in fig. 2, the pointed end directed

Figure 2

to the left and upwards, the basal portion roughly subtriangular in section and the curved horn-like extremity subcylindrical; anterior of the above noted organ and slightly nearer the median line, and so far back as to arise almost beneath the preceeding ventral segment of the abdomen and easily escaping notice if but casually examined, is a piceous, fully chitinized, upwardly and outwardly curved object, laterally somewhat flattened, the apex bifurcate, each branch flattened and apically rounded, the lower one about one-half as long as the upper one. In the center of the chamber is an unchitinized rounded flap apically bearing several stout, acutely triangular and laterally flattened teeth, and above it, lying between it and the dorsal wall, is a black chitinized organ consisting of a sort of obtuse V-shaped piece, the closed end directed caudad, the left arm very broad and so closely attached to the fleshy flap beneath it as to appear but a narrow strip unless elevated especially for examination; the right arm is apically free, forming a rounded, slightly recurved club-shaped appendage. In the left side of the chamber, and well back, is an apically rounded, slightly chitinized flap, the basal portions, so deeply embedded in tissue as to be difficultly seen, showing some more fully chitinized margins and may terminate further back in a long spine, or other appendage, though no such is to be seen in moderate dissections. The thickened and chitinized upper margins of the chamber and the inner

apical margin of the subgenital plate bear bristly hairs. No attempt is here made to suggest homologies for the male genitalia as above described.

In the female we find in the genital chamber but a single noticeable organ, which is the rudimentary ovipositor consisting of six short, unchitinized appendages grouped compactly and attached near the upper wall in the middle of the chamber; these ovipositor valves are probably naturally directed caudad, but in several specimens, in which fully formed but unoxydized ootheca filled the cavity, they are directed diagonally backwards towards the head, or cephalad; the valves are finger-like and somewhat foot-shaped apically, at least one pair, the lower and largest ones, the others being somewhat shorter and more evenly rounded apically. Hebard, Mem. Amer. Ent. Soc., No. 2, p. 284, plate x, fig. 16 (1917), calls this the concealed ovipositor; it is somewhat remindful of the external, but abortive, ovipositor in *Stenopelmatus* and *Anurogryllus*. If these valves are directly concerned with oviposition, the eggs must be immediately arranged in the simultaneously forming ootheca, which is, at least in the females of the present species containing them, extended back into the abdominal cavity as successive lots of eggs are added, the completed ootheca almost completely filling the body cavity, the end near the tip of the abdomen only in juxtaposition with the ovipositor. This seems to show that the ootheca is formed completely within the body before it commences to be ejected, and that the end first appearing when deposited is the one last formed, just the opposite of what the writer had supposed the facts to really be.

The range of measurements represented in the material of the roach now under consideration is as follows: Total length, front of head to tip of supraanal plate, ♂, 28 to 32 mm., ♀, 31 to 37.5 mm.; tegmina, ♂, 6.5 to 8 mm., ♀, 7 to 8 mm.; width of pronotum posteriorly, ♂, 14.5 to 17 mm., ♀ 15 to 20 mm.

The following manuscript note by Prof. Stoner very surely refers to this species:

"Antigua, June 29, 1918. Found many specimens of a large brachypterous cockroach under rotten logs near a small fresh water pond about a mile from the dockyards." In a published note, Can. Ent., vol. LI, p. 217 (1919), the immediate environ-

ment of this roach is said to be in "low wooded areas, under dried leaves."

The following note by Prof. Stoner is interesting as bearing on the habitat of roaches, but unfortunately the species concerned are not specified:

"Antigua, June 24, 1918. Monk's Hill. On the wooded portion of this hill the trees are, in many places, quite close together; on these trees there grow small epiphytes looking something like small pineapple plants. These 'wild pines,' as they are called, hold water and moisture and insects of various kinds, among them cockroaches, find here a cool and safe retreat."

Family **Mantidæ**

(The rearhorses)

Genus Musonia Stal

Musonia surinamus Saussure

Thespis surinama Sauss., Mitth. Schweiz. Ent. Ges., vol. III, p. 70 (1869).
Mionyx surinamus Kirby, Syn. Cat. Orth., vol. I, p. 277 (1904).

This species, the correct generic assignment of which is as above, is represented in the collection by five specimens, one male and four females, all mature and collected on Barbados, the male without further data, one female taken in May and the others on May 14 on Pelican Island. The male agrees very exactly with a specimen of the same sex from Trinidad.

The following manuscript note by Prof. Stoner refers to this species:

"Barbados. Hawkins Estate. Heavy showers last few days have freshened vegetation and in low places took small green long-horned grasshoppers and *Mantis* sp. (?) juv."

Genus Thesprotia Stal

Thesprotia subhyalina Saussure

Oligonux subhyalina Sauss., Mitth. Schweiz. Ent. Ges., vol. III, p. 239 (1870).
Thesprotia subhyalina Kirby, Syn. Cat. Orth., vol. I, p. 277 (1904).

Fifteen specimens, one adult male, seven or eight adult females and the rest nymphs of various stages and representing both sexes, taken on Antigua in June are referred to this species. In the collection of the National Museum is a male of this species

from Trinidad, a region between the type locally and that at which the present specimens were taken.

The tip of the long abdomen of this slender insect is very often broken off, as are those of the greater majority of specimens in this lot from Antigua. This loss must have been suffered either before collection or at that time, as the material was collected in spirits and remained unmounted until studied.

Material other than the above, not submitted to the writer, but presumably representing the same species, must have been taken as indicated in the following note by Prof. Stoner:

"Antigua, July, 1918. Hills and valleys, vicinity of English Harbor (village). A small grouse locust was taken in a low place near the main road, the first taken. Now and then a Mantis is taken and three species of Acridiids were taken in this situation." The mantids mentioned in this note may, however, refer to the specimens taken the preceding month.

Family **Phasmidæ**

(The walkingstick insects)

Genus CLONISTRIA Stal

Clonistria linearis Drury

Mantis linearis Drury, Ill. Nat. Hist., vol. I, pl. L, fig. 3 (1773).

Bacteria linearis Westwood, Drury's Ill. Nat. Hist., vol. I, p. 123, pl. L, fig. 3 (1837).

Clonistria linearis Kirby, Syn. Cat. Orth., vol. I, p. 351 (1904).

Pseudobacteria longiceps Kirby, Ann. Nat. Hist., (6), vol. III, p. 503 (1889).

Of this species there are twenty-six specimens in the collection, ten male and six female adults and ten nymphs of various sizes from Antigua, and one small nymph from Barbados without date. The material from Antigua was taken in June except two females which were taken on July 10 and 15.

Linearis was described and figured originally from a male specimen collected on Antigua. From that description and the accompanying little detailed figure it is difficult to make out the differentiating characters now in use. That they represent the species under consideration is fairly certain, however, since the present material is from the type locality, and the males agree very well with the original description and figure.

Whether or not the allied forms described by Stal and Bruner under the specific names *bartholomaea* and *sanctae-luciae* are specifically distinct is doubtful. That one of them, at least, is synonymous with Drury's species is very probable, since Bruner separates the females of both those forms diagnostically from *linearis* (which he places doubtfully as a synonym of *bartholomaea*) by the character of the operculum not exceeding the apex of the abdomen, a character certainly belonging to the females of *linearis* in the present collection. *Linearis, bartholomaea, guadeloupensis* and *sanctae-luciae* may all represent one and the same species, or each may be specifically distinct. Before this question can be decided definitely more material from regions occupied by them should be available for study, and the types of each should be seen where possible. As a commencement of the task of clarifying these matters a complete description of *linearis* as represented by the present topotypic material would have been drawn up except for the fact that all the specimens were preserved in spirits and were so shrunken and distorted in drying as to be rendered unsatisfactory for accurate description.

The following note by Prof. Stoner evidently refers to this species:

"Antigua, June 21, 1918. Vicinity Dockyards, English Harbor. Vegetation extremely xerophytic on the surrounding hills with many harsh spiny plants. In such situations collected several walking-sticks (the natives call them god-horses); a large *Schistocerca* (?) and a small Acridiid were also taken."

Clonistria sp.

There is a single female, apparently adult, in the collection bearing the same label as most the specimens of the species noted above, that is, Antigua, June, 1918, which is structurally very like *linearis*, but the head lacks the dark postocular stripes and the general color is darkened by many very small black dots and dashes. The slightly wrinkled appearance of the entire surface of the head, thorax and abdomen above and below is due to the coloration. This specimen may represent a new species, but is more likely one of the several allied forms occurring in the West Indies.

