THE LEAFHOPPERS OF MICHIGAN EXCLUDING THE SUBFAMILIES ATHYSANINAE AND CICADELLINAE (HOMOPTERA, CICADELLIDAE)

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
Oscar Taboada
1957

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Ray Watson
Major professor

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AN ABSTRACT

Submitted to the School for Advanced Graduate Studies of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

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Department of Entomology

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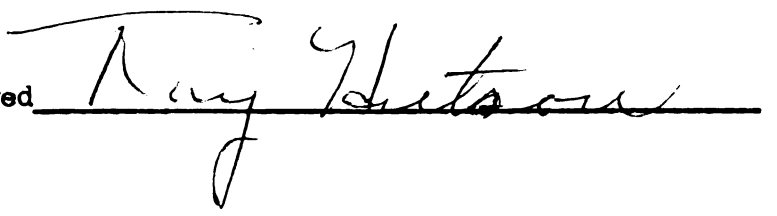
Approved 

OSCAR TABOADA AN ABSTRACT

This work is a faunistic study of the family Cicadellidae or leafhoppers of Michigan, excluding the subfamilies Athysaninae and Cicadellinae. Keys for the identification of 87 species in the subfamilies Tettigoniellinae, Evacanthinae, Penthèmiinae, Jassinae, Dorydiinae, Ledrinae, Xestocephalinae, Aphrodinae, Eurymelinae, Macropsinae, Agallinae, Gyponinae and Bythoscopinae are included. Brief descriptions of the higher groups and of each species are given, with notations on the available taxonomic information, known hosts, economic importance and distribution in the United States with particular emphasis on Michigan.

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Grateful acknowledgement is due to Dr. Dwight M. DeLong, of the Ohio State University for letting the author study many types in his leafhopper collection and for his valuable advice on this work.

The author extends his sincere thanks to Dr. Robert Dreisback of the Dow Chemical Co. for the use of his leafhopper data in his private collection and the loan of some specimens for study, and to Drs. H. Hubbell and T. Moore of the Museum of Zoology, University of Michigan, for making facilities and specimens of the museum available to him.

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I. INTRODUCTION

The Cicadellidae or leafhoppers comprise one of the largest families in the insect world. Van Duzee (1917) lists about 500 species for the United States and Canada, and at present there are about 3000 species in the Nearctic region.

Most of the species have been described within the last thirty years. Perhaps the realization that this group as a whole is of major economic importance has directed attention to it and has given impetus to the large amount of taxonomic work that has been done in this field within recent years. Leafhoppers are all plant feeders and many species are pests of economic crops. They can inflict serious damage to plants and several species are known to transmit plant diseases. Sixty species are now known to be vectors of virus diseases and many more have been incriminated.

In North America there are 15 subfamilies of leafhoppers which include 226 genera. This study includes all species belonging to 13 of the 15 subfamilies found in Michigan. The purpose of this study was to compose keys for the identification of the species found in the state, or those which may occur here, and to summarize available information pertaining to taxonomic work, known hosts, economic importance and distribution of each species in the United States with particular emphasis on Michigan. In all, 87 species are listed in this work. The author believes on the basis of intensive collection records in the literature from similar faunal areas that

perhaps a total of 600 species may be found in the state of Michigan.

Every effort has been made to make this work as complete as possible. However, it should be realized that work of this type is never concluded. The family Cicadellidae is composed of many species with different habits and from day to day new species are discovered and others extend their known ranges. Nevertheless, this work will suffice for those species found in general collecting, and it is hoped, then, as an objective or aim of this work, to aid the student in their identification, to convey information of different species for possible studies of their habits and ecology, and contribute to the knowledge of this group in this section of the country.

II. REVIEW OF LITERATURE

There have been only a few systematic treatises of the Cicadellidae at the state level in the United States. Some of the earliest works of this nature are by Osborn (1915) for the state of Maine and DeLong (1916) for the state of Tennessee. Soon after, the works of Lathrop (1919) for South Carolina, and Lawson (1920) for Kansas appeared. Later a similar work was published for Connecticut by DeLong (1923). Osborn (1928) published on the cicadellids of Ohio, and Johnson (1935) published her work on the newly enlarged subfamily Typhlocybinae for the same state. Within recent years the latest works on the leafhopper fauna of a state have been published include those of Medler (1942) for Minnesota and DeLong (1948), who excluded the large subfamily Cicadellinae because it was under revision, for the state of Illinois.

On somewhat larger boundaries there have been two excellent publications. The most recent one was that by Bierne (1956) for Canada and Alaska. Oman (1949) classified the genera and included a checklist of the leafhopper species of the Nearctic region.

There have been countless revisions of all leafhopper genera. Citations of the revisions for some of the genera are given in the text. Some of the latest revisions in the subfamilies Athysaninae and Cicadellinae, which are not included in this paper, are as follows: Beamer (1938) Acinopterus, (1935) Alapus and Hebecephalus; Bierne (1952)

Macrosteles, (1954) Streptanus; Christian (1953) Typhlocyba; DeLong (1926) Deltocephalus, (1936) Elymana, (1937) Dikraneura, (1937) Cyperana and Paluda, (1939) Scaphoideus, (1936) Forcipata, (1937) Graminella; Hepner (1942) Aligia; Knull (1946) Bandara; Lindsay (1940) Norvellina; Oman (1938) tribe Errhomenellini. Presently under revision is the Erythroneura by H. H. Ross, at the Illinois Natural History Survey.

III. METHODS

Before this study was initiated a preliminary study was made to establish the extent of the leafhopper collection in the university's entomology museum. It was found that although only a few leafhoppers were identified to species there were about twenty thousand unidentified specimens which had already been collected at different areas of the state. The writer was very fortunate in having such a large number as a beginning for a study of this nature. The unidentified specimens were identified to subfamily and their collection data were recorded (Plate 1). However, it was assumed that these leafhoppers were obtained in the course of general collecting for the museum and that no particular attention was given to type of habitat. It was also noted that there were several areas, particularly the Upper Penninsula, where hardly a leafhopper had been collected. The following plan was initiated and eventually executed in order to cover the whole state. From the spring of 1954 to the fall of the same year, and subsequently in similar periods of the years 1955 and 1956, an attempt was made to fill in the areas not previously collected. Particular attention was given to qualitative collecting by collecting in different types of habitats. The last week of August and the first week of September, 1954, and the first two weeks of July 1955, were spent in the Upper Penninsula in order to bring into balance, as much as possible, the collecting in that

COLLECTION SITES OF LEAFHOPPERS IN VARIOUS STATE COLLECTIONS PREVIOUS TO THIS STUDY

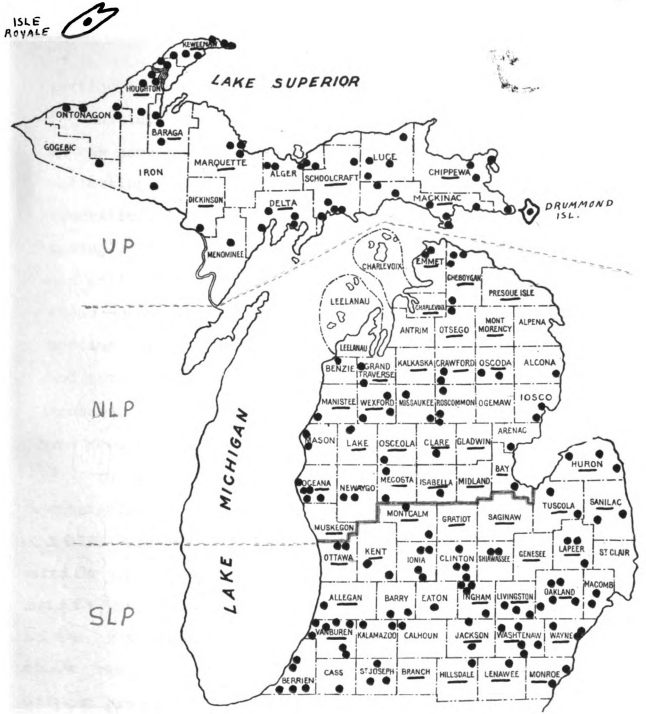
● Museum of Entomology, Michigan State University
✚ Museum of Zoology, University of Michigan
— County records in the Dreisbach collection

Plate 1

COLLECTION SITES FOR LEAFHOPPERS MADE BY THE AUTHOR

● 1954
× 1955
▲ 1956

Plate 2



A SUMMARY OF AREAS WHERE LEAFHOPPERS HAVE BEEN COLLECTED IN THE STATE

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portion of the state with the collecting in the Lower Penninsula. The rest of the state was covered by collecting in the same types of habitats at different times of the collecting period (Plate 2). The material obtained was identified during the inactive seasons (fall, winter and spring). At the end of the collecting program the writer had collected about ten to twelve thousand specimens. When these were combined with the several hundred unidentified specimens from the Museum of Zoology, University of Michigan, and the species data from the private collection of Dr. Robert Dreisbach, Midland, Michigan, it was assumed that the state had been thoroughly surveyed.

The usual method of collecting was to sweep most of the vegetation in a selected area with a sweeping net. Christian (1953) observed that populations in the genus Typhlocyba shift during the day for several species. He believed the shift was caused by difference in temperature or light intensity or a combination of both factors. The writer, assuming that the same factors cause the same effects in species of other groups, collected in the shade and light or sunlight areas of trees and shrubs. Particular attention was given to plants that were suspected of harboring or known to harbor a group or specific species of leafhoppers. Sometimes an aspirator was used to collect leafhoppers from undersides of leaves before sweeping with the net. No special type of support or ladder was carried, but an effort was made to reach

the higher branches. This insured the extensive and as much as possible the complete coverage of the plant. After each collection the contents of the net, whether it be from an area containing a meadow, a group of shrubs or a particular type of plant, was placed in one of twelve killing jars. For this purpose, one-quart wide-mouth carbon tetrachloride, or one-pint wide-mouth Mason jars with cyanide were used. The wide mouth jars were used because it was easier to place the contents of the net in them. The contents of the jar were later transferred to a metal pill box so that the jar was available for re-use.

Often, but not always, an ultraviolet light trap[1] was also used for collecting. This light trap was not used according to the manufacturer's recommendation which suggests the use of cyanide. Instead it was used as a light source for a white sheet, which proved to be practical in that the leafhoppers could be aspirated from the sheet, thus time consumed in sorting them from other insects was eliminated. Electricity was readily available for the trap either at camp sites or near the writer's overnight lodging. The trap was placed in a selected area, often using over three hundred feet of cord to reach the chosen location.

The specimens were mounted on card points in order to avoid pinning the insect directly through the body. This prevented distortion of the dimensions of the pronota and

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[1] Gardner Black light indicator trap, manufactured by the Gardner Manufacturing Co., Horicon, Wisconsin.

prevented breaking the insects on further handling. A colorless nail polish was found best to use as an adhesive in adhering the body of the insect to the card. The sternal area of the insect was adhered to the point, rather than the side of the thorax which is the conventional way. This increased the speed and facility of adhering the specimens to the card point, and the abdomen of the male specimens was severed much more easily. The use of forceps, as is customary, in grasping the tips of the wings of the specimen in order to place it on the card was discontinued early in this study. It was found that no matter how careful one intended to be, the tips of the wings where diagnostic characters were located were sometimes torn off. As a substitute, the technique of placing the specimens on their dorsal sides by rolling them gently with a blunt instrument and "picking" them up with the point containing the adhesive proved useful.

Many workers have used several techniques with many modifications in preparing the male genitalia for study. Young (1952) aptly relates,

> "Techniques are, in the final analysis, individual matters, and there are probably as many techniques and modifications of techniques as there are experts. Any technique which will make the internal male genitalia available for study under very high magnification is a suitable one for this group of insects, provided the structures are not damaged in the process."

The writer used the following technique very successfully. The entire abdomen was removed from the specimen by inverting the pin with the portion normally above the specimen next to

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the edge of a flat surface, such as a table or a desk, and letting the dorsal part of the insect lie evenly on the table near the edge. Then pressure was applied to the base of the abdomen with a blunt instrument, and the severed abdomen was placed in a Syracuse watch glass containing ten percent KOH solution. Ten pairs of such glasses, one containing the caustic potash and the other distilled water, were used. Heat, which is usually used to enhance the dissolution of the sclerotized parts, was not used. Instead all the "clearing" was done at room temperature in the series of paired glasses mentioned above. It was found that when an abdomen was placed in the last watch glass the first was pale enough to be studied or was soft enough for the genital capsule to be opened, in which case the other abdomens were ready in the order they were placed in the watch glasses. Each abdomen when ready was removed and placed in a watch glass containing water. The specimen itself was pinned to a strip of balsa wood next to the watch glass containing its respective abdomen. As soon as the abdomens were transferred from the caustic potash solution to the water another series of abdomens, prepared in the manner mentioned above, could be placed in the solution. One set of genitalia was studied while the following set was in the KOH. Each abdomen remained in the water for at least five minutes, and before each one was studied it was placed in a smaller watch glass or well glass slide containing glycerine. The next step was to study the genital structure under a binocular dissecting microscope.

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The usual magnification used to study the entire insect and the male genitalia was 40, and sometimes when studying smaller specimens 160 power was used. Several times it was necessary to open the genital capsule in order to have the diagnostic parts clearly exposed. This was done by the use of two minuten pins (Minuten nadeln), each inserted on a match stick which served as a handle, to tear away enough of the capsule to expose the genitalia. The needles were used to tease away undesirable parts and manipulated in such a manner as not to injure or dislocate any valuable part, such as a style or an aedeagus in the capsule. When the determination was made the genitalia were transferred to a 4x10 mm. microvial containing three or four drops of glycerine for storage. The vial was then corked and the pin bearing the specimen was inserted at an angle so that the vial lay roughly 45 degrees from the pin, and in this position the glycerine is not in contact with the cork.

There were rare occasions when it was difficult to study the venation or cells of wings in situ, because of the curvature or opaqueness of the wing, or the reflection of light. When this situation occurred it was necessary to remove the wing to study it. The body of a pin was slipped under the tip of the wing and eased toward the base. When near the point of articulation, the pin was given a gentle lift, thus breaking the wing off. The wing was then placed on a glass microscope slide, and xylol was added to keep it flat. Another slide was used as a cover and the mount was placed

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The method used in making drawings proved to be more time-consuming than difficult, and because of the difference in size of many species, 40, 80 and 120 magnifications were used. Whenever genitalia are studied or drawn, several workers use pieces of glass to prop the structure which is submerged in glycerine in order to observe the appropriate angles. In this study it was not deemed necessary because only the lateral and ventral views were used, and the viscosity of the glycerine was sufficient to keep the structure in the desired place. In order to get the same proportions of the specimen in the actual drawing, a grid was used in the ocular of the microscope and a piece of ruled paper which simulated the grid was placed under a sheet of onion skin paper on which the drawing was made with a soft lead pencil. The next step was to invert the onion skin paper on sketching paper. A pencil held at an angle and with pressure was used to shade over the whole drawing. The pressure thus exerted would transfer the outline of the drawing onto the sketching paper. The finished drawing was obtained by going over the lines with a crow quill pen and india ink.

IV. DISCUSSION AND RESULTS

The leafhoppers belong to the order Homoptera and they can be distinguished from the other families by the presence of two rows of spines on the hind tibia. The absence or the presence and position of the ocelli, together with the shape of the vertex, the frontal sutures, the clypeus, the lora, and to some extent, the wing venation, are used to group the subfamilies. The aforementioned areas and the presence of a number of cells or crossveins in the forewings and to a lesser extent, coloration and cells of the hind wings serve to separate them into the genera. The species are largely separated on the basis of wing venation, male genitalic structures, the shape of the female seventh sternite, and coloration, although the latter is less reliable.

Morphological terminology in this work has been limited to that which is necessary in the keys and descriptions, and no details or definitions of structures are given here. However, the terms used are those which have been used by taxonomists of the Cicadellidae for a long time. Plate 4 illustrates a generalized leafhopper with labelled parts so that the reader may find the areas used in the keys. For a more detailed account relating to leafhopper morphology, the reader is referred to such excellent works as Evans (1946), Oman (1949), Kramer (1950), and Young (1952).

Under the descriptions of each species in this work a separate paragraph is given for distribution. Whenever

possible each state is given, but often for the sake of brevity or when knowledge of the distribution is lacking, a generalized area is given. The United States has been divided into the following general areas for this purpose. The "northeastern" region includes New England, New York, Pennsylvania and south to North Carolina; the "southeastern" region includes North Carolina, South Carolina, Florida, and west to Alabama, Tennessee and Kentucky. Occasionally these two regions are referred to as the "eastern" states. The "middlewestern" region, or middlewest, embraces Ohio, Kentucky, west to Kansas in the south and Minnesota in the north. The "southern" region is composed of five states, Tennessee, Alabama, Mississippi, Louisiana and Arkansas. The "southwest" region includes, Texas, Oklahoma, New Mexico and Arizona. The "western" region is the largest, which includes the Dakotas, south to Oklahoma, California in the west and Montana in the north. The "northwestern" region includes Idaho, Oregon and Washington.

Michigan is divided according to the three biotic areas of the Michigan Conservation Department (Plate 2). The "Upper Penninsula" and the "Lower Penninsula" which is divided into the "Northern Lower Penninsula" and the "Southern Lower Penninsula." These two areas are divided by a line running from east to west along the northern border of the following counties: Saginaw, Gratiot, Montcalm, Kent and Ottawa.

The work "host plant" as used in this work, means

merely that the adult was collected from the mentioned plant.

References to specimens from the University of Michigan, the Dreisbach, the DeLong and the author's collections, are indicated with their respective initials in brackets, such as [UM], [DeL], and [CT]. Unmarked references indicate specimens from the Michigan State University collection. Most of the specimens recorded in this study are in the Cicadellidae section of the Entomology Museum of Michigan State University.

Key to Subfamilies

1. Ocelli on face (Fig. 1E)..... 2
   Ocelli proximal to margin of vertex, on disc of vertex or absent..... 4
2. Frontal sutures ending near ocelli; anterior margin of pronotum not extended beyond anterior margins of eyes..... Eurymelinae p.21
   Frontal sutures ending at antennal pits; anterior margin of pronotum extending beyond anterior margins of eye (Fig. 6)..... 3
3. Hindwings with three apical cells.....Macropsinae p. 41
   Hindwings with four apical cells.....Agallinae p. 61
4. Forewings with numerous hairs (Fig. 42).....
   .....Bythoscopinae p. 115
   Forewings without hairs..... 5

Explanation of Plate 4

Fig. 1. Idiocerus lachrymalis, A; adult, B; ventral view of the seventh, eighth and ninth sterna of the male, C; ventral view of the seventh, eighth and ninth sterna of the female, D; ventral view of the external genitalia of the male, E; frontal view of head.

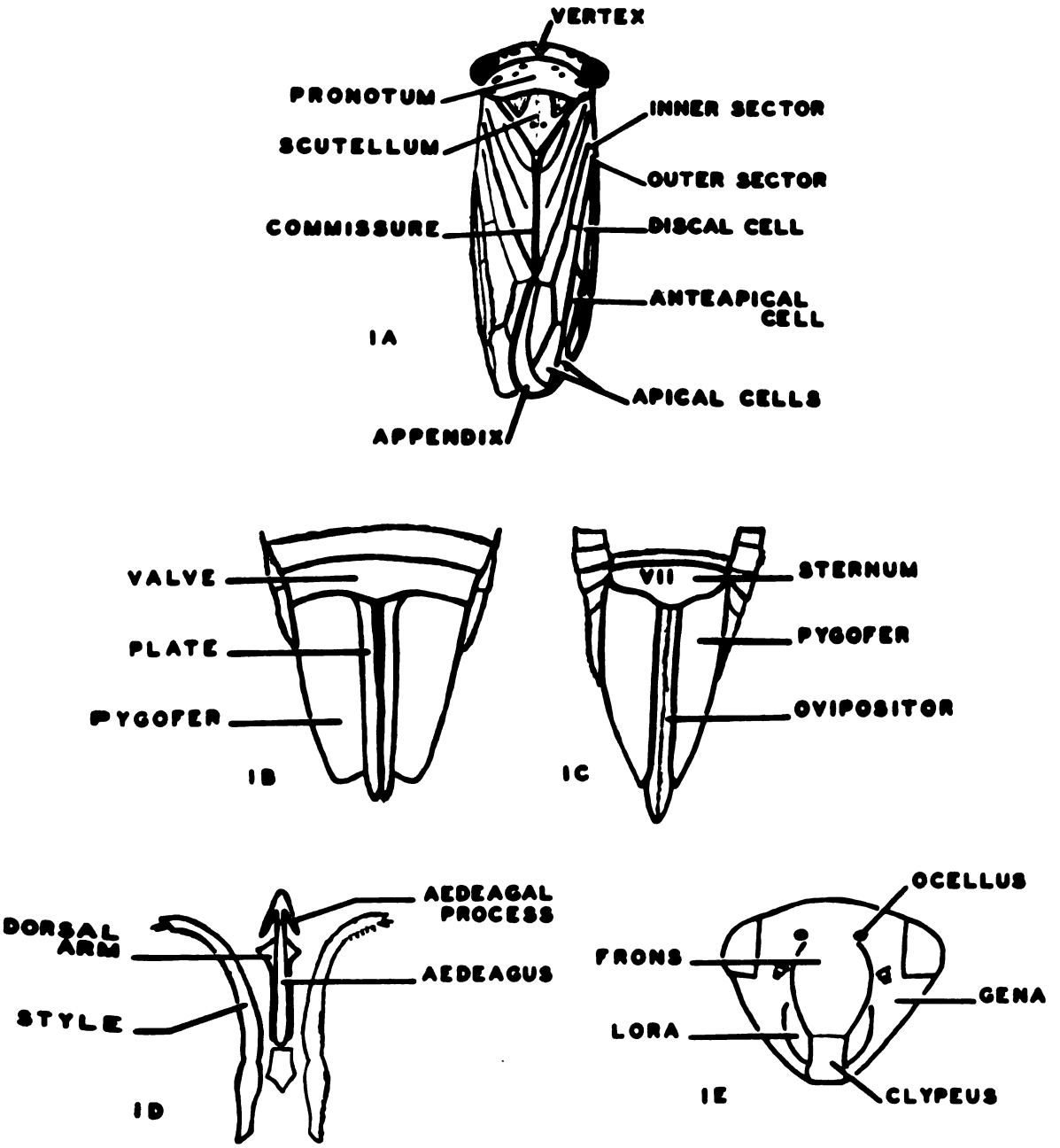

VERTEX
PRONOTUM
SCUTELLUM
COMMISSURE
INNER SECTOR
OUTER SECTOR
DISCAL CELL
ANTEAPICAL CELL
APICAL CELLS
APPENDIX
1A
VALVE
PLATE
PYGOFER
1B
VII
STERNUM
PYGOFER
OVIPOSITOR
1C
DORSAL ARM
STYLE
AEDEAGAL PROCESS
AEDEAGUS
1D
OCELLUS
FRONS
GENA
LORA
CLYPEUS
1E

Plate 4

5. A median carina on vertex and another extending from middle of front margin to each eye (Fig. 7).....
.....Evacanthinae p. 160

Median carina occasionally present on vertex but always lacking on anterior margin..... 6

6. Ocelli on disc of vertex (Fig. 2)..... 7

Ocelli, if present, on margin (Fig. 8), or proximal to margin of vertex, never on disc..... 10

7. Frontal sutures extending over the anterior margin of vertex and terminating at or near ocelli (Fig. 31).....Tettigoniellinae p. 75

Frontal sutures terminating below anterior margin of vertex (Fig. 2)..... 8

8. In profile, face concave (Fig. 60B)..Penthimiinae p. 152

Face not concave..... 9

9. Clypeus small; frons elongate and almost parallel sided.....Ledrinae p. 150

Clypeus large; frons expanding dorsad (Fig. 4).....
.....Gyponinae p. 119

10. Frontal sutures almost parallel, recurved at terminus; ledge above antennal pit oblique (Fig. 5)...
.....Jassinae p. 158

Frontal sutures diverging dorsad, if almost parallel, not recurved at terminus; ledge above antennal pit, when present, transverse.....11

11. Antennal pits with a distinct ledge above (Fig. 4)..
.....Aphrodinae p. 107

Antennal pits without a distinct ledge above..... 12

12. Forewings with veins not branching on disc and crossveins before apical crossveins absent, if branching on disc veins indistinct basally; ocelli often absent.....Cicadellinae

Forewings with veins branching on disc or crossveins present before crossveins of apical cells; brachypterous or macropterous; ocelli usually present..... 13

13. Ocelli equidistant from middle of vertex and eyes (Fig. 8).....Xestocephalinae p.112

Ocelli nearer the eyes than middle of vertex..... 14

14. Anterior margin of vertex thin, sharp and foliaceous and usually strongly produced (Fig. 3).... .....Dorydiinae p. 154

Anterior margin of vertex rounded, sometimes angled, but not thin and foliaceous..Athysaninae

Subfamily EURYMELINAE

The members of this group are easily recognized because of their wedge-shaped appearance. In addition, they have a short vertex with the ocelli on the face; the frontal sutures by-pass the base of the antenna and terminate close to the ocelli. The elytra have a large and conspicuous appendix.

This subfamily is represented in North America by only one genus, Idiocerus. According to Oman (1949), the only

Explanation of Plate 5

Fig. 2. Xerophloea viridis, dorsal view of head.

Fig. 3. Parabolocratus viridis, lateral view of head.

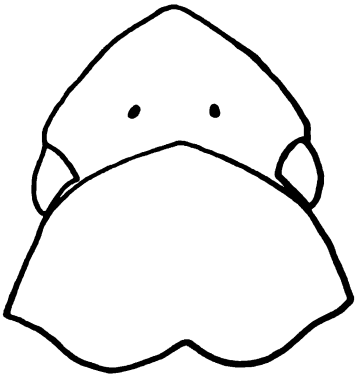
Fig. 4. Aphrodes flavostrigata, frontal view of head.

Fig. 5. Jassus olitorius, frontal view of head.

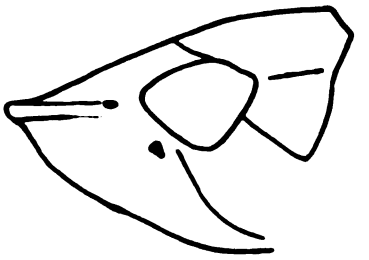
Fig. 6. Oncopsis variabilis, dorsal view of head.

Fig. 7. Evacanthus acuminatus, dorsal view of head.

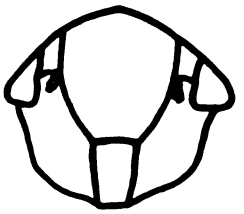
Fig. 8. Xestocephalus nigrifrons, dorsal view of head.



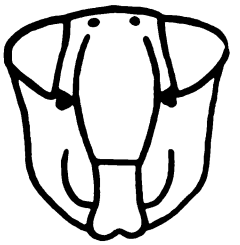
2 XEROPHLOEA VIRIDIS



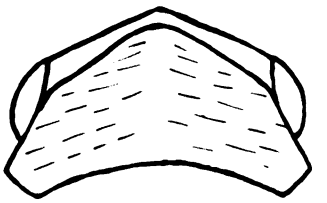
3 PARABOLOCRATUS VIRIDIS



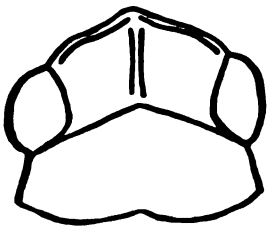
4 APHRODES FLAVOSTRIGATA



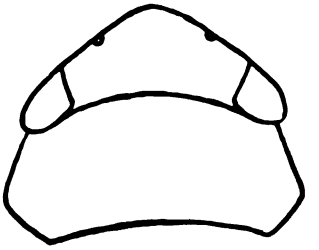
5 JASSUS OLITORIUS



6 ONCOPSIS VARIABILIS



7 EVACANTHUS ACUMINATUS



8 XESTOCEPHALUS NIGRIFRONS

Plate 5

other genus in the Americas is Zinneca, which is found in the Neotropical region.

IDIOCERUS Lewis

Idiocerus Lewis, R. H. 1835. Trans. Ent. Soc. London. 1: 47.

These are wedge-shaped leafhoppers. The head is wider than pronotum; eyes appearing bulbous; ocelli on face and close to each other. Vertex with broadly rounded front, short and parallel margin; pronotum broad. Elytra long, narrow with a broad appendix. Color variation is extensive and only a limited number of species can be definitely identified by external markings. Individuals may exhibit variation not only in color but also in the male genitalia. In many instances populations exhibit color and genitalic gradients, in which case limits are difficult to establish and identifications of these members are difficult and many times impossible to ascertain. P. Ludwig, of the Dow Chemical Co., Midland, Michigan, has undertaken to revise this group.

This group is distributed throughout most of North America, south from the limits of the tree-line, in lowlands and high altitudes wherever the food plants are found. One species, suturalis Fitch, has been found in mountains in Canada, at an elevation of 7,000 ft.; another, alternatus, at 3,200 ft. Food plants consist mainly of Salix, Juniperus, and Populus, and to a lesser extent Cratcagus, Taxodium, Grossularia, Ribes, Libocedrus and on the fruit bearing

plants of Pyrus and Prunus.

There are over eighty species and many subspecies occurring in the United States, twelve of which occur in Michigan.

Key to Species

1. Vertex with two round black spots or markings, often brownish..... 2

   Vertex without definite markings..... 8

2. Vertex with two round black spots (frequently reduced in males of lachrymalis) and a transverse black band..... 3

   Vertex with a transverse black band, often fused with round spots.....lachrymalis

3. Pale green or yellowish in color with a contrasting brown band along commissural line of elytra (Fig. 9).....snowi

   Color not as above nor commissural band present..... 4

4. Clavus with a contrasting yellow band bordered anteriorly by a dark brown or black band.....
   .....provancheri

   Clavus without a yellow band..... 5

5. Round black spots on vertex large, close to eyes.....
   .....fitchi

   Round black spots on vertex small, rarely faint..... 6

6. Veins of corium interrupted with white areas; small, 5.5 mm or less; aedeagal processes short, last ventral segment of female not strongly produced

at center of posterior margin..... 7

Veins of corium not as above; larger, 5.5-8.0 mm.; processes longer; posterior margin of last ventral segment of female strongly produced. (Fig. 1).....lachrymalis

7. Each style with two prominent spines; dorsal arm of aedeagus transversely elongate to sharp pointed process (Fig. 11B); seventh sternum of female slightly produced, notched at center to form a broad round lobe on each side of meson..alternatus

Each style with a single prominent spine; dorsal arm of aedeagus small and round; seventh sternum of female roundedly produced with a shallow mesal notch on posterior margin (Fig. 10).....varius

8. A dark brown band on commissural line, often broad, reaching posterior margin of pronotum and broken at clavus.....saturalis

Band absent from commissural line..... 9

9. Styles with two prominent spines at apex; dorsal arm of aedeagus small and round (Fig. 14); posterior margin of last ventral segment of female broadly and rounded produced, central portion produced beyond rounded margin.....pallidus

Styles with a single prominent spine at apex; dorsal arm transversely produced; seventh sternite of female not as above.....10

10. Styles narrowed to apex; aedeagus with short processes, dorsal arm thinly projected laterally; seventh sternite of female truncate.....nervatus

Styles almost parallel-margined; aedeagus with longer processes and arising subapically (Fig. 13); seventh sternum of female concave on either side of a produced median third.....duzeei

Idiocerus snowi Gillette & Baker

Idiocerus snowi Gillette, C.P. & C. F. Baker. 1895. Colo. Ag. Exp. Sta. Bul. 31, p. 79.