Family **Acrididæ**

(The shorthorned grasshoppers)

Genus Micronotus Hancock

Micronotus quadriundulatus Redtenbacher

Tettix quadriundulatus Redt., Proc. Zool. Soc. Lond., p. 208, pl. xvi, fig. 10 (1892).

Micronotus qadriundulatus Kirby, Syn. Cat. Orth., vol. iii, p. 53 (1910).

One dozen specimens of this tiny grouse locust were taken as follows: two males and one female on Antigua, one male on July 12, the others in June, but without other data; two males, six adult and one immature female from Barbados, all on May 16, except one pair in June.

This species was described from St. Vincent and has since been recorded from Haiti, Trinidad and Grenada. The dorsal undulations of the thorax are very distinct in some of the females and rather obscure in most males.

Genus Amblytropidia Stal

Amblytropidia stoneri n. sp.

Nine male and one female adults and an immature pair of a species of *Amblytropidia* collected on Antigua in June and July appear to be undescribed and are here dedicated to Prof. Dayton Stoner, the genial entomologist of the expedition and the collector of the specimens. It is a very distinct species running to *australis* in Bruner's keys in Biol. Cent. Amer., Orth., vol. ii, p. 62 (1904) and Proc. U. S. Nat. Mus., vol. xxx, p. 630 (1906). As a matter of fact it runs out in those keys to *australis* far better than does that species itself, to judge from a single female specimen of *australis* from Paraguay in the collection of the National Museum. In this female of *australis*, determined by Prof. Bruner, the median carina of the vertex is scarcely as prominent as in the United States species *occidentalis;* in the species here described this carina is decidedly more prominent than in either *australis* or *occidentalis.*

The abbreviated organs of flight will serve for the easy differentiation of this species from allied forms.

Description.—Male: Head scarcely ascending, barely if at all elevated above the level of the pronotum; fastigium of the vertex beyond the narrowest point about twice as long as broad, apically, narrowly rounded

with distinctly elevated margins and a very strong median carina, which, however, fades out before extending over much more than half the length of the occiput; frontal costa narrowed slightly mesially and sulcate almost to the clypeus and very nearly to the point of mergence with the fastigium; eyes about twice as long as the greatest width, narrowing apically, the anterior border almost straight; antennæ scarcely longer than the head and pronotum together and noticeably flattened, especially basally, where several of the segments are somewhat broadened. Pronotal disk truncate anteriorly, obtuseangulate posteriorly and with persistent and well elevated median and lateral carinæ, the latter almost parallel and the median carina severed by two transverse sulci, the posterior one of which is situated behind the middle; lateral lobes slightly longer than high, the lower margin slightly rounded and very gently ascending anteriorly, the anterior and posterior margins diverging upwardly, the anterior margin decidedly more so than the posterior one; prosternum with a flat subquadrate plate; mesosternal interspace subquadrate, that of the matasternum closed posteriorly.

Legs rather slender; posterior femora regularly but not very noticeably marked on the outer face by diagonal concolorous ridges meeting on the median line to form basally directed obtuse angles; apical angles rounded, the genicular angles acuteangulate; posterior tibiæ with from eleven to twelve spines on the outer superior margin, the opposite margin with eleven spines besides the two longer apical calcars.

Organs of flight decidedly abbreviated; tegmina not much exceeding the pronotum in length and leaving a fourth or more of the abdomen exposed; the shortening of the tegmina is due apparently to a reduction of the apical portion, which results in the intercallary area, with its rather distinct intercallary vein, extending almost to the tip of the tegmen; humeral area only very moderately expanded and furnished with somewhat regularly disposed subparallel transverse veins; costal area broad and extending the entire length of the tegmen and with irregular subparallel diagonal veins; the ulnar veins of the tegmina are stout and separated for about their basal third or half, beyond which point they are fused, the space between their separated bases forming a rather noticeable area; wings about one-half as long as the tegmina, but well formed and with distinct venation, the anal and middle areas folding fan-like when closed.

Abdomen moderately slender and dorsally subcarinate; supraanal plate elongate-triangular, the sides straight, dorsally longitudinally shallowly sulcate mesially between two low ridges, the lateral margins elevated slightly, especially basally, where the plate is laterally compressed to form a small lateral oval area; subgenital plate much elongated, somewhat narrowly pointed and extending considerably beyond the supraanal plate and cerci; cerci simple, but little over twice as long as broad, very slightly flattened and tapering to a moderately sharp point.

General coloration wood-brown; eyes generally slightly darker than the general color; disk of lateral lobes, especially in the upper portions, a post-

ocular stripe on the side of the head, the anterior longitudinal half of the tegmina on its basal half or more and the upper half of the outer face of the posterior femora sometimes darker than the general coloration, but this is not at all a constant character, those portions enumerated often being but little contrasted with the rest of the insect's coloration; the tips of the posterior femora are very constantly fuscous and the spines of the legs are piceous in the apical half.

Female: Very like the male moth structurally and in coloration, and in the latter respect would very surely exhibit about the same range of variation as described above in the case of the males were more specimens available for examination. The unique specimen before me, however, has the sides of the head, the lateral lobes of the pronotum and the outer face of the posterior femora of a uniform light green, the femora apically darker. The sternal interspaces no broader than the males. Antennæ noticeably shorter than in the male. Organs of flight very like those of the opposite sex, but slightly shorter as compared with the pronotal length. Ovipositor with the upper scoops somewhat longer than the basal depth, the superior margins unarmed, the tips curved somewhat upwards.

Measurements: Length, pronotum, ♂, 4 to 4.75 mm., ♀, 6 mm.; posterior femora, ♂, 11.5 to 13 mm., ♀. 17 mm.; tegmina, ♂, 8 to 9 mm., ♀, 9.5 mm.; antenna, ♂, 8 to 8.5 mm., ♀, 8 mm; width, pronotum across the posterior part of the disk, ♂, 2 to 2.25 mm., ♀, 3 mm.; tegmina, spread, at widest point, ♂, 2.25 mm.,

Type, male, Antigua, June 24; allotype, female, same locality, July 5; paratypes a to h, males, same locality, a and b on June 24; c, June 26; d to f, July; g, July 1; h, July 5; paratypes i and j, nymphs, i, male j, female, both same locality in June.

Type, allotype and paratypes a, b, g and i in collection United States National Museum, the remainder of the material in the collection of the University of Iowa.

Catalogue No. 25140 U. S. N. M.

This species may be the one recorded from the nymph only by Prof. Morse, Psyche, vol. XII, p. 19 (1905), from the Bahamas as *Amblytropidia* sp.

Genus ORPHULINA Giglio-Tos

Orphulina balloui Rehn

Orphulella balloui Rehn. Ent. News, vol. XVI, p. 178, pl. VIII, fig. 2, 3 (1905).

Orphulina balloui Kirby, Syn. Cat. Orth., vol. III, p. 118 (1910).

A large sires of this species was taken, 25 male and 16 female adults and one male and three female nymphs on Barbados in May and June, the only day dates noted being June 15 and 16. The two nymphs, one small one and one an apparently full

grown pupa ready for final transformation, were labelled merely "May," as were about one-half of the adult specimens. A single specimen, a female, was of the green phase of coloration.

This species superficially resembles the following one, but it is really very distinct specifically. Generically it is not so well differentiated, though the characters enumerated by the author of the genus, Boll. Mus. Torino, vol. IX, No. 184, p. 9 (1894), for the separation of these two genera are amply sufficient for the purpose, though there is some variation in the width of the mesosternal interspace. The antennal length, etc., as used by Bruner in Biol. Cent. Amer., Orth., vol. II, p. 30 (1902) are not nearly so diagnostic as those used by Gigilo-Tos, especially the more elongate mesosternal interspace, longer head and more persistent frontal costa in *Orphulina*.

Genus ORPHULELLA Giglio-Tos

Orphulella punctata DeGeer

Acrydium punctatum DeGeer, Mem. Ins., vol. III, p. 503, pl. XLII, fig. 12 (1773).

Orphulella punctata Kirby, Syn. Cat. Orth., vol. III, p. 121 (1910).

Twelve male and seven female specimens of this common and widely distributed species were taken on Antigua, labelled datically as follows: one male, June; one male and two females, June 24; two females, June 26; seven males and three females, July; two males, July 1; one female, July 5.

Three females only are green, all the rest being of the brown phase of coloration.

Genus SCHISTOCERCA Stal

Schistocerca columbina Thunberg

Gryllus columbinus Thunbg., Mem. Soc. Petersb., vol. IX, p. 399, 425 (1824).

Schistocerca columbina Kirby, Syn. Cat. Orth., vol. III, p. 455 (1910).