Length 5.25-5.75 mm. Over-all color pale green or yellowish-green. Face yellow or yellowish-green with two round black spots on vertex; pronotum and scutellum unmarked. Elytra subhyaline yellowish-green with contrasting narrow dark brown stripe along commissural line (Fig. 9), sometimes faint; apex of elytra often smoky. Antennae of male without discs. Aedeagus with lateral processes short and arising at about half the distance of the shaft; shaft narrow anterior to the origin of processes, almost parallel margined with a semi-rounded apex. Styles arching outwardly, the inner margin a little depressed near apex; outer margin with a row of short spines. Seventh sternum of female convexly rounded and shallowly emarginate mesally.

This species may be distinguished from suturalis

Explanation of Plate 6

Fig. 9. Idiocerus snowi, adult.

Fig. 10. Idiocerus varius, A; seventh sternum of female, B; dorsal view of aedeagus of male.

Fig. 11. Idiocerus alternatus, A; adult, B; dorsal view of aedeagus of male.

Fig. 12. Idiocerus nervatus, dorsal view of aedeagus of male.

Fig. 13. Idiocerus duzeei, dorsal view of aedeagus of male.

Fig. 14. Idiocerus pallidus, dorsal view of aedeagus of male.

which it resembles by the spots on the vertex and the structure of the male genitalia.

The writer has collected this species from Salix, its reported food plant, and with an ultraviolet light trap.

Distribution: Throughout most of the country. This species is very numerous in the Lower Penninsula of Michigan. MLP. (July 5-Aug. 22), Manistee Co: Manistee; Mecosta Co: Borland; Midland Co; Missaukee Co: Lake City; Muskegon Co: Muskegon Hts.; Roscommon Co: Houghton Lake. SLP. (July 5-Aug. 22), Berrien Co.; Clinton Co: DeWitt; Ingham Co: Aurelius, East Lansing, Dansville; Jackson Co: Jackson; Kent Co: Alto: Monroe Co: LaSalle.

Idiocerus suturalis Fitch

Idiocerus suturalis Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Rep. 4: 59.

Length 5.0-6.0 mm. Background color pale-green or yellowish-green. A wide, sometimes narrow, or faint dark brown stripe along commissural line, often interrupted at apex and middle of clavus. Scutellum and posterior margin often brown. Elytra hyaline towards outer margin; apex often smoky. Male antennae with black elongate discs. Aedeagus narrow with margins parallel except for the base; lateral processes short and arising near apex of shaft. Styles arching outwardly

with margins almost parallel, with single apical spine. Seventh sternite of female roundedly produced and truncate mesally.

This species is closely allied to snowi and is often mistaken for it. The absence of the rounded spots on the vertex, the male genitalia and the last ventral segment of female will distinguish it from that species.

Salix, Populus and Betula are the food plants. It has been found in the Canadian Rockies at altitudes of 7,000 feet. The writer has collected this species from poplar saplings along the shore of Lake Superior and with an ultraviolet light trap.

Distribution: Very common in the eastern states and west to Colorado. This species is numerous and can be collected in most areas of Michigan. UP. (July 7-Aug. 7) Keweenaw Co: Isle Royale; Marquette Co: Marquette; Ontonagon Co: Silver City. NLP. (July 13-Aug. 12) Cheboygan Co: Cheboygan; Kalkaska Co.; Mecosta Co.; Midland Co.; Missaukee Co: Lake City; Montmorency Co: Atlanta; Oscoda Co: Luzerne; Otsego Co: Vanderbilt. SLP. (July 5-Aug. 19) Clinton Co: DeWitt; Gratiot Co.; Ingham Co: Dansville, East Lansing; Jackson Co.; Kalamazoo Co.

Idiocerus pallidus Fitch

Idiocerus pallidus Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Rep. 4: 59.

Bythoscopus obsoletus Walker, F. 1851. Homopterous List of Brit. Mus. 3: 873.

Length 6.0-6.5 mm. Color cream to white, often greenish; elytra subhyaline. Male with large antennal discs. Aedeagus thin and narrowing to a thick rounded apex; lateral processes short and arising subapically. Styles projecting outward, almost parallel margined, narrowed at apex and slightly narrowed one-third the distance from apex. Beginning at apex, outer margin of styles with a row of spines (Fig. 14). Seventh sternum of female strongly produced at central portion of posterior margin.

Closely resembling dugesi in external appearance, but the aedeagus and styles of male genitalia are distinctive.

Salix and Populus are the recorded food plants. The writer has also collected this species from Acer.

Distribution: Transcontinentally distributed in the northern area of the country. This species is more common in areas of the Upper Peninsula of Michigan. Up. (July 10-Aug. 27) Alger Co: Holcomb, Shingleton; Dickinson Co: Vulcan; Keweenaw Co: Gay, Isle Royale; Mackinac Co: Cedarville; Marquette Co: Ishpeming; Ontonagon Co: Bergland. NLP. (July 5-Sept. 12) Isabella Co.; Kalkaska Co.; Midland Co.; Otsego Co. SLP. Ingham Co., July 5, 1940 3♀; Oakland Co., July 4, 1938 [D].

Idiocerus duzeei Provancher

Idiocerus duzeei Provancher, A.L. 1890. Petite faune ent. du Canada. 3: 292.

Idiocerus perplexus Gillette, C.P. & C.F. Baker. 1895. Colo. Exp. Sta. Bul. 31: 76.

Length 6.0-7.0 mm. Generally cream in color, varying from yellowish to almost white, often greenish; elytra subhyaline with apices sometimes fuscous or smoky. Antennal discs of male ovate base of Aedeagus wide and narrowed to a thick rounded apex; lateral processes spine-like, arising subapically. Styles projecting outward, almost parallel margined; outer margin enlarged near apex and abruptly narrowed to pointed apex with a single spine (Fig. 13). Seventh sternum of female convex with central one-third produced.

Reliably distinguished from pallidus by the aedeagus and styles of the male genitalia.

Several specimens were collected from willow, Salix, by the writer, although the common food plant is cottonwood, Populus deltoides.

Distribution: Ranges from the northeastern states to Kansas and Colorado. This species is found in limited areas of the Lower Penninsula, it may be found in other areas of the state in the future. NLP. Cheboygan Co., July 13, 1941 (C. Hubbs) 1♂; Isabella Co., Aug. 11, 1956 (O. Taboada) 6♂ & 1♀; Midland Co., July 7, 1942, 2♀ [illegible].

SLP. Ingham Co.: Aug. 9, 1948 (C.E. Pederson) 1♀, M.S.U., Sept. 13, 1894.

Idiocerus provancheri Van Duzee

Idiocerus provancheri Van Duzee, E.P. 1890. Can. Ent. 22(6): 111.

Length 5.25-5.75 mm. Largely brown in color; face, vertex, pronotum and scutellum, sometimes black with lighter or cream areas, particularly around two black spots on vertex, pronotum and scutellum. Clavus of elytra yellow with inner margin black forming a V-shape; apex subhyaline or smokey towards apex; corium with veins darker, apex smoky with hyaline areas one-fourth the distance from apex. Male aedeagus slowly narrowed to an enlarged and blunt apex; lateral processes absent. Styles acutely angling outwardly; margins almost parallel, inner margin slowly tapered to depressed apex. Seventh sternum of female strongly produced with a median notch.

Easily distinguished from the other species by the conspicuous coloration.

A common species on Crataegus and often on Prunus and Pyrus.

Distribution: Found in the northeastern and midlewestern states to Iowa and Colorado. In Michigan this species is widely distributed. UP. Keweenaw Co., Isle Royale, Aug. 2-7, 1936 (C.W. Sabrosky) 1♂ & 1♀. NLP.

Cheboygan Co., Aug. 31, 1940 1♀ [D]; Midland Co., July 19, 1943 1♀ [D]. SLP. (July 11-Aug. 3) Clinton Co.; Ingham Co: East Lansing; Lapeer Co: Deerfield Township; Macomb Co: Mt Clemens.

Idiocerus fitchi Van Duzee

Idiocerus maculipennis Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Rep. 4: 59.

Idiocerus fitchi Van Duzee, E. P. 1909. Can. Ent. 4(11): 383.

Length 5.25-6.0 mm. General coloration brown; with cream or yellowish areas on face, vertex around the two black spots, pronotum and scutellum. Anterior margin of pronotum with dark markings and posterior margin yellowish; basal angles of scutellum dark, margin yellowish. Elytra mostly subhyaline, with a dark margin near base and a large dark spot on outer margin near apices brown or fuscous, a light spot near apex; clavus with a narrow light stripe. Male aedeagus narrow, tapered from a wide base to an enlarged rounded apex; styles long, narrowed to apical half which project outward. Seventh sternum of female roundedly produced with a small notch on meson.

Coloration and the aedeagus and styles of male genitalia will easily distinguish this species from provancheri.

Food plants Crataegus, Salix, Populus and often

found on Pyrus.

Distribution: Ranges from the eastern states to Iowa. This species has been found in only one locality, but may be found in other areas of the state in the future. SLP. Ingham Co., July 8, 1948 1♀: East Lansing, July 22, 1948 1♀.

Idiocerus lachrymalis Fitch

Idiocerus lachrymalis Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Rep. 4: 58.

Length 6.0-8.0 mm. Coloration cream or yellowish, elytra subhyaline, veins darker. Margin of face and vertex with a transverse dark brown band, rounded projections near meson and near the eyes. The latter often broken from band; male vertex often unmarked. Ocelli concolorous with face; male antennae with elongate discs. Pronotum with brown spots on anterior portion, in male absent, spots next to eyes often remaining. Three wide scutellar markings arising at base, reduced in male. Elytral veins dark, sometimes darker towards apex; commissural line of female and often male broken by a light area near middle and another at apex of clavus. Male aedeagus narrow with lateral processes arising near apex; styles projecting outward; terminus acutely angled to a pointed apex; outer margin with a row of spines, the apical pair of which are more conspicuous and very close

to each other (Fig. 10). Seventh sternum of female with center portion of posterior margin strongly produced.

This species is variable in size, color and markings, however, the genitalia of the male and to some extent the size of the female will distinguish this species in this area.

Populus and Salix are the host plants. The writer has collected the majority of the specimens in the M.S.U. collection with an ultraviolet light trap.

Distribution: This species has been reported from altitudes of 7,000 feet in the Canadian Rockies, and has been recorded from most areas of the United States, except the southern states. Found in widely scattered areas of Michigan. UP. Houghton Co.: Houghton, August 7, 1936 (C. W. Sabrosky) 1♂; Marquette Co.: Marquette, July 7, 1955 (C. Taboada) 14♀ and 6♂. NLP. (July 3-Sept. 9) Bay Co.; Charlevoix Co.: Beaver Isl.; Kalkaska Co.: Sharon; Lake Co.; Midland Co.; Otsego Co.; Roscommon Co. SLP. Gratiot Co.: August 19, 1955 (R.L. Fischer) 1♀; Ingham Co.: East Lansing, August 2, 1940 1♀.

Idiocerus varius DeLong & Hershberger

Idiocerus varius DeLong, D. M. & R. V. Hershberger. 1947. Ohio Jour. Sci. 47(1): 46.

Length 5.0-5.5 mm. Yellowish or ochreous, often, areas with a slight hue of green. Vertex with subhyaline dark

area at apex; two round black spots between eyes on margin of face and vertex, male with additional brown markings next to eyes; face rarely unmarked. Male antennal discs large. Anterior portion of pronotum with black markings, lighter in color or reduced and less conspicuous in female; light areas throughout. Base of scutellum with black spots, other areas variously marked. Elytra hyaline, dark veins on clavus and corium interrupted by light opague areas. Male aedeagus wide at base and tapered to a narrow apex; styles long and narrow with a single spine near apex (Fig. 10B). Seventh sternum of female roundedly produced on posterior margin, a shallow broad mesal notch (Fig. 10A).

This species closely resembles alternatus, but may be reliably distinguished by the male genitalia.

Distribution: Ranges from the southeast to the middle-west. This species is not common in Michigan, but is distributed in different areas of the state. UP. Luce Co., July 13, 1955 (O. Taboada) 1♀; Mackinac Co.: Brevort, August 2, 1936 (C. W. Sabrosky) 4♂ and 4♀; Menominee Co., July 12, 1955 (O. Taboada) 1♂ and 1♀. NLP. Cheboygan Co., July 22, 1932 1♂ [UM]; Missaukee Co.: Lake City, June 20, 1948 (D. Bray) 1♀; Roscommon Co.: Houghton Lake, May 29, 1937 1♀. SLP. Ingham Co.: M.S.U., July 21, 1890 1♂.

Idiocerus nervatus Van Duzee

Idiocerus nervatus Van Duzee, E. P. 1894. Buffalo Soc. Nat. Sci. Bul. 5(16): 205.

Length 4.0-4.5 mm. Pale green in color, scutellum with basal angles brown; elytra subhyaline. Male antennae with small discs. Aedeagus slowly narrowed from a wider base to apex, processes short and sharp; styles which have a single spine curved outward and tapered to apex (Fig. 12). Seventh sternum of female with posterior margin truncate.

This species resembles pallidus but may be distinguished by the single spine on male styles and truncate posterior margin of the last ventral segment of the female.

Food plant Salix.

Distribution: Widely distributed in the eastern half of the U. S. and west to Arizona and California. Only two specimens have been collected in Michigan. NLP. Isabella Co.: Mt. Pleasant, July 11, 1956 (O. Taboada) 1♂ [OT]. SLP. Ingham Co.: M.S.U., May 2, 1892 1♂ (HOLOTYPE).

Idiocerus alternatus Fitch

Idiocerus alternatus Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Rep. 4:59.

Idiocerus interruptus Gillette, C. P. & C. F. Baker. 1895. Colo. Ag. Exp. Sta. Bul. 31, p. 74.

Length 5.0-5.25 mm. Face yellowish with brownish markings; vertex with two black round spots and brownish markings. Pronotum with light line on meson and dark markings near anterior margin. Scutellum with basal angles and two spots on disc black. Dark veins of subhyaline elytra interrupted with light opaque or whitish areas, one such area on

commissural line and another at apex of clavus. Male aedeagus thinly narrowed toward apex, lateral processes short and sharp; styles projecting outward and narrowed toward apices, a pair of spines at each apex followed by smaller and incomspicuous row of spines (Fig. 11B). Seventh sternum of female slightly produced and mesally notched.

This species may be distinguished from lachrymalis by size, absence of transverse black band on vertex, the structures of the male genitalia and last ventral segment of the female.

Food plant Salix and reported by Phillips (1951) on "sour cherry".

Distribution: This species has been reported to inhabit altitudes of up to 3,200 feet in the Canadian Rockies, and widely found in most of the United States, including Michigan. UP. Keweenaw Co: Gay, July 10, 1955 (O. Taboada) 1♀; MacKinac Co: Brevort, Aug. 4, 1936 (C. Sabrosky) 2♀, Naubinway, July 12, 1955 (O. Taboada) 1♀; Menominee Co., July 31, 1952 1♂. NLP. (May 9-Aug. 11) Arenac Co.: Standish; Charlevoix Co.: Hog. Isl.; Clare Co.; Isabella Co.; Midland Co.; Roscommon Co. SLP. Clinton Co., July 9, 1948, 1♀; Ingham Co., Sept. 4, 1948, 1♀, M.S.U., March 23, 1921, 1♀, March 30, 1890, 1♀ & August 12, 1890 1♂; Vanburen Co.: South Haven, May 28, 1891, 1♀.

Subfamily MACROPSINAE

One of the most conspicuous characteristics of this group of leafhoppers is the pronotum, which is angularly produced to anterior margin of eyes or beyond and is rugose or punctured. Some members of the subfamily Agallinae resemble these, but the three apical cells of the hindwing and the small ledge over the antennal pits will readily distinguish the Macropsinae. The vertex is narrow and the ocelli are on the face. The clypeus of these leafhoppers is small and the suture is absent. The frontal sutures terminate at the antennal pits.