This locust is represented in the collection by a series of nine male and eight female adults and two male nymphs which are probably this species, all taken on Antigua, one female on June 21, three pairs on June 24, four males and three females on June 26, two males and one female on July 1 and the nymphs in June, the day not stated.

This series shows very little variation. The maculation of the

tegmina varies somewhat in distinctness and the general coloration of some specimens is lighter than in others. The pronotal disk is usually unicolorous, but sometimes there is present an obscure posteriorly narrowing longitudinal lighter streak; lateral lobes unicolorous or the lower portion slightly lighter, and a slightly darkened area mesially on the anterior portion of the lobe. The sides of the head have a blackish subocular stripe much less conspicuous than in *pallens*. The posterior femora are usually white on the outer face, but rarely they are brown, similar to the general coloration. The pronotal disk is acute posteriorly, but there is some slight variation in this respect.

Schistocerca inscripta Walker

Cyrtacanthacris inscripta Walk., Cat. Derm. Salt. Brit. Mus., vol. III, p. 550 (1870).

Schistocerca inscripta Kirby, Syn. Cat. Orth., vol. III, p. 455 (1910).

Three males and two females of this species were taken by the expedition, all from Antigua, the females on July 3 and the males on July 1, 5, and 10.

This species resembles *americana*, but is noticeably smaller; it may eventually prove to be but a smaller form of that widely distributed species. These Antiguan specimens agree with ones from Jamaica, the type locality. Some variation is noticeable in the clearness of tegminal maculation and also in the variegation of the lateral lobes of the pronotum.

Schistocerca pallens Thunberg

Gryllus pallens Thunbg., Mem. Acad. Petersb., vol. V, p. 237 (1815).

Schistocerca pallens Kirby, Syn. Cat. Orth., vol. III, p. 460 (1910).

A fine series consisting of 22 males and 13 females, also two large female nymphs probably of this species, were brought back by the expedition. One male comes from Antigua, taken July 12, and all the rest are from Barbados, 15 males and 8 females on June 16 and the rest with only the month date of June and a single pair taken in May.

This species seems very uniform in having the costal area of the tegmina immaculate; the clearness of tegminal maculation varies somewhat, but here, too, the variation is slight. The marking of the pronotum, however, is decidedly variable, especially on the disk where the color ranges from a wholly unicolor-

ous brown to a very conspicuous longitudinal yellowish stripe; the lateral lobes are mesially marked with blackish, which mark is unicolorous, or with a central white streak; the vertical subocular black streak is a constant and conspicuous feature of the coloration.

It appears probable that a number of specific names will eventually fall into synonymy under *pallens* when a thorough revision of the genus is made. Scudder, in his revision of 1899, Proc. Amer. Acad. Arts and Sci., vol. XXXIV, p. 441-476, refers with a query the species *cubensis* Sauss. and *pectoralis* Walker, to the synonymy under this species, but Kirby, in his recent catalogue, lists *cubensis* as a distinct species and places *pectoralis* in synonymy under a name still older than *pallida*, the *rustica* of *Fabricius*. A thorough revision of this genus, based on a study of typical material so far as possible, is much to be desired.

Notes made by Prof. Stoner in Barbados under dates of May 15, 16, 20 and 22 refer wholly or in part to *pallens*. These notes are here copied verbatim:

"*Barbados.*

15 May, 1918. Found large grasshoppers *(S. pallens)* and the field cricket *(G. assimilis?)* not uncommon in the small cane fields and grassy plots in the suburbs of Bridgetown.

16 May, 1918. On high land out Hastings Way about 4 miles from Bridgetown sour grass is grown abundantly and in these fields *S. pallens* was abundant, though exceedingly wary and difficult to catch. The insects are protectively colored; rise up again quickly after alighting if they are pressed; if they alight, crawl for some distance in the under grass before flying again. When secured in the net will leave it like a shot if the opening is not kept closed.

These dry uplands furnish a few conocephalids and also some *O. balloui.* in low places around ponds or along the few small open streams found a few green long-horned grasshoppers.

20 May, 1918. Even on the bare, dry hills heavily pastured by goats and cattle *S. pallens* was not uncommon. (St. Michael's Parrish).

22 May, 1918. Hawkins Estate. *S. pallens* common on high, dry hills."

Family **Tettigonidæ**

(The longhorned grasshoppers)

Genus NEOCONOCEPHALUS Karny

Neoconocephalus guttatus Serville

Conocephalus guttatus Serville, Ins. Orth., p. 518 (1839).

Conocephaloides guttatus Kirby, Syn. Cat. Orth., vol. II, p. 242 (1906).

Neoconocephalus guttatus Karny, Abhandl. k. k. Zool.-Bot. Ges. Wien, vol. IV, pt. 3, p. 24 (1907); ID, Wytsman's Gen. Insectorum, Fasc. 139, pl. VI, fig. 13 (1912).

Two specimens, both males, from Antigua, one on July 15, the other in July, with the day not recorded.

Neoconocephalus triops Linnæus

var. *macropterus* Redtenbacher

Conocephalus macropterus Redt., Verh. Zool.-Bot. Ges. Wien. vol. XLI, p. 381, 402 (1891).

Conocephaloides macropterus Kirby, Syn. Cat. Orth., vol. II, p. 245 (1906).

Neoconocephalus macropterus Karny, Abhandl. k. k. Zool.-Bot. Ges. Wien. vol. IV, pt. 3, p. 27 (1907).

Two males, two female adults and two immature females of this form are present in the collection, all from Barbados, the nymphs in May, the day not indicated, the two males and one female on May 16 and the other female on June 14.

One of the males is of the brown color phase and tends strongly towards the variety *fusco-striatus* of Redtenbacher.

There is no doubt in the mind of the writer that this is a variety of the *triops* complex. *Triops*, with its synonyms *mexicana*, *obtusus* and *dissimilis*, has the vertex blackish beneath at the apex, as has also the color-form *fusco-striatus;* this ventro-apical darkening of the vertex fades gradually, as easily observed when a series of specimens are studied, to a wholly unicolorous vertex. Specimens in which the vertex is without ventro-apical infuscation are determinable as *macropterus* and occur in both green and brown phases of coloration.

Contiguus Walker is a recorded synonym of *mexicana*, which is a synonym of *triops*, and it is almost certain that several other names in this genus will eventually be found to be synonymous with *triops* or some of its varieties.

Genus CONOCEPHALUS Thunberg

Conocephalus cinereus Thunberg

Conocephalus cinereus Thunbg., Mem. Acad. Petersb., vol. v, p. 273 (1815).

Anisoptera cinereum Kirby, Syn. Cat. Orth., vol. II, p. 276 (1906).

Conocephalus cinereus Karny, Wytsman's Gen. Insectorum, Fasc. 135, p. 13 (1912).

Conocephalus cinereus Rehn and Hebard, Trans. Amer. Ent. Soc., vol. XLI, p. 243, pl. XXII, fig. 12, and pl. XXIII, fig. 5, 6 (1915).

Of this common West Indian species there are 26 specimens in the collection, four males, seven females and three nymphs from Barbados in May, and four males, seven females and one nymph from Antigua in June and July.

The adults of the above material are brachypterous except a single male specimen from Barbados, taken May 16.

The "small, green, long-horned grasshoppers" referred to in the note quoted under *Musonia surinamus* on a previous page, obviously refer to the present species.

Family **Gryllidæ**

(The crickets)

Genus NEOCURTILLA Kirby

Neocurtilla hexadactyla Perty

Gryllotalpa hexadactyla Perty, Delect. Anim. Art., p. 119, pl. XXIII, fig. 9 (1832).

Neocurtilla hexadactyla Kirby, Syn. Cat. Orth., vol. II, p. 2 (1906).

One adult and thirteen nymphs, fresh water pond, English Harbor, Antigua, June 28, 1918.

One of the above nymphs has but three dactyls on the anterior tibiæ.

Genus SCAPTERISCUS Scudder

Scapteriscus abbreviatus Scudder

Scapteriscus abbreviatus Scudd., Mem. Peabody Acad. Sci., vol. I, p. 14, pl. I, fig. 8, 20 (1869).

Scapteriscus abbreviatus Kirby, Syn. Cat. Orth., vol. II, p. 2 (1906).

One adult female bearing a label reading: "*Scapteriscus variegatus*" and the legend "B 1047. 013.", all in black ink except "013," which is in red ink. This specimen may not be from the present collection, but this species occurs in the West Indies, as there is a female in the National collection from the

Bahamas, taken at Nassau by Dr. William Mann. At least the writer finds no characters at variance with those exhibited by material taken in Florida.