Two genera, containing some forty species, are recorded in this subfamily for North America. Both genera are found in Michigan. At least one species, Macropsis trinaculata, which feeds on Prunus, is known to be a vector of a virus disease, Peach yellows. Other species are known to feed on Prunus, Rubus, Betula, Alnus, Juglans, Corylus, Salix, Populus, Quercus, Ulmus and Gleditsia.

Key to Genera

Striae of pronotum transverse: ocelli closer to eyes than meson.....Oncopsis.

Striae of pronotum not as above; ocelli equidistant from eyes and meson (Fig. 15).....Macropsis.

ONCOPSIS Burmeister

Oncopsis Burmeister, H. 1838. Genera quadam insectorum icoribus illustravit el descripsit. p. 27, pl. 10.

These are small leafhoppers, most of them measuring between 3.5-5.0 mm. in length. The vertex is short; ocelli on face closer to eyes than meson. Anterior margin of pronotum acutely or roundedly produced at least to anterior margin of eyes; striae transverse.

The color variation, markings, sexual dimorphism and other diagnostic characters are so minuscule that reliable separation of the species is difficult. A large number of specific names have arisen because of this variation. Bierne (1951) reviewed the group and reduced the twenty-one species previously described for North America to seven, of which four are found in Michigan.

The host plants of the group consist of Betula, Alnus, Juglans, Corylus, Salix, Populus and at least one species, fitchi, feeds on wild species of Prunus.

Key to Species

1. Elytra with five apical and three anteapical cells... 2
   Elytra with four apical and two anteapical cells.....
   .....verticis
2. Female seventh sternite strongly produced and deeply notched at meson (Fig. 20A); male style broad and narrowed near apex (Fig. 20B).....variabilis

Female seventh sternite not as above; male style narrow..... 3

3. Female seventh sternite produced at center portion of posterior margin (Fig. 21A); male style curved and rounded near apex (Fig. 21B).....fitchi

Female seventh sternite not produced but appearing broadly concave (Fig. 22B); male style thin and long (Fig. 22A).....nigrinasi

Oncopsis nigrinasi (Fitch)

Athysanus nigrinasi Fitch, A. 1851. N. Y. Sta. Univ. Reg. Ann. Rep. 4:61.

Length 4.0-5.0 mm. Yellowish to brownish in color with darker brown markings; pronotum with fuscous pits. Female with facial area, and basal angles of scutellum dark brown; elytra subhyaline with light-brown areas. Male fuscous or yellowish-brown with light areas on commissure. Seventh sternum of female broadly and shallowly excavated on posterior margin (Fig. 22B). Male style appearing long and narrow with a sharp tooth at apex (Fig. 22A).

This species can be readily separated from the others by the female seventh sternite and the characteristic narrow style of the male.

It feeds on blue beech, Carpinus caroliniana; also reported on Viburnum and Corylus.

Distribution: Common in the eastern part of the country.

In Michigan, only two specimens have been collected. NLP. Midland Co., July 15, 1947 1♂[D]. SLP. Ingham Co.: M.S.U., June 23, 1890 1♀.

Oncopsis variabilis (Fitch)

Athysanus variabilis Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Reg. 4:60.

Athysanus abietis Fitch, A. 1851. List of the specimens of homopterous insects in the collection of the British Museum. 3, p. 875.

Pediopsis flavescens Provancher, L. 1872. Nat Can. 4:370.

Macropsis clitellarius Provancher, L. 1872. Nat Can. 4:377.

Oncopsis tumidifrons DeLong, D.M. 1923. Conn. Geol. Nat. Hist. Surv. Bul. 34:70.

Length 5.0 mm. This species is extremely variable in color, some specimens are solid in color varying from yellowish to dark brown, others are greenish-yellow with dark claval suture or brown with most of clavus yellowish or light brown. Elytra hyaline or dark brown with hyaline areas.

The only identifying characters for this species is the female seventh sternite, which is strongly produced on posterior margin with a deeply excavated notch at meson and the styles of the male which are broad and narrowed to apex (Fig. 20 A & B).

Betula and Alnus are the food plants of this species. The writer collected a female with an ultraviolet light trap.

Distribution: Transcontinentally distributed on the northern areas of the country. This species has been collected in several areas of the Upper Penninsula. UP. Keweenaw Co.: Copper Harbor, July 8, 1955 (C. Taboada) 2♀; Isle Royale, August 3-7, 1936 (C. Sabrosky) 1♀; Marquette Co.: Huron Mts., July 7, 1921 (T. H. Hubbell) 1♀; Marquette, July 7, 1955 (C. Taboada) 1♀ [CT]; Schoolcraft Co.: Manistique, July 8, 1923 (S. Moore) 1♀. NLP. Emmet Co., July 4, 1910, 1♀.

Oncopsis verticis (Say)

Jassus verticis Say, T. 1830. Jour. Acad. Nat. Sci. Phila. 6:308.

Bythoscopus distinctus Van Duzee, E. P. 1890. Ent. Amer. 6:224.

Length 3.5-4.5 mm. Color yellowish to light brown with fuscous, light brown markings or both. Face yellowish to light brown, usually unmarked. Vertex and pronotum numerously pitted; dark brown areas behind eyes and at basal angles of scutellum. Elytra dark brown, lighter in female and appearing hyaline with whitish areas near apex and at apex of clavus; four apical and two anteapical cells.

This species is readily distinguished from the others in the group by having four apical and two anteapical cells in the forewing.

Feeds on black walnut, Juglans nigra L., and may be found wherever this plant is found.

Distribution: Ranges from Maine south to Tennessee and west to Colorado. This species has been rarely found in Michigan, but no doubt that it may be found in other areas of the state wherever its host plant is present. SLP. Ingham Co.: East Lansing, July 15, 1948, 2♀, August 13, 1948, 1♀, 2♂, M.S.U., July 21 & 29, 1890, 2♂, August 29, 1890, 1♂; Washtenaw Co.: Ann Arbor, June 4 & 15, 1948 (R. F. Hussey) 2♂.

Oncopsis fitchi Van Duzee

Athysanus fenestratus Fitch, A. 1851. N. Y. Sta. Univ. Reg. Ann. Rep. 4:60. Name preoccupied.

Athysanus minor Fitch, A. 1851. N. Y. Sta. Univ. Reg. Ann. Rep. 4:60.

Macropsis ocellatus Provancher, L. 1872. Nat Can. 4:377.

Bythoscopus pruni Provancher, L. 1890. Petite entomologique du Canada. 3:290.

Pediopsis dorsalis Provancher, L. 1890. Petite entomologique du Canada. 3:292.

Oncopsis fitchi Van Duzee, E. P. 1916. Catalogue of the Hemiptera of Am. north of Mex. p. 65. New name for Athysanus fenestratus.

Length 4.0-5.0 mm. Color light brown fuscous, almost black or combinations of dark and light brown, the female

usually yellowish brown. Vertex almost black in males; lighter in females. Face yellowish, male with a transverse black band between antennal pits and four black spots, females with a dark facial patch. Pronotum dark dotted; elytra hyaline with brown or fuscous on clavus, apical cells and crossveins; usually in females the markings are lighter. Female seventh sternite not longer than wide with a shallow emargination on posterior margin (Fig. 21A). Male style narrow, slightly curved with ventral margin rounded near sharp apex (Fig. 21B).

The food plants of this species are **Betula**, **Alnus** and wild species of **Prunus**.

Distribution: Throughout most of the country. This species has been found in scattered points in the state. UP. Delta Co., July 4, 1947, 1♂, [D]; Keweenaw Co.: Brockway Mts., July 11, 1955 (O. Taboada) 1♂, Copper Harbor, July 9, 1955 (O. Taboada) 2♂& 1♀, Gay, July 10, 1955 (O. Taboada) 1♂, Isle Royale, July 18, 1938 (G. Steyskal) 1♂,[UM] ; Luce Co., July 13, 1955 (O. Taboada) 1♀; Mackinac Co.: St. Ignace, July 10, 1927 (S. Moore) 1♂ & 1♀. SLP. Huron Co.: Port Austin, July 18, 1922 (T. H. Hubbell) 2♂,[UM] ; Tuscola Co.: Kinston, July 30, 1955 (O. Taboada & W. Drew) 1♀.

MACROPSIS Lewis

Macropsis Lewis, R. H. 1835. Trans. Ent. Soc. London. 1:49.

Pediopsis Burmeister, H. 1838. Genera quaedam insectorum iconibus illustravit et descripsit. pl. 10.

The average size of these leafhoppers is about 4.5 mm. The vertex is short and parallel margined; ocelli on face about midway between eyes and meson. Anterior margin of pronotum obtusely produced beyond anterior margin of eyes; striae oblique.

The color in this group is extremely variable. At present, coloration is used in separating the species, however, the overlapping is so extensive and there is so much individual variation that it is almost impossible to identify many of the species with certainty. This group was revised by Breakey (1932).

Fourteen of the thirty nine species which are reported for North America, and one subspecies are found in Michigan.

The food plants are Salix, Populus, Prunus, Gleditsia, Quercus and Ulmus.

Key to Species

1. Each elytron with one or more round pellucid white spots..... 2

   Each elytron without pellucid white spots, but often with bands or hyaline areas..... 4

2. Each elytron with one round pellucid white spot, aedeagus long and slender and split at terminus Fig. 17).....insignis

   Each elytron with more than one pellucid white spot.. 3

3. Each elytron with two pellucid white spots, one on corium and one on base of clavus; aedeagus with a slightly enlarged terminus (Fig. 16).....quadrimaculata

Each elytron with three pellucid white spots in a row; aedeagus enlarged at terminus (Fig. 18).....trimaculata

4. Each hind tibia bearing a black spot at base (With black spot at apex of vertex...Subspecies graminea).....virescens

Hind tibiae not spotted as above..... 5

5. Each epimeron with a black spot or band (Fig. 19....

Males..... 6

Females..... 14

Each epimeron unmarked...Males..... 13

Females..... 18

6. Base of each elytron with a broad black band bordering scutellum, remainder dark amber.....basalis

Base of each elytron without black band, if basal part black the remainder of elytron with dark markings..... 7

7. Elytra uniform in color..... 8

Elytra not uniform, but banded or spotted..... 10

8. Elytra amber-brown.....viridis

Elytra not as above..... 9

9. Vertex and pronotum yellowish-green; length 4.5 mm.....trivialis

Vertex and pronotum cinereous-brown to brownish-green; length 5.0 mm.....erythrocephala

10. Elytra with definite or almost continuous transverse bands..... 11

Elytra blackish with hyaline bands ill defined.....nigricans

11. Elytra ferruginous with one hyaline band.....ferruginoides

Elytra with more than one band, not hyaline..... 12

12. Elytra with two narrow dark brown bands, one interrupted at claval suture.....bifasciata

Elytra with two broad dark brown bands, anterior band not interrupted at claval suture.canadensis

13. Cinereous in color; face with circular black spot...tristis

Green in color; face unmarked.....confusa

14. Elytra of uniform color..... 15

Elytra marked with spots or bands..... 16

15. Color green; length 6.0 mm.....erythrocephala

Color yellowish-green; length 5.5 mm.....trivialis

16. Elytra with definite band or bands..... 17

Elytra without definite hyaline bands.....nigricans

17. Elytra ferruginous with a hyaline transverse band...ferruginoides

Elytra grayish hyaline with two fuscous transverse bands.....bifasciata

18. Face with a circular black spot and a band between eyes.....tristis

Face without such markings..... 19

19. Color green..... 20

Color yellowish-green to ferruginous..... 21

20. Length 4.75 mm.....confusa

Length 5.5 mm.....viridis

21. Color ferruginous; elytra with broad black band at base of clavus bordering scutellum.....basalis

Color yellowish-green..... 22

22. Elytra greenish hyaline; extremities of fore and middle tibiae, black.....trivialis

Elytra with two brownish transverse bands; fore and mid tibiae not marked.....canadensis

Macropsis erythrocephala (Gillette & Baker)

Pediopsis erythrocephala Gillette, C. P. & C. F. Baker. 1895. Colo. Ag. Exp. Sta. Bul. 31:72.

Length 5.0-6.0 mm. This species exhibits sexual dimorphism; female green, often fulvous green, elytra hyaline green. Male brown or brownish green marked with fuscous; pronotum and scutellum brown, the basal angles of scutellum with black spots, elytra brownish hyaline. Both sexes with a black spot on each epimeron (Fig. 19).

This species is commonly found on willow, Salix sp.

Distribution: Found in most parts of the country. This

species is found in scattered areas of the Lower Penninsula. NLP. Bay Co., June 25, 1939, 1♀, [D], August 1, 1942, 1♀, [D], Cheboygan Co., July 7, 1918, 1♀, [UM]; Midland Co., July 8, 1934, 1♀, June 21, 1939, 1♀ & July 7, 1942, 1♀, [D]; Otsego Co.: Vanderbilt, July 6, 1955 (O. Taboada) 1♀. SLP. Clinton Co., July 9, 1948, 4♂ & 1♀; Ingham Co., June 30, 1948, 1♀, July 3, 1948 1♀, July 15, 1948, 1♂, East Lansing, July 7, 1948, 1♀, August 19, 1948, 1♀; Jackson Co.: Jackson, August 22, 1948, 1♀; Kent Co.: Alto, June 25, 1937, 1♂: Oakland Co., July 4, 1938, 1♂.

Macropsis insignis (Van Duzee)

Pediopsis insignis Van Duzee, E. P. 1899. Ent. Am. 5(9):171.

Length 4.25-5.0 mm. Reddish brown to grayish brown in color; basal angles of scutellum with darker spots. Elytra usually with a whitish spot at first crossveins and paler at basal portions of costa; veins usually paler.

This is frequently confused with trimaculata, but the aedeagus of the male (Fig. 17) will distinguish it from that species.

Host plant wild plum, Prunus americana Marsh.

Distribution: It is distributed in the states between Colorado and Pennsylvania. Numerous males and females have been collected, in a limited area of state. SLP. (July 8-Oct. 1) Clinton Co.; Ingham Co.: East Lansing.

Macropsis trimaculata (Fitch)

Pediopsis trimaculatus Fitch, A. 1851. N. Y. Sta. Univ. Reg. Ann. Rep. 4:60.

Length 4.5-5.0 mm. Color light-brown to dark-brown. Face sufused with fuscous pits; scutellum with a dark brown spot at basal angles. Margin of vertex and pronotum with fuscous striae; often with a small brown spot behind each eye. Epimera of both sexes black; elytra alternating in shades of brown with a whitish spot at apex, another on anterior and of anteapical cells and another near the branching of the first sector.

This species closely resembles insignis, with which it co-exists on the same host plant, but may be distinguished by the three pellucid white spots on the elytra and the aedeagus of the male (Fig. 18). It is economically important in that it transmits the virus which causes peach yellows. The host plant is wild plum, but as Bierne (1954) points out by being a causual feeder on peach, apricot and grapes, in this manner transmits the virus from plum to peach. The author has collected this species on sour cherry, Prunus cerasus L.

Distribution: Ranges from the eastern states west to Colorado. This species is numerously found in limited but scattered areas of the Lower Penninsula. NLP. Oceana Co.: Shelby, July 9, 1953 (O. Taboada) 2♂. SLP. (July 9-August 17) Clinton Co.; Ingham Co.: East Lansing; Kent Co: Grand Rapids.

Macropsis quadrimaculata Breakey

Macropsis quadrimaculata Breakey, E. P. 1932. Ann. Ent. Soc. Am. 25:832.

Length 4.0-4.5 mm. Color reddish-brown, face fulvous and scutellum with two fuscous triangles at basal angles. Elytra reddish-brown, opaque, each with a pellucid white spot at base of clavus and another on corium.

This species is similar to trimaculata, and insignis, but may be distinguished by the slightly expanded apex of aedeagus (Fig. 16) and from the other species by the coloration of elytra.

Host plants, wild plum, raspberry, Prunus americana Marsh and Rubus sp.

Distribution: Described from specimens from South Dakota, Nebraska, North Carolina, Colorado and Tennessee, and now recorded from Michigan. SLP. Ingham Co., August 17, 1948 7♂ & 5♀; East Lansing, June 22, 1♂; August 17, 2♂♂ 1♀; Oct. 1, 1948, 1♀.

Macropsis tristis (Van Duzee)

Pediopsis tristis Van Duzee, E. P. 1890. Can. Ent. 22(6):249.

Length 4.75-5.5 mm. Color cinereous-brown; face with black band at vertex, rarely broken and a black rounded spot on frons. Scutellum with black spots at basal angles; elytra cinereous hyaline with pale veins.

The black facial markings will distinguish this species

from the others.

Wild plum, Prunus americana Marsh, is its host plant.

Distribution: Eastern half of the U. S. to Colorado. This species has been collected in only one locality, but may be found in other areas of the state in the future. SLP. Ingham Co., August 17, 1948, 1♀, East Lansing, July 3, 1948, 1♂, August 9, 1948 (C. E. Peterson) 1♀.

Macropsis confusa (Breakey)

Macropsis confusa Breakey, E.P. 1932. Ent. Soc. Am. Ann. 25(4):327.

Length 4.0-4.5 mm. Pale or yellowish-green in color; pits of face and rugae of pronotum inconspicuous, cremera of both sexes unmarked. Elytra hyaline, apex faintly smoky..

This species resembles viridis, but it is smaller in size.

The host plant is poplar, Populus sp., but the writer has collected this species from willow, Salix sp.

Distribution: Ranges from the northern states to Wisconsin. In Michigan, this species has been collected from scattered areas of the state. UP. Keweenaw Co.: Gay, July 10, 1955 (C. Taboada) 1♀. NLP. Isabella Co.: Mt. Pleasant, July 11, 1956 (C. Taboada) 1♀; Missaukee Co., July 14, 1945 1♂[D], Aug. 5, 1945 1♂ & 2♀ [D]; Otsego Co.: Vanderbilt, July 6, 1955 (C. Taboada) 1♀.

SLP. (June 25-July 24) Ingham Co.; Kent Co.: Alto.

Macropsis basalis (Van Duzee)

Pediopsis basalis Van Duzee, E.P. 1889. Ent. Am. 5(9):171.

Length 4.0-5.0 mm. Male face, upper portion in female, vertex, pronotum and scutellum ferruginous. Female clytra greenish hyaline with a broad brown almost dark band at base. Epimera marked in male, unmarked in female. Male clytra dark amber with basal band similar to female; triangular brown spots in basal angles of scutellum.

The basal bands of clytra will distinguish the more typical forms of this species from most of the others. There are intermediate color forms within this species which has Populus as its host plant, and the following species; canadensis, host plant Salix; bifasciata, host plant Populus aspen; nigricans and ferrugineifrons, host plant Salix; and others that do not occur in Michigan.

Distribution: Transcontinentally in the north area of the country. This species is found in scattered areas of the Lower Penninsula. NLP. Cheboygan Co., Aug. 10, 1939 (F. Hubbs) 1♀, [UM]; Crawford Co., July 3, 1939 1♀; Gladwin Co., June 23, 1936 1♀, Midland Co., July 13, 1944 1♀. SLP. Ingham Co.: East Lansing, July 7, 1940 2♀.

Macropsis viridis (Fitch)

Pediopsis viridis Fitch, A. 1851. N.Y. Sta. Univ. Reg. Ann. Rep. 4:59.

Length 4.5-5.5 mm. Color in both sexes green to yellowish-green, except male with elytra usually brownish hyaline, occasionally in female. Epimera with a broad black mark.

Resembling confusa, but this species is larger in size and has black spots on epimera.

Host plant willo., Salix sp.

Distribution: Transcontinentally distributed along the northern part of the country. This species has been taken from several areas of the state. UP. Keweenaw Co.: Gay, July 10, 1955 (O. Taboada) 1♂. SLP. (June 5-Aug. 1) Clinton Co.; Ingham Co.: East Lansing, M.S.U.; Ionia Co.: Ionia; Kalamazoo Co.; Kent Co.: Alto, Grand Rapids; Monroe Co.: LaSalle.

Macropsis canadensis (Van Duzee)

Pediopsis canadensis Van Duzee, E.P. 1890. Can. Ent. 22(6):111.

Length 4.75-5.25 mm. Color varying from pale yellowish-green to greenish-fulvous. Elytra in both sexes with two brown bands, the first near the middle and the second near apex. Female head and pronotum yellowish-green or greenish-fulvous; epimera unmarked; elytra

greenish hyaline. Male darker or fulvous, scutellum with brown triangle at basal angles, a red line at middle to the transverse impression; epimera with black spots.

The female may be separated from the female of bifasciata, which it closely resembles, by not having the middle transverse band interrupted at claval suture and black spots on epimera; the male by being smaller than the male of that species.

The host plant of this species is willow, Salix sp.

Distribution: Ranges from Maine to California. In Michigan this species has been found in only one location, but may be found in other areas of the state in the future. U.P. Houghton Co.: Alston, July 11, 1936, 1 .

Macropsis nigricans Van Duzee

Pediopsis trimaculata Van Duzee, E.P. 1889. Ent. Am. 5(9): 172. Preoccupied.

Pediopsis bifasciata Osborn, H. & E.D. Ball. 1898. Proc. Dav. Acad. Nat. Sci. 7:118.

Macropsis nigricans Van Duzee, E.P. 1916. Check list of the Hemiptera of Am. north of Mex. p. 64. New name.

Length 5.0-5.5 mm. Color varying from greenish-fulvous to greenish-brown with black markings. Pronotum with fuscous marks, anterior impressions usually dark brown. Scutellum greenish-fulvous with a brown of black triangle at basal angles. Elytra hyaline with brown to

black marks on basal half, along costa and usually to clavus, and at apex. Epipleura in both sexes with black spots.

Host plant cottonwood, Populus deltoides Marsh.

Distribution: Ranges from the Middlewest to Colorado. This species has been taken in only one locality in Michigan. MLP. Cheboygan Co., July 21, 1932 (J. Leonard) 1♀.

Macrorsis ferruginoides (Van Duzee)

Pediopsis ferruginoides Van Duzee, E.P. 1909. Ent. Am. 5(9): 171.

Length 5.0-6.0 mm. Color ferruginous or reddish; lower half of face and venter yellow. Pronotum dark on disc, marked with fuscous spots behind each eye; scutellum often with five yellow spots. Elytra with a transverse hyaline band before apex (Fig. 15); costa with a yellowish margin.

This species is known to occur on narrow-leaved willows, Salix sp., as host plants.

Distribution: Mostly found in the midwest and west to Colorado, and New Mexico. Only one specimen has been found in Michigan. MLP. Midland Co., July 7, 1942 1♀ [D].

Macrorsis trivialis (Ball)

Pediopsis trivialis Ball, E.P. 1902. Can. Ent. 34(12):304.

Length 4.5-5.5 mm. Female yellowish-green in color, and unmarked, elytra greenish hyaline; epimera unmarked. Male yellowish-green, elytra greenish hyaline and smoky toward apices. Epimera marked with a black spot; the extremities of fore and middle tibia and tarsal claws also black.

The black markings of the fore and middle legs will distinguish this species from viridis.

The host plant of this species is willow, Salix sp.

Distribution: The eastern half of the United States and Colorado. This species is found in limited areas of the state. UP. Houghton Co.: Alston, July 11, 1936 (C. Steinbach) 5♀[UI]. NLP. Missaukee Co.: Lake City, Aug. 6, 1948 (D. Bray) 1♀. SLP. Kalamazoo Co.: Augusta, July 23, 1940 1♀; Kent Co.: Grand Rapids, July 5, 1937 1♀.

Macropsis bifasciata (Van Duzee)

Pediopsis bifasciata Van Duzee, E.P. 1889. Ent. Am. 5(9): 173.

Length 5.0-5.25 mm. Color greenish-red; female elytra grayish hyaline with two transverse dark brown bands, one at middle, interrupted at clavus, and another just next to apex; male elytra brownish hyaline, bands absent. Scutellum with black triangular spots on basal angles; epimera with large black spots.

Host plant is poplar, Populus sp.

Distribution: From the northeastern states west to Colorado. This species has been taken from only one location, but it may be found in other parts of the state in the future. NLP. Roscommon Co., July 8, 1945 1♀, [D].

Macrosis virescens (Gmelin)

Cicada virescens Gmelin in Linnaeus' Syst. Nat., 13th ed. 4:2111. 1788.

Pediopsis virescens Osborn, H. 1915. Me. Agr. Exp. Sta. Bul. 238:90.

Length 4.0-5.0 mm. Yellowish-green in color; elytra greenish hyaline, often smoky apically; scutellum concolorous with pronotum, often basal angles with darker spots. Hind tibia with a black spot. Epimera unmarked.

This is distinguished from the subspecies graminea by the absence of the black spot at apex of vertex.

Host plants include willow, Salix sp., and cottonwood, Populus sp.

Distribution: From the eastern states to Wisconsin. This species has been found in only two localities of Michigan, but may be found in other areas of the state where the host plants are present. SLP. Ingham Co.: East Lansing, July 15, 1948 1♂; Wayne Co.: Plymouth, July 7, 1956 (O. Taboada), numerous males & females.

Macrosis virescens subsp. graminea (Fabricius)

Cicada graminea Fabricius, J.C. 1709. Ent. Syst. Suppl., p. 521.

Pediopsis graminea Osborn, H. 1905. N.Y. Sta. Ent. 20th Rep. p. 505.

Macrosis virescens var. graminea (Fabricius) Weiss, H.B. & E.L. Dickerson. 1919. Jour. Econ. Ent. 12:437.

Length 4.4-5.0 mm. Similar to virescens, green to yellowish-green in color. Both sexes with a black spot on each hind tibia, apex of vertex and epimera.

The black spot on apex of vertex will easily distinguish this form from virescens.

Host plant includes poplar, Populus sp., willow, and Salix sp.

Distribution: Ranges from the eastern states west to Wisconsin. This subspecies has been taken from only two locations in Michigan. SLP. Clinton Co., July 9, 1948 2♂; Wayne Co.: Plymouth, July 7, 1956 (C. Tabeada) 1♂.

Subfamily AGALLIINAE

The pronotum is broadly produced, sometimes angularly, reaching anterior margin of the eyes. The surface is either finely granulate or rugose. The vertex is short and broad, and the ocelli are on the face. Frontal sutures originate from a narrow clypeus, terminating at the antennal pits. Four apical cells are present in the hindwings.

Explanation of Plate 7

Fig. 15. Macropsis ferruginoides, adult.

Fig. 16. Macropsis quadrimaculata, dorsal view of aedeagus of male.

Fig. 17. Macropsis insignis, dorsal view of aedeagus of male.

Fig. 18. Macropsis trimaculata, dorsal view of aedeagus of male.

Fig. 19. Macropsis erythrocephala, frontal view of face.

Fig. 20. Oncopsis variabilis, A; seventh sternum of female, B; lateral view of style of male.

Fig. 21. Oncopsis fitchi, A; seventh sternum of female, B; lateral view of style of male.

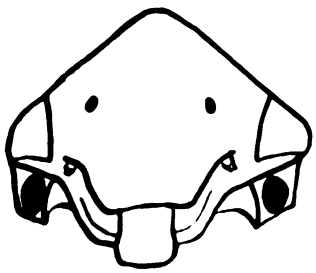
Fig. 22. Oncopsis nigrinasi, A; lateral view of style of male, B; seventh sternum of female.

15 MACROPSIS FERRUGINOIDES

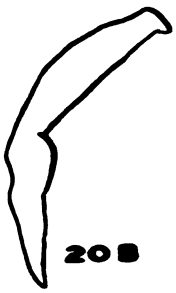
16 MACROPSIS QUADRIMACULATA

17 MACROPSIS INSIGNIS

18 MACROPSIS TRIMACULATA



19 MACROPSIS ERYTHROCEPHALA



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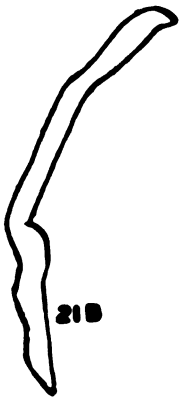
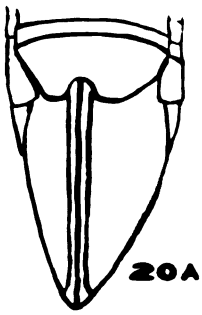


21B



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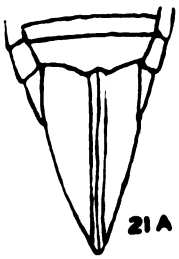
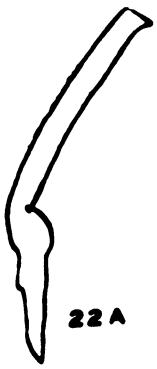


21A

ONCOPSIS VARIABILIS

ONCOPSIS FITCHI



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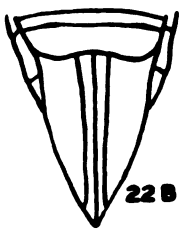


22B

ONCOPSIS NIGRINASI

Plate 7

Gmen (1933) lists three genera and over seventy species for the Nearctic Region. The group as a whole feeds primarily on cereal, forage and truck crops, and may often occur in such large numbers that they become economically important. Eight of these leafhoppers are known to be vectors of virus diseases, of which four occur in Michigan. There are three genera in this subfamily, including six species found in the state, a seventh species may possibly occur here.

Key to Genera

1. Pronotum finely granulated; vertex shorter at meson than next to the eye (Fig. 24A)..... 2

   Pronotum rugulose; vertex longer at meson than next to the eye.....Aceratagallia

2. Posterior margin of head sinuate behind each eye.....

   ..Agalliopsis

   Posterior margin of head not sinuate behind each eye (Fig. 28C).....Agallia

ACERATAGALLIA

Aceratagallia Kirkaldy, G. W. 1907. Sugar Planters Assn. Exp. Sta. Div. Ent. Bul. 3(1):30.

The vertex is short mesally and wide between the eyes, usually longer mesally than next to the eyes; posterior margin broadly rounded and rarely sinuate behind each eye.

Pronotum mostly transversely rugulose with lateral margins short and posterior margin slightly concave. Black color markings when present, in the form of two round spots above the ocelli on the vertex, longitudinal stripes on the pronotum and the triangles on the base of the scutellum; elytra with black and brownish patches.

This genus contains the largest number of species of the subfamily that are important economically. Some of the species are known to feed on forage and cereal crops and weeds, and A. californica Baker, on spruce, Picea sp.

Of the twenty-nine species in the group two have been found in Michigan. A third species possibly may occur in the state as it is within its normal range.

Key to Species

1. Male style twisted (Fig. 23B); seventh sternum of female subtruncate and slightly notched mesally (Fig. 23A).....vulgaris

   Male style not twisted; seventh sternum of female not subtruncate..... 2

2. Male style with a ventral tooth (Fig. 27), plates not reaching apex of pygofer.....accola

   Male style without a ventral tooth (Fig. 25), plates reaching pygofer.....sanguinolenta

Aceratagallia vulgaris Oman

Aceratagallia vulgaris Oman, P. W. 1933. U. S. Dept. Ag. Tech. Bul. 372. p. 60.

Length 2.5-3.0 mm. Color varies from yellowish-brown to dark brown. Vertex with black spots above ocelli, often a dark depressed line on anterior margin of pronotum. In dark specimens, vertex and pronotum with a light stripe on each side of a median dark line. Elytra subhyaline with brown veins. Male styles twisted (Fig. 23B) and plates shorter than pygofer; female seventh sternum subtruncate (Fig. 23A).

This species closely resembles sanguinolenta, but the male genitalia and the female seventh sternum will distinguish it.

Known to occur in praire-type vegetation, Oman (1933) collected it from common ragweed, Ambrosia artemisiaefolia. L.