Abbreviatus may have to fall as a synonym of Burmeister's *variegatus*. That species is described as having wings supereeeding somewhat the tegmina, but a specimen recorded from Barbados by Rehn as *variegatus* is noted as having the wings shorter than the tegmina. The writer has seen no specimen fitting the description given by Burmeister, but the character of the wings being longer than the tegmina is given only in a diagnostic key and may not apply to this particular species, since some of the older writers, and too many of the recent ones, are prone to carelessness in placing units in keys. Then Mr. Rehn states that the tegmina of the *variegatus* from Barbados, a male, is very different in shape from that of *abbreviatus*. Thus there may indeed be two brachypterous species of this genus in the West Indies.

Genus Cycloptilum Scudder

Cycloptilum minimum n. sp.

The very small size and the unusually long wings are diagnostic of this little cricket, no other known form having the wings projecting a distance even one-half as great as the pronotal length. The maxillary palpi are also very different from those of allied forms.

Description.—Male, (the female unknown): Size decidedly less than any other known species of the genus. Head with the facial protuberance about as in *squamosum*, mesially divided by a vertical impressed line; maxillary palpi with the penultimate segment about equal in length to the apical one, the latter rapidly expanding to the scarcely obliquely truncate tip, this entire apical segment being scarcely, if any, longer than the apical width. Eyes about as in *squamosum*.

Pronotum very small and short, being no more than twice as long as the head; in allied forms it is distinctly more than twice, often three times, as long as the head; pronotal disk anteriorly truncate and posteriorly broadly rounded, the whole tapering somewhat posteriorly, but scarcely so much as in *squamosum*. Tegmina very large, projecting beyond the pronotum a distance but little less than the pronotal length, decidedly more than in other species of the genus; the tegmina are posteriorly slightly broader than the posterior width of the pronotum, not considering the deflexed lateral fields of the former; tympanum perfectly developed, occupying the

whole of the exposed dorsal area of the tegmen; the apical curvature of the tegmen is approximately the same as that of the pronotal disk.

Anterior tibiæ without foramini, or with ones so small as to be seen only under high magnification; caudal femora more slender than in *squamosum*, especially in the apical portion; armature of caudal tibiæ about as in that of *squamosum*, the dorso-internal spurs scarcely, if at all, shorter than the ventro-external ones; posterior metatarsus rather long and slender, sulcate dorsally and armed on each margin with but three or four very minute serrations, the apical spurs about as in *squamosum*.

Abdomen not differing materially from that of *squamosum;* cerci broken off in both specimens examined.

General color yellowish brown with darker mottling; the tegmina with the apical margins irregularly mottled with black and the anterior longitudinal half of the lateral field is black.

Measurements: Length, total from front of head to end of abdomen, 5 mm.; pronotum, 1.9 mm.; elytra beyond the pronotum, 1.6 mm.; posterior femora, 3 mm.; width pronotum posteriorly, 2 mm.! posterior femora at widest point, 1.25 mm.

Type male, Antigua, June 1918; paratype a, same data.

Type in collection U. S. National Museum; paratype in collection University of Iowa.

Catalogue No. 25141 U.S.N.M.

Genus Anurogryllus Saussure

Anurogryllus antillarum Saussure

Gryllodes antillarum Sauss., Miss. Mex., Orth., p. 414, pl. vii, fig. 10, 13 (1874).

Anurogryllus antillarum Kirby, Syn. Cat. Orth., vol. ii, p. 24 (1906).

One female, Antigua, in the month of June, day not noted.

Genus Gryllus Linnæus

Gryllus assimilis Fabricius

Gryllus assimilis Fabr., Syst. Ent., p. 280 (1775).

Gryllus assimilis Kirby, Syn. Cat. Orth., vol. ii, p. 37 (1906).

Gryllus assimilis Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., p. 295-320, pl. iv, figs. 1, 2, 4-9 (1915).

Fifteen specimens of this common and wide spread species were taken, distributed as follows: Barbados, in May, three male and five female adults; June, one male adult; Antigua, June, three male nymphs, July, one adult male and three immature females.

All of the above adults are macropterous. A thorough revision

of this most variable of insects is given by Rehn and Hebard at the above cited reference.

Many synonyms are recorded of this cricket.

Genus Endacusta Brunner

Endacusta (?) sp.

Out adult male and a pair of immature specimens of a species of *Endacusta* were taken on Antigua in June. The genera in the group to which this gryllid belongs are to a considerable extent based on the presence or absence of foramina on the anterior tibiæ, or present on one or both sides, etc., characters probably of very little or no value and wholly undependable, in some cases being absent or present in the same species. On such characters the present insect runs out in Saussure's keys to the genus *Endacusta* in the case of the adult, that specimen having distinct foramina on the inner face of the fore tibiæ, but the nymphs of both sexes run to the genus *Phalangopsis*, having foramina on neither face of the tibiæ. There are males of *Amphicusta annulipes* in the collection of the National Museum with foramina on both faces of the tibiæ as there are supposed to be, and females of the same species, determined by Mr. Rehn, without foramina on either face. Thus there is, at present, such confusion in this group that it is thought best to consider the present form as an unknown species and refer it questionably to *Endacusta*, as the adult male appears to belong there. This adult has very short lateral pad-like tegmina, apically broadly rounded and of a leathery texture.

Genus Heterecous Saussure

Heterecous (?) *dubius* n.sp.

This cricket is placed in the genus *Heterecous* with considerable doubt, for if it really belongs here, it indicates that the genus was wrongly placed by its author, Saussure, among the non-musical forms, as the male has well developed stridulating organs. There is little doubt of the insect belonging to the subfamily Enopterinæ, the general facies being characteristic of the members of that group and the only feature at all at variance being the paucity of inter-spinal serrations on the posterior tibiæ, as noted in the following rather complete characterization:

Description.—Male, (female unknown); head about as long as deep, vertical, the mouth inferior; vertex rostrate, of moderate length, the width scarcely one-half that of the basal segment of the antennæ, the dorsal margins parallel, the anterior margins diverging downwards; eyes prominent, narrowing ventrally; ocelli small and obscure; antennæ long and slender; palpi with the last three segments subequal in length, each being about as long as the combined lengths of the basal two, the apical one gradually expanding from the narrow basal portion to the broad apex, where it is about as broad as the length of that segment, the tip oval in section and deeply excavate.

Pronotum about as long as the posterior width, a little longer than the head and noticeably broadening posteriorly, the disk subsinuate posteriorly and broadly and shallowly concave anteriorly, rounding without distinct lateral carinæ into the lateral lobes, which are fully three times as long as high, with both lower angles rounded, the anterior ones the more so.

Tegmina fully developed, almost attaining to the tips of the posterior femora, and with a well developed tympanum; strigulatory vein but moderately heavy, mesially bent at rightangle; speculum opaque, fully twice as long as wide; wings exceeding the tegmina and surpassing the tips of the hind femora.

Abdomen of moderate size, the subgenital plate elongate, triangular, the ventral surface convex; cerci basally heavy and broad, thence tapering to an apically slender tip projecting well beyond the tip of the subgenital plate.

Legs stout; anterior and intermediate femora wholly unarmed, the posterior ones armed on the ventro-external margin only with a number of very small triangular teeth, five or six towards the apex the largest; anterior tibiæ with large open foramina on both faces, that on the outer face somewhat the narrower. The dorsal and ventral surface of the fore tibiæ are rounded and unarmed except for a short apical spine on each ventral margin; posterior tibiæ ventrally carinate mesially and finely and bluntly serrate, dorsally flat, gently broadened apically and both carinæ armed with seven or eight stout spurs, those of the inner margin much longer and extending further towards the base of the tibæ; between the large spurs of the outer margin there are a few small teeth, usually one between each two spurs, none on the inner carina except two or three very small ones towards the base; apical calcars of the posterior tibiæ three in number on each side, short, the outer ones much shorter than the tibial depths, the middle one the longer, the others very short; the inner ventral calcar about the same length as the corresponding outer one, but the upper and median ones are much longer than the corresponding outer ones, the median one being about one-half as long as the posterior metatarsus and almost as long as the tibial depth and the upper inner calcar noticeably longer than the median one, being slightly longer than the tibial depths; posterior metatarsus about twice as long as broad, apically slightly swollen and rounded above and below, above armed with two long stout apical spines directed upwards and backwards and with a pair of lateral

calcars fully twice as long as the dorsal spines and more than twice as heavy, directed backwards and bearing many fine short hairs, as do also the two longer inner calcars of the posterior tibiæ, also microscopically true of other calcars; second tarsal segments of all the legs broadly expanded and ventrally concave; third tarsal segment slender, apically gently swollen, the claws basally broad and simple.

General color honey yellow, the abdomen is suffused with fuscous above and below, especially apically, and the lateral lobes of the pronotum have a blackish stripe extending along the upper portion along the cites of lateral carinæ; eyes black; extreme tips of spines and calcars of the legs dark and there is a narrow longitudinal black streak on the outer face of the posterior femora. The antennæ have certain of the segments very obscurely alternately darker and lighter.

Measurements.—Length, total, 18 mm.; pronotum, 3 mm.; posterior femora, 9.15 mm.; width, pronotum posteriorly, 3 mm.; posterior femora at widest point, 2.5 mm.

Type, male, Antigua, collected in July, the day not given.

Type in collection of the U. S. National Museum.

Catalogue No. 25143 U.S.N.M.

THE SCUTELLEROIDEA OF THE DOUGLAS LAKE REGION

DAYTON STONER

INTRODUCTION

The Scutelleroidea form an important and interesting part of the hemipterous fauna of almost every region. During the summers of 1919 and 1920 opportunity was afforded the writer for collecting and studying the scutelleroid fauna in the vicinity of the University of Michigan Biological Station situated on Douglas Lake in northern Michigan. The results are brought together in the form of the present annotated list which, based as it is on rather intensive collecting in a fairly well circumscribed area, should furnish data for more definite conclusions concerning the geographical distribution and natural history of these insects.

Field work was done during the months of July and August and the material thus secured affords the basis for this paper. Collecting was not attempted at a distance of more than fifteen miles from the lake. Without doubt other species of Scutelleroidea occur in the area herein discussed, although collecting was usually indulged in several times each week. Species which, from their known distribution, should presumably occur in the region, but which have not yet been recorded, are included at the end of this paper in a "Hypothetical List." Twenty-three species are at present represented from the region by specimens now in my collection. These are discussed in the following pages. A few words concerning topography, soil conditions, flora, etc., may be opportune at this point.

Douglas Lake is located toward the extreme northern end of the southern peninsula of Michigan, a little more than seventeen miles south of the Straits of Mackinac and about the same distance from Lake Michigan on the west and Lake Huron on the east. It lies in the Transition Zone, between the northern

coniferous forest area and the central deciduous hardwood forest area. The immediate region of the lake where most of our collecting was done, is covered with glacial deposits and the soil is exceedingly sandy. Formerly, pine forests covered these sand areas but forest fires and lumbering have reduced the primeval forests so that, for the most part, aspens have now taken their places. Although extensive burned over areas with their thick growth of aspens, blueberry bushes and ferns occur all about the lake, pentatomids were not found in any numbers in such situations. But on the poorer soil which usually supports wild raspberry and blackberry plants and, perhaps, a thin stand of blue grass or red top, these bugs were most commonly found. There are few cultivated areas of any size in the region, but the ones which were visited yielded nothing of particular importance in the way of pentatomids.

The low, boggy land in the vicinity of Douglas Lake itself is of considerable extent and supports various types of semi-aquatic vegetation. In such situations a few thyreocorids and our most valuable find of all, *Sciocorus microphthalmus*, were taken. Arbor vitæ, tamaracks, spruces and a few balsams occur in these bogs and where the shade is dense little or no small vegetation suitable for plant feeding bugs is found. However, the narrow roadways and numerous trails which wind about in what seems to the newcomer an intricate maze are often grown over with more or less vegetation which offers food for some of the plant feeding forms.

In the vicinity of the lesser bogs, streams and lakes of the region various types of transitional plants occur. These link up the aquatic with the strictly terrestrial vegetation and such places afforded our best collecting grounds especially toward the latter part of the summer.

The sand beaches at various places around Douglas Lake are quite extensive and after some of the prolonged high winds pentatomids are occasionally found in the beach drift. At some points the beach, a few feet back from the water's edge is grown up in reeds and bunch grass, but such situations did not yield the cydnids that might be expected.

Most of the streams of the region are small, but along their moist banks in the cleared and burned over areas weeds, grass-

es and willows grow and collecting is usually good in such situations.

During the eight weeks that the Biological Station was open in the summer of 1918, the total rainfall was a little under 1.75 inches. As a result, much of the vegetation on the exposed sand dunes became parched and dry and was deserted by plant-feeding bugs. In spite of the somewhat greater amount of precipitation in 1920 the vegetation in such situations, especially after the middle of July, became hard and dry as during the preceding season.

A large share of the pentatomids mentioned in this paper are of transcontinental distribution, but a few of the forms are confined principally to northern latitudes. Among these may be noted *Elasmostethus cruciatus, Meadorus lateralis, Apateticus bracteatus* and *Podisus placidus,* all of which, with the exception of the first, are not particularly rare in the Douglas Lake region.

Acknowledgement is due the following persons for assistance in collecting material: Miss Priscilla Butler, Mr. E. H. Brunquist, Prof. H. C. Fortner, Mr. M. H. Hatch, Mr. H. W. Mossman, Prof. G. R. LaRue, Director of the Biological Station, and Mrs. Stoner, who was a constant aid and companion. Thanks are also due Dr. J. H. Ehlers, one of the botanists of the Station staff, for the identification of most of the plants herein mentioned.

ANNOTATED LIST

Family **Scutelleridæ**

Subfamily **Tetyrinæ**

Homaemus aeneifrons (Say)

This is probably the commonest species of Scutelleroidea found in the region and a large series of specimens taken at frequent intervals during July and August is at hand. The time of greatest abundance of the adults seems to be between July 20 and August 20. My earliest record for an adult is July 4. Several nymphs in third and fourth instars were taken up to July 15, but after that date the numbers of immature individuals gradually fell off. In my field notes of July 8, 1920, the following memorandum occurs: "Nymphs in third and

fourth instars are common in open places in the woods on high, dry, sandy ground and also along the edges of woods north of North Fishtail Bay. Adults are also fairly common, but many of them are yet soft, indicating that the insects have but recently molted for the last time." The high, grassy hills south of Camp Davis offer excellent habitats for this bug, particularly during July.

However, not always were specimens taken in such arid situations for numerous examples are at hand from the vicinity of Smith's Bog, Bessey Creek near Ingleside and the small streams which flow into North Fishtail Bay.

Considerable variation in both size and coloration obtains in my specimens. The females average much larger and are more distinctly marked than the males, although one male in the collection is as distinctly marmorate as the best marked female.

Curiously enough, the closely allied species *H. bijugis* was not taken in the region, although northern Michigan is within its recorded range. It may be distinguished from *H. aeneifrons* by the yellowish marginal or submarginal line on the head, the rounded instead of angular anterior prolongation of the 6th visible ventral segment, the generally paler color and the slightly smaller size.

Subfamily **Odontotarsinæ**

Eurygaster alternatus (Say)

This scutellerid is also very common in open, dry grassy situations in the region, particularly on the higher ground. Nymphs far outnumber adults until the middle of July. My earliest record for an adult is June 29. On July 2, 1919, great numbers of nymphs in all stages were taken along the engineers' base line south of the Biological Station, while but two adults fell to our nets on this date.

The usual variation in size and color is exhibited by the specimens at hand. However, one of these, a female taken on July 17, is unique in having the scutellum, hemelytra and pronotum a uniform brick red in color with a round black dot at each humeral angle. In addition, the alternations on the connexivum are almost obsolete. Another specimen, a female taken

July 8, is suffused with pinkish, but the alternations on the connexivum are very well marked.

Family **Cydnidæ**

Although numerous and seemingly favorable habitats of the members of this family occur in the Douglas Lake region, the surprising paucity, both in individuals and in species is worthy of mention. The cultivated and uncultivated areas in low, marshy places in the open and along the woodlands would appear to offer excellent breeding and feeding places for thyreocorids; and one would expect to find cydnids on the sandy hills and lake shores. We were much disappointed on discovering the real situation, for the family is represented in our collection by but twenty specimens representing five species. These are the result of our efforts during the entire two seasons.

Subfamily **Thyreocorinæ**

Thyreocoris ater (A. and S.)

Nine specimens, four adults and five nymphs, are represented in my collection. In 1919 the first specimen of the season was a nymph in the second instar taken in a low, grassy creek bottom about two miles north of North Fishtail Bay on July 16. A low lying field of red top grass *(Agrostis alba)* just north of Ingleside proved to be our best collecting ground for the species, all our other specimens of this season having been taken here. On July 22 two adults and two nymphs were swept from the still uncut grass. One nymph is in the second instar, the other is in the fourth. Two days later another adult and a nymph were taken in the same place. An adult was discovered in beach drift near the Biological Station on June 30 by M. R. Hatch. In the Station records I find a specimen recorded from beach drift by R. F. Hussey.