Distribution: This is a very common species in the eastern United States, west to Colorado and Texas. This species has not been taken in Michigan, but it is possible that it may be found in the state, since the type of vegetation and one of the known hosts are present in many parts of the state.

Aceratagallia accola Oman

Aceratagallia accola Oman, P. W. 1933. U. S. Dept. Ag. Tech. Bul. 372. p. 57.

Length 2.5-3.0 mm. The general coloration is darker than sanguinolenta, which it resembles externally, although it appears more robust in shape. It is easily distinguished from that species by the male style having a ventral tooth (Fig. 27) and the plates being shorter than the pygofer; the female by having rounded lateral angles on the posterior margin of the seventh sternum.

The host plant has not been definitely established, but has been found in grass in Illinois, and in open fields where the vegetation is short. The writer has collected this species from a roadside stand of weeds.

Distribution: Originally described from specimens taken in Washington D. C. and vicinity, and in Illinois. Only one specimen has been taken to date. NLP. Cheboygan Co., July 5, 1955 (C. Taboada) 1♂, [OT].

Aceratagallia sanguinolenta (Provancher)

Aceratagallia sanguinolenta Provancher, A. L. 1872. Nat. Can. 4(11): 376.

Bythoscopus siccifolius Uhler, P. R. 1877. U. S. Geol. & Georg. Surv. Ter. Bul. 3(14): 359.

Length 2.75-3.25 mm. Coloration light-brown with dark-brown or black markings; males darker than females. Vertex with black spots above ocelli and a light brown area next to each eye; a longitudinal brownish line on either side of a pale median line. Pronotum with fuscous markings anteriorly

and with indistinct longitudinal brownish lines. Elytra brownish, veins darker; white areas on clavus and base of corium. Apex of male style foot-shaped sharply pointed (Fig. 25); plates almost reaching apices of pygofer. Seventh sternum of female with slightly produced lateral angles.

Similar to accola, but the male is easily distinguished because of the absence of the ventral tooth on the style.

This species is economically important in that it causes heavy feeding injury to many economic crops such as clover, alfalfa and especially legumes. It is also found on asters and many other herbaceous plants, and is also known to be the vector of potato yellow-dwarf disease. The writer has collected this species from Prunus Cerasus L.

Distribution: This species is very common in the eastern United States, and ranges as far west as Utah and Arizona. In Michigan it is very abundant in many parts of the state. UP. (July 16-Sept. 6) Baraga Co.: Baraga; Keweenaw Co.: Eagle Harbor; Marquette Co.; Menominee Co.: Stephenson. NLP. (April 20-Sept. 1) Cheboygan Co.; Emmet Co.: Good Hart; Iosco Co.: Alabaster; Missaukee Co.: Lake City; Oceana Co.: Shelby; Oceola Co. SLP. (March 7-Oct. 1) Berrien Co.: Buchanan, Niles; Clinton Co.: Bath, St. Johns; Gratiot Co.: Alma; Hillsdale Co.; Ingham Co.: East Lansing, M.S.U.; Jackson Co.: Brooklyn, Jackson; Kent Co.: Grant Rapids; Livingston Co.; Macomb Co.: Romeo, Utica; Oakland Co.:

Pontiac Lake; Ottawa Co.: Holland; Saginaw Co.; St. Joseph Co.: Centerville; Vanburen Co.: Bangor, Grand Junction, So. Haven; Washtenaw Co.: Ann Arbor, Saline; Wayne Co.: Detroit.

AGALLIOPSIS Kirkaldy

Agalliopsis Kirkaldy, G. W. 1907. Sugar Planters Assn. Exp. Sta. Div. Ent. Bul. 3(1): 30.

Head with vertex shorter mesally than next to eyes, posterior margin sinuate behind each eye. Pronotum finely granulate; posterior margin almost straight; lateral margins short. Usually yellowish-brown, often darker; markings consisting of dark round spots. Veins darker than elytra.

The leafhoppers belonging to this group inhabit herbaceous plants, trees and shrubs. Two of the ten species that occur in the Nearctic region have been found in Michigan.

Key to Species

Male plates long and constricted at middle (Fig. 26); seventh sternum of female truncate.....*peneoculata*

Male plates short; seventh sternum of female deeply excavated on posterior margin (Fig. 243).....*novella*

Agalliopsis peneoculata Oman

Agalliopsis peneoculata Oman, P. W. 1933. USDA. Tech. Bul.

No. 374, p. 17.

Length 4.0-4.5 mm. The color is brownish or fuscous with black markings; elytra with transverse smoky bar near first sector. Male plates elongate and constricted at middle (Fig. 26); Seventh sternum of female truncate on posterior margin.

The lateral constriction of the male plates and the truncate posterior margin of the female seventh sternum will easily separate this species from novella.

This species inhabits herbaceous vegetation.

Distribution: Found in the following areas: New York, Illinois, southern Ontario, Quebec and Michigan. This species was described from a holotype male and allotype female, collected by E.D. Ball, at Lapeer, Mich., Aug. 24, 1919.

Agalliopsis novella (Say)

Agalliopsis novella Say, T. 1831. Acad. Nat. Sci. Phila. Jour. 6: 309.

Macropsis nobilis Forbes, S.A. 1885. Ill. Dept. Agr. Trans. p. 22.

Length 3.5-4.0 mm. Color yellowish-brown with darker markings, males often darker. In light specimens markings are faint. Pronotum with a pair of black round spots (Fig. 24A); elytra with light colored veins. Male plates finger-like in shape and shorter than pygofer;

seventh sternum of female with posterior margin deeply excavated. (Fig. 248).

The finger-shape of the male plates and the deep excavation of the posterior margin of the female seventh sternum will separate this species from pereoculata.

This species may be found on alfalfa, clover and several non-economic herbaceous plants. The writer has collected several individuals of this species from Prunus sp.

Distribution: Commonly occurs throughout the eastern half of the country. This species is very common in the Lower Peninsula of the state. UP. Baraga Co.: L'Anse, July ?, 1955 (C. Taboada) 1♀; Menominee Co.: Stephenson, (date?). NLP. (June 6-July 15) Cheboygan Co.: Douglas Lake, Wolverine; Kalkaska Co.; Midland Co.; Missaukee Co.: Lake City; Oceana Co.: Shelby. SLP. (May 20-July 9) Clinton Co.: Bath; Ingham Co.: East Lansing, M.S.U.; Kalamazoo Co.: M.S.U. Biol. Sta.; Livingston Co.

AGALLIA Curtis

Agallia Curtis, J. 1833. Ent. Mag. 1(19): 192.

Head with vertex short and almost uniform in length. Pronotum finely granulate; lateral margins short; in some species posterior margin almost straight, in others concave. Color pale-brown to dark brown, markings darker; elytra with darker veins.

There are ten species in the group, two are found in Michigan.

Key to Species

Male plates depressed near base (Fig. 28B); sternum of female roundedly produced on posterior margin (Fig. 28A).....constricta

Male plates not depressed near base; seventh sternum of female truncate.....quadripunctata

Agallia quadripunctata (Provancher)

Bythoscopus quadripunctatus Provancher, L. L. Nat. Can. 4(11): 376.

Ulopa canadensis Van Duzee, E. P. 1892. Am Ent. Soc. Trans. 19(12): 301.

Length 3.0-4.0 mm. Color varying from pale brown to dark brown. Vertex and pronotum with two black spots; elytra light-brown with pale veins. Male plates finger-like and narrowed to apex; posterior margin of female seventh sternum truncate.

This species resembles constricta, but the absence of a lateral constriction of the male plates and the truncate seventh sternum of the female will separate this species.

This species is known to occur in moist, shaded and open woodlands. Black and Oman's (1947) work indicates that this species normally reproduces parthenogenetically in

eastern United States.

Experimentally, this leafhopper is capable of transmitting Potato yellow-dwarf and Clover big-vein diseases.

Distribution: Commonly found in the eastern United States, north of northern Georgia, Alabama and Louisiana, and west to Oregon and south to California. In Michigan, only females have been found. UP. Schoolcraft Co., July 16, 1946, 1♂, Manistique, July 25, 1945, 1♂. NLP. (May 28-June 26) Mecosta Co.; Midland Co.: Midland; Missaukee Co.: Lake City; Sanilac Co. SLP. (May 11-Sept. 13) Allegan Co.: Fennville; Berrien Co.: Three Oaks; Clinton Co.; Ingham Co.: East Lansing, M.S.U.; Jackson Co.; Kalamazoo Co.: M.S.U. Bio. Sta.; Kent Co.: Alto, Grand Rapids; Lenawee Co.: Hudson; Livingston Co.; Montcalm Co.: Carson City; Oakland Co.: Pontiac Lake; Washtenaw Co.: Ann Arbor; Wayne Co.: Detroit, Garden City.

Agallia constricta Van Duzee

Agallia constricta Van Duzee, E. P. 1894. Can. Ent. 26(4): 90.

Length 3.25-3.75 mm. Usually light-brown in color, rarely dark-brown. Vertex with black spots above the ocelli (Fig. 28C). Posterior margin of pronotum slightly concave, a pair of black spots near the margin; elytra with pale veins. Male plates laterally constricted near the base (Fig. 28B); seventh sternum of female roundedly produced on

posterior margin (Fig. 28A).

The lateral constriction of the male plates and the roundedly produced posterior margin of the female seventh sternum will easily separate this species from quadripunctata.

The species is the vector of Potato yellow-dwarf and Clover big-vein diseases and may be found feeding on clover, alfalfa, potato, weeds and grasses.

Distribution: Most common of the agallian group in the southeastern states and ranging north to New Jersey, and west to Iowa, south to Kansas and Texas. Only a limited number of specimens have been found in the southern part of Michigan. SLP. Allegan Co., August 19, 1956 (H. D. Niemczyk) 2♂; Ingham Co., July 27 & Oct. 8, 1953 1♂, August 19, 1954 1♂; Kalamazoo Co., June 27, 1953 1♂.

Subfamily TETTIGONIELLINAE

This subfamily is characterized by having the ocelli on the disc of vertex. The frontal sutures extend over the anterior margin of the vertex and are near the ocelli. In addition, the members of the group are usually large and have three apical cells in the hind wing.

Seven of the nineteen genera which have been recorded in the United States, occur in Michigan.

Seldom, if ever, members of this group occur in large enough numbers to cause feeding injury to economic plants, their economic importance, however, is due to the fact that

Explanation of Plate 8

Fig. 23. Acerotagallia vulgaris, A; seventh sternum of female, B; lateral view of style of male.

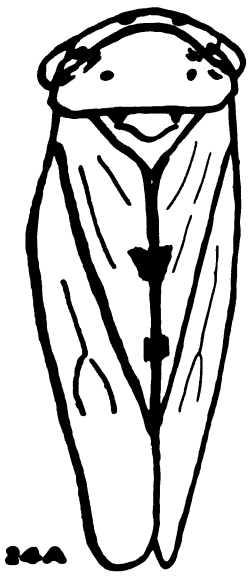
Fig. 24. Agalliopsis novella, A; adult, B; seventh sternum of female.

Fig. 25. Acerotagallia sanguinolenta, lateral view of style of male.

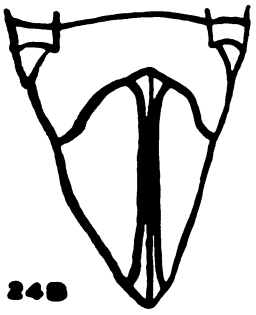
Fig. 26. Agalliopsis reneoculata, dorsal view of male plates.

Fig. 27. Acerotagallia accola, lateral view of style of male.

Fig. 28. Agallia constricta, A; seventh sternum of female, B; dorsal view of male plates, C; adult.

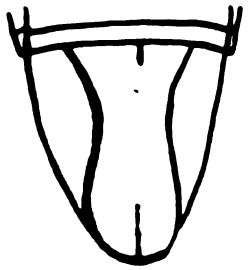


24A

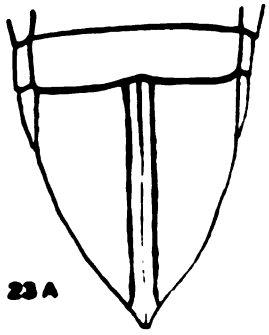


24B

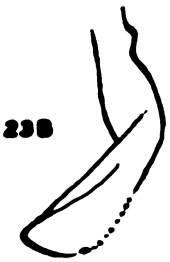
AGALLIOPSIS NOVELLA



26 AGALLIOPSIS PENEOCULATA

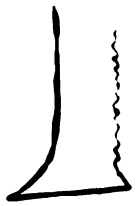


23A

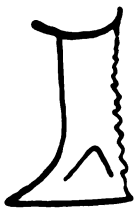


23B

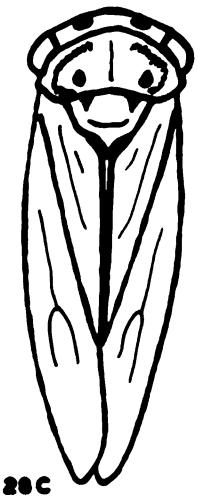
ACERATAGALLIA VULGARIS



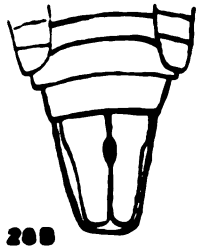
25 ACERATAGALLIA SANGUINOLENTA



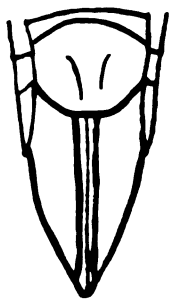
27 ACERATAGALLIA ACCOLA



28C



28B



28A

AGALLIA CONSTRICTA

seventeen species are known to be vectors of plant viruses.

Key to Genera

1. Lateral view of head appearing pointed (Figs. 29 and 30); species green, green with yellow areas or yellowish-green and never with stripes on either thorax or elytra..... 2

   Lateral view of head appearing bulbose or rounded (Figs. 32 and 33); species black to brown or reddish brown, or green with red or black stripes on the thorax and elytra (Fig. 34)..... 3

2. Elytra shiny green and finely punctate, reticulate veined at apex.....Draeculacephala

   Elytra dull green and densely punctate, apical areas not reticulate veined.....Helochara

3. Profile view of head bulbous; at least pronotum irregularly surfaced or coarsely rugose; relatively large species..... 4

   Profile view of head blunt or roundedly angled; rugae absent or at most, the pronotum finely rugose; relatively small species conspicuously banded or striped vertex (Fig. 34)..... 5

4. Vertex with a deep longitudinal furrow (Fig. 31); pronotum almost twice as long as vertex..Aulacizes

   Vertex without a deep longitudinal furrow; pronotum as long as or a little longer than vertex...Cuerna

5. Frontal sutures approach ocelli in an almost straight line; color yellowish-green with transverse black bands on the vertex and thorax and longitudinal black stripes on the elytra.....Kolla

Frontal sutures approach ocelli in an undulating manner or begin from margin of vertex transversely than posteriorly towards ocelli..... 6

6. Vertex with undulating bands in discal area; anterior margin of pronotum and scutellum marked with black spots.....Neokolla

Vertex with a black band along the margin; vertex, anterior of pronotum and scutellum yellow; posterior portion of pronotum green with two red spots; elytra green with conspicuous longitudinal red stripes (Fig. 34).....Graphocephala

HELOCHARA Fitch

Helochara Fitch. 1851. N. Y. State Univ., Regents Ann. Rep. 4:56.

Head wider than long and wider than pronotum. Vertex almost flat; anterior margin bluntly angled. The face in profile appears convex and pointed at apex (Fig. 30). Pronotum densely punctate; longer than vertex, with short lateral margins and a V-shaped notch on the posterior margin. Elytra densely punctate; distinctly veined, with three anteapical cells. Color dull green or yellowish-green.

Two species are known to occur in the U. S. H. communis is widespread throughout the United States and the other, delta, which is the vector of Pierre's disease of grapes, is known only from California.