This is the largest and shiniest species of thyreocorid in the region. The general form is broadly, regularly ovate and the punctures on the scutellum are not deep.

Thyreocoris nitiduloides (Wolff)

One of the members of my class in Entomology submitted a specimen of this species for examination and later a satisfactory exchange was effected whereby it became my property.

The specimen is a male, taken in August, and forms the only available record of the species for the region.

The present form is to be distinguished from *T. ater* by its smaller size, less broadly ovate form, deeper and denser punctuation and therefore less shiny appearance.

In general, this insect has about the same distribution as the preceding form, although it has not been so commonly met with in northern United States and Canada as *T. ater*. This indication of relative abundance and occurrence is borne out by our records.

Thyreocoris pulicarius (Germ.)

The first specimen of this species was taken just north of Ingleside July 22, 1919. The field was grown up in red top, together with a little timothy, and numerous plants of the bristly crowfoot *(Ranunculus pennsylvanicus)* were growing here and there. But one other specimen was taken during the remainder of the season; it was secured on August 6 in sweepings made in a low moist place a few miles west of Pellston. Specimens of the species were not taken during the season of 1920.

This form is considerably smaller (2.5—3.0 mm.) than either of the preceding, and is the only one here recorded in which the margins of the hemelytra are pale.

Subfamily **Cydninæ**

Cydnus sp.

A fragment of the prothorax, the front femora and tibiæ constitute the material which I include under the above generic name. Although I cannot associate these fragments with any species of cydnid in my collection, I feel that they were at one time possessed by a form either in or near this genus as it is now understood. These remains were found around the roots of wild rye *(Elymus canadensis)* growing along the beach west of Grapevine Point. Careful search was made here and elsewhere on several occasions during both seasons for living examples, but none were found.

Sehirus cinctus (P. B.)

But seven specimens were found during the entire two seasons of collecting. One specimen was taken July 7. The other

six were taken in sweepings from weeds growing in a low place in a rye field July 18. The grain had just been cut and it is possible that the bugs may have moved from that to the weeds. Adjacent to the field was a pine and hardwood forest.

This is the largest cydnid that is likely to be found in the region, averaging about 5 to 6 mm. in length. In color, it is uniform bluish with white pronotal and costal markings and with abbreviated white lines on the outer sides of the tibiæ.

Family **Pentatomidæ**

Subfamily **Pentatominæ**

Sciocoris microphthalmus Flor.

It was rather a pleasant surprise to discover this typically Palæarctic species in the Douglas Lake region and it proved to be the best find of our two seasons' collecting. My earlier note concerning the occurrence of this rare pentatomid in Michigan (Ent. News, XXXI, 1920, 141) constitutes the first published record for the state. The following statement regarding its status is quoted from that note:

"This little pentatomid is one of the rarest and most interesting members of the North American heteropterous fauna but less than a half dozen definite locality records are known to me at the present time. Van Duzee (Trans. Am. Ent. Soc. XXX, 1904, 32) records a single specimen from the White Mountains in New Hampshire and Parshley (Fauna of New England, 14, 1917, 17) records a specimen from Maine. To these localities I am glad to add another, thus making known the further distribution of this insect within our borders.

"During the summer of 1919, I took four specimens of *Sciocoris microphthalmus* in the Douglas Lake region of northern Michigan. One of these, a male, was taken in the sweep net on July 9, and again on July 18, a male and a female were swept from roadside weeds growing in a wooded area along the edge of a small stream. One nymph, a male about one-third grown, was also taken on July 20 in a similar situation."

During the season of 1920 special effort was made to secure specimens in the situations where they were found in 1919, but in vain. One specimen, a female taken July 16 on the cement

sidewalk at Camp Davis, the University engineering camp, constitutes our only record.

Apparently the species is not even locally common in the region, but it is very gratifying to know that it is not unlikely to be met with in the vicinity of the Biological Station. And it is also interesting from a zoological standpoint to note the extension of its range during the past fifteen years.

The small size (6.0—7.0 mm.), clypeate head, flattened and laminated connexivum and the rather short and bluntly rounded scutellum will at once distinguish this from any other Michigan pentatomid.

Peribalus limbolarius Stal

One nymph taken along the edge of an oats field near Riggsville, about four miles from Douglas Lake on July 29, 1919, constitutes our only record of this bug for the region.

The species is found generally throughout the United States and Canada. In most sections of the United States this is usually an abundant or at least common bug, and its apparent rarity here seems worthy of comment. However, in my experience in Iowa and other points farther west, the insect is commonly found in well cultivated districts. Not very many such areas occur in the immediate vicinity of Douglas Lake, but a number of excursions were made to outlying cultivated areas such as the one first mentioned, but with results as noted.

Chlorochroa uhleri Stal

This is another species which, in the adult stage, is not often met with in the region until the latter part of July. Indeed, adults of this form seem, in general, to appear later in the season than most other pentatomids and the height of abundance of adults occurs between July 15 and August 10.

Nymphs in the first and second instars were swept in considerable numbers from smooth sumach *(Rhus glabra)* on June 29, 1920. At this time also one adult was found. Often, too, nymphs and adults are found on blueberry bushes *(Vaccinium pennsylvanicum)* of which an abundance occurs in the vicinity of the Station. However, I am not sure that they feed on this plant, for several nymphs which I confined in a cage and furnished with fresh blueberry stalks daily could not be observed

to feed upon them and died within a short time. In addition to sumach and blueberry, specimens were often taken from huckleberry *(Gaylussacia baccata)* in August.

At 11:00 A. M. on August 10, 1919, I found both adults and nymphs on the panicles of *Rhus glabra,* which grows in some abundance on the Biological Station grounds; the particular plot here observed consisted of about forty plants. Although I did not see the nymphs with the beak inserted in the fruit, I *did* note several *adults* with the beak thus inserted, and in the act of sucking. The following table will serve to give some idea of the abundance of these bugs on the plants in the plot based upon more or less regular intervals of collecting:

Time	No. adults taken	No. nymphs taken
11:00 A. M.	5	several
11:15 A. M.	8	
12:00 M.	2	
12:40 P. M.	2	
1:40 P. M.	3	
2:40 P. M.	1	
5:00 P. M.	2	3
7:50 P. M.	1	

Each time that the plot was visited it was inspected very carefully for adults, all of which were removed as soon as discovered. Apparently the Chlorochroas came in from nearby plants and areas to feed on the sumach fruit and, indeed, it seemed that the insects habitually *sought* these plants.

The green color of the bugs with the pinkish margins on pronotum, hemelytra and abdomen served to make the insects very inconspicuous against the reddish brown panicles and the green leaves of the sumach bushes. The bugs were very active on the date above mentioned, which was clear and very warm; if the collector approached too closely they dodged quickly to the opposite side of a panicle or dropped suddenly to the ground and "played dead."

On the morning of August 13 I took from the same plot of sumach bushes ten specimens of *C. uhleri,* all that I could find; and in the afternoon of the same day six more specimens, all adults and, curiously enough, all females. In my notes of July 15, 1919, I find the following statement: "*C. uhleri* and *E.*

euschistoides have been for four or five days and still are at the height of their abundance for the season."

The local status of this as well as other species of pentatomids seems to fluctuate considerably from season to season for, while the present form was very abundant during the season of 1919, only eleven specimens, of which but four are adults, were taken during the season of 1920.

Most of my specimens are typically colored, although a few have the hemelytra suffused with pinkish.

Mormidea lugens (Fabr.)

But one specimen, a half grown nymph taken on July 11, 1919, from the reeds at Sedge Point, represents this species.

The general distribution of the species would suggest that it should be found rather more commonly in the region than one would be led to believe from our single record. However, I have never found this to be a common form in any locality.

The adult may be distinguished from all other pentatomids in our fauna by the size (6.0—7.5 mm.), the general grayish olive color with two transverse abbreviated yellowish white lines anteriorly on the pronotum, and the black scutellum margined with yellowish white.

Euschistus euschistoides (Voll.)

Scarcely any habitat of the region is without its fair quota of individuals of this pentatomid, for it is one of the commonest and most generally distributed species as well as the most abundant member of the genus.

Adults are not uncommon in late June, though they become much more numerous later in the season, the height of abundance being between August 10 and 20. Apparently the species is double-brooded in this latitude, for half-grown nymphs have been taken as late as August 10. Nymphs in third and fourth instars are common up to about July 20; for several days after this adults are more plentiful, when again the nymphs become common.

This bug is often found on raspberry and blackberry bushes growing in the more or less open places in the woods, such as the burned-over area west of Bryant's Hotel and the partially cleared areas on Grapevine Point. Usually it is more abundant

in the higher and more open ground than the following species, *E. tristigmus.* In the few cultivated districts about the lake this also proved to be the most abundant species of pentatomid. The grassy fields north of Ingleside and about Riggsville afford excellent habitats.

On numerous occasions during both seasons *E. euschistoides* was observed on the panicles of the sumach *(Rhus glabra)*, particularly toward the middle of August. Many individuals, both nymphs and adults, were also observed with the beak inserted in the fruit of this plant, from which its owner was sucking the juice.

On occasions after high winds from off the lake numbers of these bugs could be secured in the beach drift near the Biological Station. No doubt the insects in attempting to rise in flight were caught by the breeze and carried out over the lake into which they fell, to be washed ashore later by the waves.

This pentatomid may be easily recognized from any other in the Douglas Lake fauna by its grayish color, small black spot at the lateral angles of the ventral abdominal segments and the deeply incised apex of the head.

Euschistus tristigmus (Say)

In low wooded places, or along the edges of such situations which have grown up in raspberry and blackberry bushes examples of this species are likely to be found in considerable numbers.

This also seems to be one of the species in which the individuals arrive at maturity comparatively late in the season. Nymphs are abundant and considerably exceed adults in number up to about June 20, after which time the latter are always common in proper habitats. Our earliest record for an adult is June 30, 1920, when one specimen was found in beach drift. A few other specimens have been taken in beach drift in July. Nymphs in second, third and fourth stages are usually plentiful on wild raspberry *(Rubus idaeus* var. *aculeatissimus)* at Grapevine Point during the entire summer. Other suitable habitats are the berry patches west of Bryant's Hotel and north of North Fishtail Bay, where the bugs are common until about

mid-August. If the season is very dry, as often happens in the region, the numbers become much reduced.

The species also visits the sumach frequently, although not in such great numbers as *E. euschistoides*, but I have never seen it feeding upon this plant.

In the Station records for 1918, I find this form recorded on *Salix* by Hussey.

In this region this is the only member of the genus in which the venter is furnished with a row of black spots, which may be, in some cases, more or less obsolete.

Euschistus variolarius (P. B.)

While in Iowa, and, indeed, in most parts of the United States where the three species of Euschistus here mentioned occur, this is the most common representative of the genus, but two specimens are in my collection from Douglas Lake. I have seen but one other and that in a student's collection; it was taken on July 2 from grass growing along the east shore of Douglas Lake. My own specimens, both males, were taken July 15 and 16, 1920, in beach drift.

This species is to be distinguished from *E. euschistoides*, its nearest ally in the Douglas Lake fauna, by the absence of black points at the incisures on the edges of the abdomen, the usually rounded anterior margin of the head and the rounded median black spot on the genital segment of the male.

Coenus delius (Say)

Although this is a widely distributed and, in some parts of the United States at least, a fairly common species, it is one of the less familiar forms in the Douglas Lake region. The net result of our two seasons of collecting is but four adult individuals along with a number of nymphs. More of the latter might have been secured, but all the adults that were seen were taken.

Apparently this is one of the species which matures comparatively late in the season. My earliest record for an adult is July 7. Most of the nymphs were taken about the middle of July; one in the second instar was taken July 11, while another in the fourth instar was taken July 14. On July 17 an adult was taken in which the exoskeleton was still soft and yellowish,

indicating that this individual had just molted for the last time.

It seems that the mortality among the nymphs is rather high or that the adults are more than usually secretive, for on the grass growing on the hills just back of Camp Davis and in the cleared areas north of North Fishtail Bay, nymphs in second and third instars are plentiful enough between July 4 and 11. However, later in the season when one would expect to find them in these situations, the adults are conspicuous by their absence. Neither were they to be found in any other situation. On a few occasions specimens have been swept from wild raspberry. Two adults were taken in beach drift in front of the Station on August 16, 1920.

This pentatomid may be distinguished by the regularly convex oval form, the slightly convex head with prominent median carina, the short rounded humeri, broad rounded apex of scutellum and irregularly reticulate venation of the wing membrane.

Neottiglossa undata (Say)

This is quite a common pentatomid in the region and we possess numerous adults taken during July. We have also a few nymphs in all instars taken after the middle of July.

Numerous examples are usually to be found on blue grass and red top growing in open places of the aspen association as well as on those grasses which may grow in low, more or less moist places such as the road through Reese's Bog and the fields north of Ingleside.

This is a small (4.5—5.0 mm.), easily distinguished pentatomid, dull yellowish in color, elongate oval in outline and presents a neat and trim appearance. Head convex with pale yellowish, calloused, longitudinal median line which extends backward on pronotum and scutellum.

Cosmopepla bimaculata (Thomas)

This is not a common bug in the region and the collector is not likely to take more than three or four specimens during the course of a day's work in the field.

My earliest record for an adult is July 7. I have taken a first instar nymph on July 11 and half grown nymphs as late as August 4. July seems to be the month in which the species is

most likely to be met with. During this month it also breeds, for pairs have been taken in copula on July 22 and 29. On the latter date I took, in the vicinity of Riggsville, a specimen which had just molted for the last time, the body integument being yet soft and delicate.

On July 18, 1919, a specimen was swept from cinquefoil *(Potentilla monspeliensis)* growing in a low damp place in a rye field; again on July 8, 1920, several adults were taken in the same place on plants of this species. I have an adult which was taken on July 4 in beach drift near the Biological Station.

Apparently this pentatomid is most at home in low lying grass lands or semi-cultivated areas such as are found along Bessey Creek or north of North Fishtail Bay as well as, sometimes, along the shaded areas bordering woodland or in woodland.

C. bimaculata may be distinguished from any other pentatomid of the region by its size (5.0-7.0 mm.), and its general black coloration marked with reddish yellow.

Banasa dimidiata (Say)

One of the joys associated with collecting in the Douglas Lake region is the likelihood of meeting with considerable numbers of this beautifully colored pentatomid, especially during the latter part of July and also in August. It is during the first few days of August that the height of abundance of adults seems to be attained.

The favorite host plant here appears to be arbor vitæ *(Thuja occidentalis)*, which is a common tree along some portions of the lake shore as well as in other places. On August 8, 1919, many adults and nymphs, the latter mostly in the third and fourth instars, were swept from the small Thujas growing along the lake shore north of the Station. At this time, also, egg masses were found on the under side of the leaves of the Thuja. These egg masses usually contain from ten to twenty eggs placed side by side in the ordinary manner of pentatomid eggs.

The color of both nymphs and adults blends in very well with the color of the tree and the lighter green color of the cones, which latter, by the middle of August, are about one-half inch in diameter. Contrary to my observations on most pentatomids

these insects do not "let go" suddenly when the tree upon which they are resting is beaten or disturben, but they seem to cling to it all the more tightly under such conditions. As a result I often found that, after beating the foliage of a tree thoroughly, I was able to obtain another specimen or two by shaking the branches very hard.

Toward the middle of August a few specimens of this species were taken from round-leaved dogwood *(Cornus circinata)* growing along the beach near Grapevine Point. The only other plants upon which I have taken the species in the region are blueberry *(Vaccinium)* and service berry *(Amelanchier canadensis)*.

During the summer of 1920 high winds seemed to be more prevalent than during the previous season and a good many insects were found in beach drift. There is no doubt that during these high winds flying insects of various kinds are caught by them and blown out on the lake, where they fall to the surface of the water, to be later washed ashore by the waves. In the first week of July, 1920, more pentatomids were found in beach drift near the Biological Station than during the entire season of 1919, and among this lot was a number of *B. dimidiata*.

This is the only greenish pentatomid of the region in which the basal half of the pronotum and more or less of the hemelytra are colored reddish or olive brown. Length, 8.0—11.0 mm.

Considerable variation in coloration is exhibited by the specimens in my collection. Recently molted adults are almost a uniform pale yellowish, the basal pronotal band being not yet well marked. In some fully matured examples the anterior half of the pronotum and the extreme tip of the scutellum are reddish brown.

Subfamily **Acanthosomatinæ**

Meadorus lateralis (Say)

Of this northern representative of our pentatomid fauna I have in my collection four specimens, two males and two females from the Douglas Lake region. All were taken between July 10 and 24, 1919. During the season of 1920 I saw but one

specimen and that in a student collection; it, too, was taken in July.