Helochara communis Fitch

Helochara communis Fitch. 1851. N. Y. State Univ., Regents Ann. Rep. 4:56.

Length of male 4.0-5.0 mm. and female 6.0-7.0 mm. Male with black face and dark concentric lines on margin of vertex; genital plates triangular and elongate. Face of female yellowish green with dark parallel lines converging on center of frons; seventh sternum slightly produced mesally on the posterior margin.

Found along stream banks, marshy grasses and moist low lands.

Distribution: Widespread throughout the U. S. This species has been found only in Michigan's Lower Penninsula. NLP. (June 6-Sept. 8), Cheboygan Co.; Midland Co.: Midland; Missaukee Co.: Lake City. SLP. (March 23-Sept. 24), Clinton Co.; Eaton Co.; Ingham Co.: East Lansing, Dansville; Kalamazoo Co.; Kent Co.; Shiawasse Co.; Van Buren Co.: South Haven; Wayne Co.: Plymouth.

Explanation of Plate 9

Fig. 29. *Draeculacephala mollipes*, lateral view of head.

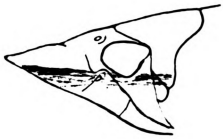
Fig. 30. *Helochara communis*, lateral view of head.

Fig. 31. *Aulacizes irrorata*, dorsal view of head.

Fig. 32. *Neokolla gothica*, lateral view of head.

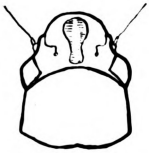
Fig. 33. *Cuerna lateralis*, lateral view of head.

Fig. 34. *Graphocephala coccinea*, adult.



29 DRAECULACEPHALA MOLLIPES

30 HELOCHARA COMMUNIS



31 AULACIZES IRRORATA

32 NEOKOLLA GOTHICA

34 GRAPHOCEPHALA COCCINEA

33 CUERNA LATERALIS

Plate 9

KOLLA Distant

Kolla Distant, W. L. 1908. Rhynchota. 4(1):223.

Head as wide as pronotum; apices subconical with rounded margins. Face in profile almost straight with a rounded apex. Pronotum almost parallel sided; posterior angles rounded, and posterior margin almost straight. Color green or yellowish green with black stripes; vertex and pronotum transversely banded with green, or yellowish green and black. Elytra green with longitudinal stripes and apices smoky.

Four species have been recorded in the United States; only one occurs in Michigan; the others are Middlewestern and Southwestern in distribution.

Kolla bifida (Say)

Tettigonea bifida Say, T. 1831. Acad. Nat. Sci. Philadelphia Jour. 6:313.

Tettigonia tenella Walker, F. 1851. List of specimens of Homopterous insects in the collection of the Brit. Mus. 3:770.

Length 5.5-6.0 mm. Vertex with transverse black stripe between the eyes; black around apical margin, with two median yellow maculae; a black spot at each side between transverse stripes; remainder yellow to yellowish green. Anterior margin of pronotum black with a yellowish stripe immediately behind; posterior margin yellow with a black

stripe immediately in front; remainder yellowish green. Elytra green with longitudinal black stripes; apical portion membranous and dark colored.

This species is known to occur in wet lowlands and meadows.

Distribution: Common throughout the eastern half of the U. S. This species has been collected only from the northern and southern areas of the state. UP. (Sept. 6), Menominee Co.: Stephenson. SLP. (July 8-Sept. 8), Berrien Co.: Benton Harbor; Clinton Co.; Ionia Co.: Lyons; Ingham Co.: East Lansing; Jackson Co.; Kent Co.: Alto; Wayne Co.: Garden City.

NEOKOLLA Melichar

Neokolla Melichar, L. 1926. Annales Historico-naturales, Magyar Nemzeti Museum. 23: 343.

Head as wide or slightly wider than pronotum; vertex with broad rounded margin, apex blunt. Face in profile convex; ledge over antennal pit not prominent (Fig. 32). Posterior angles of pronotum broadly angled; surface slightly irregular. Conspicuously dark striped; with light green, olive, or reddish-brown background, or entirely black.

Four species have been described for the U.S. One occurs in Michigan, the others including the vector of Pierre's disease of grapes, severini, are western and

southwestern in distribution.

Neoconocephalus gothica (Signoret)

Tettigonia gothica Signoret, V.A. 1854. Annales Societe Entomologique de France, Ser. 3, 2: 345.

Length 5.5-6.5 mm. Color extremely variable, from light green, olive, light brown to reddish-brown background. Vertex with a black spot at apex and black undulating stripes continued from the end of dark frontal suture towards the center of disc; stripes often meeting at center or each recurved to form two parallel rectangles between the ocelli. Dark stripe of frontal sutures branching towards apex; a black spot adjacent to eyes large, small or frequently absent. Posterior margin of pronotum shallowly but broadly emarginate; anterior margin with dark markings; disc irregularly splotched with variable dark markings. Elytra with longitudinal black or brownish, often faint stripes.

This species is commonly found on herbaceans vegetation.

Distribution: Common throughout the eastern half of the U.S. The following records indicate that this species is commonly found in the lower Penninsula; UP. (Aug. 26-31), Baraga Co.: Baraga; Mackinac Co.: St Ignace. NLP. (June 6-Sept. 2), Cheboygan Co.: Riggsville; Grand Traverse Co.: Kingsley; Livingston Co.; Mecosta Co.: Big Rapids; Mid-

land Co.: Midland; Missaukee Co.: Lake City; Montmorency Co.: Atlanta; Newago Co.: White Cloud; Oceana Co.: Ferry; Osceola Co.: Reed City. SLP. (April 20-Oct. 10), Clinton Co.: Bath; Ingham Co.: East Lansing; Jackson Co.: Jackson; Kalamazoo Co.: M.S.U. Biol. Sta.: Kent.: Alto; Montcalm Co.: Lakeview.

AULACIZES Amyot & Serville

Aulacizes Amyot C.J.B. and Audinet Serville. 1843. Histoire naturelle des insectes. Hemipteres. p. 571.

Head wider than pronotum; anterior margin of vertex bluntly rounded with a deep longitudinal furrow on disc. (Fig. 31). In profile, face appearing bulbous and with a distinct ledge over the antennal pit. Pronotum longer than vertex; the posterior margin with a shallow notch; surface very irregular and punctate. Large species, at least 10 mm. in length. Color dark brown with ivory markings, and in addition, often with yellow markings.

Two species are known to occur in the U.S.; one is found in Florida, and the other in the southwest and the middlewest.

Aulacizes irrorata (Fabricius)

Cicada irrorata Fabricius, J. C. 1794. Entomologia systematica 4:33.

Length 11.0 mm. Color dark to reddish brown with ivory

and yellow markings. Vertex with large black spots. Pronotum marked with light spots and an occasional yellow spot. Elytra surface rough with yellow and light markings; outer edge with a row of yellow spots.

Occurs on shrubs and herbaceous vegetation.

Distribution: Eastern U. S. and middlewest. This species has been found in the northern part of the state; but may be found in other areas in the future. SLP. Cass Co., Union, June 12, 1955 (R. L. Fischer), 1♂; Kalamazoo Co., M.S.U. Bio. Sta., August 21, 1955 (R. Scheibner) 4♀; July 4, 1956 (R. Scheibner) 1♀.

CUERNA Melichar

Cuerna Melichar, L. 1952. Annales Historico - naturales, Magyar Nemzeti Museum 21:199.

Head slightly larger than pronotum. Anterior margin of vertex rounded. In profile face appears convex with a distinct ledge over the antennal pit (Fig. 33). Pronotum with irregular surface; posterior margin almost parallel with anterior margin. Color brown, dark brown or dark red.

This genus contains fourteen species, two of which are found in Michigan; the others are western and southwestern in distribution.

Key to Species

An irregular light stripe extending from eye along edge

of vertex to the other eye; vertex and pronotum black, densely spotted with white; elytra red or reddish brown with black veins.....lateralis

Light stripe absent; vertex and pronotum scantily spotted with light spots; elytra and veins concolorous dark brown.....limbata

Cuerna lateralis (Fabricius)

Cercois lateralis Fabricius, J. C. 1798. Supplementum entomologiae systematicae. P. 524.

Cercopis marginella Fabricius, J. C. 1803. Systema rhyngotorum P. 96.

Tettigonia striata Walker, F. 1851. List of the specimens of Homopterous insects in the collection of the British Museum 3:775.

Tettigonia lugens Walker, F. 1851. List of the specimens of Homopterous insects in the collection of the British Museum 3:775.

Tettigonia pyrrhotelus Walker, F. 1851. List of the specimens of Homopterous insects in the collection of the British Museum 3:775.

Length 7.0-8.0 mm. Head and remainder of body, excepting elytra, black with numerous ivory colored spots. Face with a narrow ivory stripe along the upper margin of the frons. An ivory band running from the eye along margin of abdomen to pygofer. Hind femora with an ivory stripe along outer

edge. Elytra red with dark veins and dark longitudinal sections in discal areas.

Cuerna lateralis may be distinguished from C. limbata by the presence of a narrow ivory stripe along the upper margin of the frons and the red elytra with the distinguishing black veins.

Herbaceaus plants are the common hosts of this species and is known to be a vector of phony peach disease.

Distribution: From the eastern U. S. to the northwest. The following records indicate that this species, although rarely collected, is distributed throughout most of the state. UP. Alger Co.: Chatham, June 15, 1♂, June 7, 1♀, 1901; Gogebic Co., July 22, 1919 (T.H.H.) 2♀, [UM] Keweenaw Co.: Copper Harbor, August 25, 1954 (C. Taboada), 1♀. NLP. Cheboygan Co., July 21, 1941 (T. W. Porter), 1♂; Emmet Co. August 4, 1918 1♀[UM]; Montmorency Co.: Atlanta, July 20, 1940, 1♀; Missaukee Co.: Lake City, June 22, 1948 (D. Bray), 1♀; Oceola Co., August 6, 1903 (E. H. Frothington) 1♀, [UM]; Presque Isle Co., July 19, 1942, 1♀; Roscommon Co.: Higgins Lake; East Lansing, 1882, 1♀.

Cuerna limbata (Say)

Tettigonia limbata Say, T. 1820. Acad. Nat. Sci. Phila. Jour. 4:340.

Length 8.0 mm. Head and remainder of body, excepting elytra, black with a few ivory or yellowish spots. An ivory

band running from the eye along margin of abdomen to pygofer. Hind femora with an ivory stripe along outer edge, sometimes absent or interrupted. Elytra deep dark brown.

Cuerna limbata may be distinguished from C. lateralis in that the vertex, pronotum and scutellum are scantily spotted with light colored spots. In addition, the elytra and veins are concolorous dark brown.

Bierne (1956) indicates this species is found in the grasslands of Canada. This suggests that it is found in the same habitat in Michigan.

Distribution: From the east to the west coast within the northern portion of the U. S. It is believed that this species will be found in other areas of the state at some future date. SLP. Ingham Co.: East Lansing, April 16, 1889, 1♀; April 17, 1♂, May 1, 1♂-1♀, and May 13, 1♀, 1890; April 27, 1923, 1♂.

GRAPHOCEPHALA Van Duzee

Graphocephala Van Duzee, E. P. 1916. Check list of the Hemiptera (excepting the Aphididae, Aleuroididae and Coccidae) of America North of Mexico. P. 66.

Head nearly as wide as pronotum; vertex flat, anterior margin with a dark stripe and roundedly produced. The face in profile convex. Pronotum wider than long with almost parallel sides, broadest at posterior margin concave and shallowly notched. Elytra with a distinct appendix. Colored

conspicuously with yellow, green or blue, and red or orange.

There are five species recorded in the U. S., one occurs in Michigan and the others, of which versuta is the vector of Phony peach disease are southeastern and southwestern in distribution.

Graphocephala coccinea (Forster)

Cicada coccinea Forster, J. R. 1771. Novae species insectorum; centuria 1:69.

Length 7.5-8.5 mm. Head almost as wide as pronotum; vertex yellow with a black band along the roundedly produced margin; frontal sutures black. Face in profile strongly convex and yellow. Pronotum almost parallel sided; posterior margin concave; anterior margin yellow; posterior portion green or blue with red or orange spots. Elytra green or blue with longitudinal red or orange stripes (Fig. 34).

This species may occur in large enough numbers to cause economic injury to Rubus sp., and ornamental shrubs.

Distribution: Common throughout the eastern half of the U. S. This species is very common throughout the state. UP. (July 8-August 26), Alger Co.: Munising; Baraga Co.: L'Anse; Chippewa Co.: Drummond Island; Dickinson Co.: Vulcan; Gogebic Co.: Keweenaw Co.: Isle Royale; Luce Co.; Menominee Co.: Menominee; Ontonagon Co.: Bergland, Porcupine Mts.: Schoolcraft Co.: Manistique. NLP. (July 18-Sept. 9), Alcona Co.; Cheboygan Co.; Emmet Co.; Isabella Co.; Manistee Co.;

Missaukee Co.: Lake City; Montmorency Co.; Osceola Co.; Otsego Co.: Vanderbilt; Presque Isle Co.; Roscommon Co.: Houghton Lake. SLP. (June 29-Sept. 19), Berrien Co.: Benton Harbor; Calhoun Co.; Hillsdale Co.: East Lansing; Ionia Co.: Ionia; Jackson Co.; Kalamazoo Co.: M.S.U. Biol. Sta.; Kent.: Alto, Grand Rapids; Lenawee Co.; Monroe Co.; Shiawassee Co.: Owosso; Van Buren Co.: Grand Junction.

DRAECULACEPHALA Ball

Draeculacephala Ball, E. D. 1901. Proc. Iowa Acad. of Sci. 8:66.

Head as wide as pronotum or slightly wider. In profile, face appearing pointed, slightly concave (Fig. 29). Vertex flat, with rounded anterior margin somewhat elevated; yellow with dark lines. Pronotum with parallel sides and usually the posterior two thirds green, anterior portion yellow. Elytra dark green with veins raised, often paler in color; apical area reticulate veined.

Sixteen species have been recorded in the U. S., of which three are known to be vectors of virus diseases. Eight species of this group are found in Michigan.

Key to Species

1. Females 2
   Males 9

Length 9.0 mm. Vertex decidely longer than wide....
.....antica

9. Antennal pits dark; dark area of pits extending posteriorly to last thoracic pleuron (Fig. 29. Narrow stripes on edge of vertex between eyes and frontal sutures faint or often absent..... 11

Antennal pits partially dark; dark area beyond pits absent. A broad dark band on edge of vertex between eyes and frontal sutures..... 10

10. A dark triangular spot just back of apex. Dark band between eye and frontal suture linear.....
.....angulifera

Triangular spot absent. Dark bands in front of eyes broad.....prasina

11. Length 6.0-6.5 mm..... 12

Length 7.0-8.0 mm..... 13

12. Vertex longer than wide and longer than pronotum. Terminus of ventral process of aedeagus pointed (Fig. 38A).....mollipes

Vertex as long as wide and a little shorter than pronotum. Terminus on ventral process of aedeagus rounded with a median notch (Fig. 37A).....
.....constricta

13. Brownish vermian markings on anterior portion of pronotum. Length 8.0 mm.....paludosa

Markings absent. Length 7.0-7.5 mm..... 14

14. Ventral process of aedeagus narrow and long with a

rounded terminus and a median notch (Fig. 39A). Tips of paired spine-like structures straight (Fig. 39B).....antica

Ventral process of aedeagus broad and pointed without apical notch. Tips of paired spine-like structures curved dorsally..... 15

15. Ventral process gently sloping posteriorly to a broad neck (Fig. 36B). Paired process extending almost to apex of terminus (Fig. 36A)...producta

Ventral process abruptly curved to a slender neck (Fig. 35B). Paired processes directed towards ventral process and terminating far from apex of terminus (Fig. 35A).....portola

Draeculacephala prasina (Walker)

Tettigonia prasina Walker, F. 1851. List of the specimens of Homopterous Insects in the collection of the British Museum. 3:768.