One of my specimens, a female, was taken from a lily pad in the water of Douglas Lake. Another was taken in beating the vegetation growing along the edges of beach pools at Sedge Point. My other specimens were taken from vegetation growing in low and more or less swampy situations.

This is proportionately the narrowest and most linear of the Douglas Lake pentatomids and is not unlikely to be mistaken for a capsid. However, the present form has five antennal segments, while the capsids have but four. In addition *M. lateralis* is of a yellowish brown color mottled with reddish. Length, 7.0—9.0 mm.

Elasmostethus cruciatus (Say)

This is another typically northern representative of the group. While it is more widely distributed than *M. lateralis*, having been recorded as far to the southwest as New Mexico, it seems, in general, not to be so common as that form. I have but one specimen from the Douglas Lake region; it is a typically colored female taken August 2, 1920, in sweeping the vegetation along the low, swampy shore of the lake west of Bryant's Hotel. Mr. R. F. Hussey has told me of a specimen taken by him in the summer of 1918.

Subfamily **Asopinæ**

Perillus bioculatus var. *(b.) clauda* (Say)

On July 18, 1919, a Perillus nymph, probably of this species and the only representative of the genus taken during the summer, was swept from a low, grassy area in a field of rye which had been cut shortly before. This field was about one and one-half miles northeast of North Fishtail Bay and well out in the open cultivated district.

A single dead specimen, an adult male, was found on one of the shelves in Houghton Hall July 4, 1920. The bug had probably crawled into the building for protection at the time of hibernation, but had not been able to survive the rigorous Michigan winter. The antennæ of this specimen are entirely black.

This conspicuously marked black and red pentatomid is con-

siderably larger than *C. bimaculata*, the only other black and red representative of the Scutelleroidea mentioned in this paper up to this time. The present form averages from 8.0 to 11.5 mm. in length.

Perillus exaptus (Say)

I have one specimen of this species in my collection, a female taken July 24, 1920, by M. H. Hatch, at Big Stone Bay in Emmet County. The light markings are reddish yellow with the extreme margins of pronotum, hemelytra and connexivum palest. The anterior femora are armed with a very low blunt tubercle in place of the stout spine characteristic of the preceding species.

Apateticus cynicus (Say)

This is the largest, although apparently one of the less common pentatomids of the region. A female which I have measures 19.0 mm. in total length; the males average somewhat smaller. I have but two specimens, a male and a female. The latter was taken in beach drift July 26, 1919, while the male was picked from the clothing of a visitor at Grapevine Point, August 13. Specimens of the species were not taken during the 1920 season.

Apateticus bracteatus (Fitch)

This is the more common of the two larger forms of this genus which occur in the region, a series of eight adults representing our efforts for the seasons of 1919 and 1920.

My best haul of this species was made on July 16, 1919, when I took four adults, two males and two females, in addition to a fourth instar nymph. They were swept from willows growing in a low, swampy, uncultivated area about one and one-half miles north of North Fishtail Bay. On either side of this narrow area a forest fire had burned—indeed, it was still smoldering on this date. One of the adults had apparently just cast the last nymphal skin for the body integument was still soft and a little paler than usual. My other specimens, with the exception of two, have been taken on willow. A single female was found in beach drift July 22 and, by a curious coincidence, my only adult specimen taken in 1920 was found in a similar situation on the same date in July.

In accordance with my delimitation of this form I have included here specimens which average somewhat smaller than the preceding and in which the vaginal plate of the female is triangular rather than quadrate. The general coloration in the present form is a somewhat reddish yellow; however, none of my Douglas Lake specimens are as dark as some from Oregon, which are in my collection. As between the two representatives of the genus found at Douglas Lake, the present form has the humeri somewhat less attenuate than in *A. cynicus*, although the humeri of both are about equally acute. All my specimens of *A. bracteatus* have the anterior pronotal margins more strongly crenulate than in *A. cynicus*.

Podisus maculiventris (Say)

At no time during our stay at Douglas Lake was this bug common, although in most places in the United States and Canada it is the most abundant member of the genus. Adults are likely to be met with after the middle of July in low grassy places such as lake borders and bogs. I took several along the shore of Lancaster Lake on July 20, at which time also a number of nymphs in third and fourth instars were secured. Several times I have taken the species from willow *(Salix)*. I have four specimens that were taken in beach drift near the Biological Station.

P. maculiventris may be separated from the following species by its larger size (10.0—14.0 mm.), and the proportionately longer ventral spine which extends forward between the posterior coxæ.

Podisus modestus (Dallas)

This is the smallest representative of the subfamily in the region, averaging in length from 7.0 to 10.0 mm. It is also a little paler than the preceding form and shares with it the distinction of having the wing membrane marked by a longitudinal brownish vitta. I have but eight specimens, all but one of which were taken after the middle of July. One adult was taken in beach drift on July 11.

Podisus placidus (Uhler)

So far as the Douglas Lake region is concerned this seems to be the commonest representative of the genus and during

the latter part of July and all of August it may usually be taken in low, more or less swampy areas; oftentimes it is to be found in such areas which have been burned over some months previously and have since been permitted to grow up in weeds and grass.

My earliest record for an adult in the field is July 24, when I secured these forms as well as nymphs from balsam poplar (*Populus balsamifera*). One specimen in my collection was taken in beach drift July 17. As with *P. maculiventris* I have on numerous trips taken this form on willows growing in low places. On one occasion I took a specimen from white cedar (*Thuja occidentalis*) growing along the east shore of Douglas Lake. Often grassy areas among the aspens will yield a number of these bugs.

During the season of 1920 several adults and nymphs were captured on August 9 in the low, swampy, burned-over areas surrounding Smith's Bog. No other Podisus was taken in this situation.

This bug is to be distinguished from its congeners by the form, which is broader than usual behind the middle, by the blunt, rounded humeri and by the lack of a dusky longitudinal fritta on the wing membrane. Length, 9.0—11.0 mm.

HYPOTHETICAL LIST

I have added the following hypothetical list of species simply to indicate to the prospective student of the group the desirability of being on the lookout for them in the Douglas Lake region. Those species are here included which, although not at present represented in our collections, would seem from what is already known of their distribution, likely to be met with in the region. Possibly further collecting extending over a period of years will reveal at least some of the forms mentioned below; also, perhaps, other species than the ones here listed may be added.

Family **Cydnidæ**

Subfamily **Thyreocorinæ**

Thyreocoris lateralis (Fabr.) Has been recorded from Michigan.

Subfamily **Cydninæ**

Pangaeus bilineatus (Say)
Amnestus spinifrons (Say)
Amnestus pusillus Uhler

Family **Pentatomidæ**
Subfamily **Graphosomatinæ**

Podops cinctipes (Say)
Podops parvulus (Van D.)

Subfamily **Pentatominæ**

Brochymena arborea (Say)
Brochymena quadripustulata (Fabr.)
Trichopepla semivittata (Say)
Hymenarcys nervosa (Say)
Menecles insertus (Say)
Thyanta custator (Fabr.)
Acrosternum hilare (Say)

CONCLUSION

In conclusion it may be of some interest from the standpoint of geographic distribution to compare the pentatomid fauna of the Douglas Lake region in Michigan with the pentatomid fauna of the Lake Okoboji region in northwestern Iowa, at which place I have also made a study of the group.

Although the two regions are rather widely separated—Lake Okoboji is about 500 miles west and 175 miles south of Douglas Lake—and the floral and geological conditions are somewhat different, both are lake regions. In addition, our collecting was undertaken for about the same length of time at each place and during the same season of the year, so that a reasonable basis for comparison is available.

Perhaps a brief quotation from an earlier paper on the Lake Okoboji pentatomids* will suffice for a general explanation of conditions at that place. "The vicinity of the Macbride Lake-side Laboratory (on West Okoboji Lake) offers excellent collecting grounds all within easy access. Indeed, so many ecological areas are seldom found within so circumscribed a region.

Deep woods, swamps, sandy beaches, high rolling prairies with their respective types of flora—all are within one's ability to investigate. . . . ."

It may be mentioned in passing, that coniferous trees are totally lacking in the vicinity of Okoboji, which lies just within the lower boundary of the Transition Zone (Alleghanian), the Upper Austral (Carolinian) becoming evident only a few miles to the south.

	Genera in list	Genera common to both places	Species in list	Species common to both places
Douglas Lake Region	19	14	23	17
Lake Okoboji Region	19		29	

* Stoner, Dayton, The Pentatomoidea of the Lake Okoboji Region, Bull. Lab. Nat. Hist., S. U. I., VII, No. 3, 1917, 39-47.