Aulacizes noveboracensis Fitch, A. 1851. N. Y. State Univ. Regents Ann. Rep. 4:56.

Length of male 8.0 mm. and female 8.5-9.0 mm. Vertex yellow, shorter than wide and shorter than pronotum, in male appearing more blunt; with two black spots near the apex and a broad black band on margin between eyes and frontal sutures, often faint in female. Pronotum wider than long; anterior margin yellow, posterior area dark green;

occasionally, a thin white stripe longitudinally bisecting it and the yellow scutellum. Elytra dark green; margin and apices opaque light colored, margins often yellow; veins white or light colored.

This species may be distinguished from D. angulifera by the broad dark bands on margin of vertex between eyes and frontal sutures. Vertex decidedly wider than long; maculae faint.

Distribution: Common throughout the U. S. The following records indicate that this species is well distributed in the state. UP. (July 7-August 31), Alger Co.: Wetmore; Baraga Co.: L'Anse; Gogebic Co.: Watersmeet; Luce Co.; Mackinac Co.: Cedarville, St. Ignace; Marquette Co.; Ontonagon Co.: Bergland. NLP. (July 6-Sept. 1), Benzie Co.; Cheboygan Co.; Emmet Co.: Good Hart; Oscoda Co.: Luzerne. SLP. (June 10-Oct. 11), Berrien Co.: Benton Harbor; Gratiot Co.; Ingham Co.: East Lansing, Dansville; Jackson Co.; Kent Co.: Alto; Shiawassee Co.: Owosso; Van Buren Co.: South Haven.

Draeculacephala angulifera (Walker)

Tettigonia angulifera Walker, F. 1851. List of the species of Homopterous Insects in the collection of the British Museum. 3:771.

Draeculacephala manitobiana Ball, E. D. 1901. Proc. Iowa Acad. of Sci. 8:70.

Explanation of Plate 10.

Fig. 35-39. Dracculacephala male genitalia.

Fig. 35. portola, A; lateral view, B; ventral view.

Fig. 36. producta, A; lateral view, B; ventral view.

Fig. 37. constricta, A; lateral view, B; ventral view.

Fig. 38. mollipes, A; ventral view, B; lateral view.

Fig. 39. antica, A; ventral view, B; lateral view.

35 A

36 A

35 B

PORTOLA

37 A

36 B

PRODUCTA

37 B

CONSTRICTA

36 A

39 A

35 B

MOLLIPES

39 B

ANTICA

Plate 10

Length of male 7.5 mm. and female 8.5-9.0 mm. In both sexes vertex yellow; anterior margin with at least three parallel submarginal light brown stripes. Dark bands in front of eyes linear. Vertex in male about one-third wider than long; a black triangular macula posterior to two black apical spots, the lateral angles of the macula branch posteriorly and laterally to frontal sutures; a stripe connects the base of triangle and posterior margin of vertex. In female, vertex more angled than male; slightly wider than long. Apical spots of vertex reduced, with two dark brown oblique stripes on either side of median dark brown stripe.

In both sexes, anterior portion of pronotum yellow; posterior portion green, scutellum yellow; elytra dark green, margins opaque light colored to yellow, apices opaque light colored, veins whitish.

The linear dark bands between eyes and frontal sutures, and the vertex being slightly wider than long will distinguish this species from D. prasina.

Distribution: Found in the northern portion of the U. S. from coast to coast. This species is scarcely found in the state. UP. (July 7-Aug. 27), Alger Co.: Shingleton; Dickinson Co.: Waucedah, July (day ?) (W. W. Newcomb) 2♀, [UM]; Gogebic Co.: Watersmeet; Keweenaw Co.: Isle Royale. NLP. (August 6), Missaukee Co.: Lake City. SLP (July 13), Montcalm Co.; Washtenaw Co.: Little Portage Lake, Oct. 7, 1937 (I. J. Cantrall) 1♀,[UM].

Draeculacephala mollipes (Say)

Tettigonia mollipes Say, T. 1831. Acad. Nat Sci. Phila. Jour. 6: 312.

Length of male 6.0 mm. and female 7.5-8.0 mm. Vertex as long as or slightly longer than wide and slightly longer than pronotum. Vertex yellow, narrow light brown markings faint or often absent. Anterior portion of pronotum yellow, posterior portion dark green. Scutellum yellow, elytra concolorous with pronotum; veins often light colored with margins and apices opaque light colored. Male sternal plates long and tapered. In ventral view, apex of ventral process of aedeagus pointed; lateral spine-like processes elongate, curved and extending posteriorly to tip of aedeagus (Fig. 38). In lateral view, caudal portion of ventral process of aedeagus curves upward, anterior portion curved dorsally; spine-like processes with thick basal processes and curved dorsally. Posterior margin of female seventh sternum mesally tapered to a rounded apex.

Draeculacephala mollipes may be distinguished from D. constricta by having the vertex slightly longer than wide and slightly longer than pronotum. Terminus of ventral process of aedeagus of male pointed (Fig. 38).

Distribution: Common throughout the U.S. This species has been found only in the Lower Peninsula. MJP. (Aug. 6), Cheboygan Co.: Cheboygan; Emmet Co.; Osceola Co.;

Oscoda Co.: Luzerne. SLP. (May 25-Sept. 24), Allegan Co.; Clinton Co.: De Witt; Gratiot Co.; Ingham Co.: Dansville, East Lansing; Jackson Co.: Jackson; Kent Co.: Alto; Livingston Co.; Macomb Co.: Utica; Ottawa Co.: Coopersville, Holland; Saginaw Co.; Sanilac Co.: Port Sanilac; St Joseph Co.; Van Buren Co.: Gobles; Washtenaw Co.: Ann Arbor; Wayne Co.: Detroit.

Draeculacephala constricta Davidson & DeLong

Draeculacephala constricta Davidson, R.H. & D.M. DeLong. 1943. Ohio Jour. Sci. 43 (4):193.

Length of male 6.5 mm. and female 8.0 mm. Vertex as long as wide and shorter than pronotum. Light brown longitudinal markings on vertex faint. Anterior portion of pronotum yellow, posterior portion dark green. Scutellum green; elytra dark green with light colored veins; margins and apices opaque light colored. Male sternal plates long and tapered. In ventral view, ventral process of aedeagus narrowed before base, apex rounded and feebly emarginated; lateral spine-like processes wide at base and curved, the tips often cross far before apex of aedeagus (Fig. 37). In lateral view, caudal portion of ventral process of aedeagus slightly curved dorsally; lateral spine-like processes thick at base, extending posteriorly and curved dorsally. Posterior margin of female seventh sternum mesally tapered to a round apex, similar to D. mollipes.

This species may be distinguished from D. mollipes by having the vertex as long as wide and shorter than pronotum. Terminus of ventral process of aedeagus of male rounded with a shallow median notch.

Distribution: Common throughout the eastern and middlewestern states. The following records indicate that this species has not been frequently collected in the Lower Penninsula. NLP. (July 7), Benzie Co.; Cheboygan Co. SLP. (June 12-Sept. 17), Hillsdale Co.; Ingham Co.: East Lansing; Jackson Co.: Brooklyn; Kent Co.: Alto; Oakland Co.: Ottawa Co.: Holland; Shiawassee Co.: Owosso.

Draeculacephala portola Ball

Draeculacephala portola Ball, E. D. 1927. Fla. Ent. 11:35.

Length of male 7.5 mm. and female 9.5 mm. Vertex yellow with faint light brown narrow lines; in female, slightly longer than wide and as long or slightly longer than pronotum; in male, as long as wide. Anterior portion of pronotum yellow; posterior portion dark green. Scutellum yellow. Elytra dark green with light veins, margins and apices opaque light colored. Male plates long and narrowed to a round apex. In ventral view, ventral process of aedeagus curved sharply to form a slender neck; paired spine-like processes extending outward, then curved toward aedeagus, but terminating much before the apex of terminus. In lateral view, posterior portion of ventral process slightly upturned,

anterior portion sharply curved dorsally; spine-like processes thick at base and extending caudally then recurved dorsally far before the apex of aedeagus (Fig. 35). Median area of posterior margin of female seventh sternum produced to form a blunt apex.

The female length (9.5 mm.) and the vertex being slightly longer than wide will distinguish this species from the female of D. producta. The male's ventral process of aedeagus which abruptly curves to form a slender neck and the paired processes which are directed towards the ventral process and terminating far from apex will distinguish this species from the male of D. producta.

This species is the vector of Sugar cane chlorotic streak in sugar producing areas.

Distribution: This species was previously reported from the southeastern states and Illinois, but it is now found in Michigan. UP. (Sept. 7), Alger Co.: Chatham. NLP. (August 17), Muskegon Co.: Muskegon Hts.; ~~NLP~~. Cheboygan Co.: Douglas Lake 1♂ and 1♀ [UM]; SLP. (June 21-Sept. 8), Clinton Co.; Ingham Co.: Dansville, East Lansing; Kent Co.: Alto; Van Buren Co.: South Haven.

Draeculacephala paludosa Ball & China

Draeculacephala paludosa Ball, E. D., & W. E. China. 1933. Kans. Ent. Soc. Jour. 6:3.

Length of male 8.0 mm. and female 10.0-11.0 mm. Vertex

yellow with conspicuous dark narrow lines. Anterior portion of pronotum yellow with brownish vermian markings; posterior portion green. Scutellum yellow, elytra dark green, usually with light colored veins. Margins and apices of elytra opaque light colored. Male genitalia same as portola.

The brownish vermian markings on anterior portion of pronotum, and the length, 10.0-11.0 mm. will distinguish this species from D. portola.

Swamps and marshes are the common habitat of this species, especially bulrushes, Scirpus sp.

Distribution: Transcontinentally distributed on the northern portion of U. S. This species has been rarely collected in the state. NLP. Cheboygan Co.: Cheboygan, July 13, 1939 (F. Hubbs) 1♂ and 1♀: July 28, 1932 (J. Leonard) 3♀, [UM]. SLP. Ingham Co., July 30, and August 1, 1948, 1♀. East Lansing, June 27, and July 6, 1939, 1♀.

Draeculacephala producta (Walker)

Tettigonia producta Walker, F. 1851. List of the species of Homopterous Insects in the collection of the British Museum. 3:772.

Tettigonia acuta Walker, F. 1851. List of the species of Homopterous Insects in the collection of the British Museum. 3:773.

Tettigonia minor Walker, F. 1851. List of the species of Homopterous Insects in the collection of the British

Museum. 3:772.

Draeculacephala cubana Metcalf, Z. P., and S. C. Bruner. 1936. Puerto Rico Univ. Jour. Ag. 20:926.

Length of male 7.0 mm. and female 10.0 mm. Vertex yellow with light brown narrow lines; in female as long as wide and as long as pronotum; male, slightly wider than long and slightly shorter than pronotum. Anterior portion of pronotum and scutellum yellow; posterior portion dark green. Elytra dark green with light colored veins; margins and apices opaque light colored. Male sternal plates long and narrowed to a rounded apex. In ventral view, ventral process of aedeagus gently sloping posteriorly to a broad neck, paired spine-like processes broad at base and extending outward (Fig. 36B). In lateral view, posterior portion of ventral process slightly upturned; anterior process curved dorsally. Spine-like processes slightly enlarged at base, extending posteriorly then recurved dorsally near apex of aedeagus (Fig. 36A). Female seventh sternum strongly produced at central area of posterior margin.

The female species may be distinguished from D. portola and D. antica by the length (10.0 mm.), and by the vertex which is as long as wide and as long as the pronotum. The male species may be distinguished from D. portola and D. antica by the ventral process of aedeagus which gently slopes posteriorly to a broad neck and the paired processes which extend almost to apex of terminus.

Distribution: Originally described from Florida, but

now recorded from Illinois, California, Colorado, Washington and Michigan's Lower Peninsula. NLP. (July 20-August 24), Iosco Co.: Alabaster; Manistee Co.: Manistee; Muskegon Co. SLP. (June 22-Sept. 1), Berrien Co.: Benton Harbor; Clinton Co.; Ingham Co.: Dansville, East Lansing; Jackson Co.; Kalamazoo Co.; Livingston Co.; Wayne Co.

Draeculacephala antica (Walker)

Tettigonia antica Walker, F. 1851. List of the species of Homopterous Insects in the collection of the British. Museum. 3:771.

Length of male 7.0 mm. and female 9.0 mm. Vertex yellow with faint light brown narrow lines; in female, decidedly longer than wide and longer than pronotum; male, slightly longer than wide and as long as pronotum. Anterior portion of pronotum yellow; posterior portion dark green. Scutellum yellow, elytra dark green with light colored veins; margins and apices opague light colored. Male sternal plates long and narrowed to rounded apices. In ventral view, ventral process of aedeagus narrow and long with rounded terminus and a median notch; base of paired spine-like processes broad, sloping to narrow tips which extend beyond apex of aedeagus (Fig. 39). Female seventh sternum concavely then roundedly produced towards center of posterior margin.

The length of the female (9.0 mm.), and the vertex which is decidedly longer than wide, will distinguish this

species from D. portola and D. producta. The male's ventral process of aedeagus, which is narrow and long with a rounded terminus and a median notch and the paired spine-like structures which are almost straight will distinguish this species from the males of D. portola and D. producta.

Distribution: Common throughout the eastern and middlewestern states. This species has been collected from one location in Michigan's Upper Penninsula, however, it may be more widespread than the records indicate. UP. (July 8), Dickinson Co. NLP. (June 6-August 7), Cheboygan Co.; Emmet Co.: Good Hart; Manistee Co.: Manistee; Oceana Co.: Shelby; Roscommon Co.: Houghton Lake. SLP. (May 5-Sept. 8), Clinton Co.: Bath; Ingham Co.: East Lansing; Jackson Co.: Jackson; Kent Co.: Alto, Grand Rapids; Livingston Co.; Macomb Co.; Ottawa Co.: Holland; Shiawassee Co.: Owosso; Wastenaw Co.: Ann Arbor, Dexter; Wayne Co.: Garden City.

Subfamily APHRODINAE

The most distinguishing character of this group is the ocelli which are distant from the eyes and just poterior to the margin of the vertex. The head is as wide as the pronotum or slightly wider. In addition, the vertex appears depressed and angularly produced between the eyes.

The species of this group are similar to the Xestocephalus in that they normally stay close to the ground in decaying vegetation and roots of herbaceous plants. However,

they are often collected with a net.

This subfamily contains only one genus.

APHRODES Curtis

Aphrodes Curtis, J. 1833. Ent. Mag. 1(19):195.

Acucephalus Germar, E. F. 1833. Silbermann's Revue Entomologique. 1:181.

Pholetaera Zetterstedt, J. W. 1838. Insecta Lapponia. Col. 288.

Head shorter than pronotum but as wide or slightly wider. Pronotum sloping to a depressed vertex; anterior margin of vertex thin, sometimes acute and upturned. Ocelli distant from eyes and slightly above the margin. Vertex and pronotum rugose or granulose; elytra without appendix.

The species generally appear stout, but the coloration varies from dark to light brown with darker brown spots or markings, light bands on the pronotum and vertex, hyaline areas or some combinations of the aforementioned colors.

Except for one species, the coloration of the males is unreliable as a diagnostic character, however, the male genitalia are the most reliable for the separation of most of the species. All six species that occur in the U. S. appear to spread out fan-like from their center of distribution in the northeastern area. None are found in the west or southwest and three are found in Michigan.

Key to Species

1. Males with a yellow transverse band on pronotum (Fig. 44B); aedeagus without processes arising at apex of shaft (Fig. 44A); females 7.0-8.0 mm. in length.....*costata*

   Males without transverse band; aedeagus with a pair of processes arising at apex; females 7.0 mm. or less in length..... 2

2. Aedeagus with one pair of processes arising at middle of shaft (Fig. 43); females not more than 4.5 mm. in length.....*flavostrigata*

   Aedeagus without processes arising at middle of shaft (Fig. 41); females not more than 7.0 mm....*agrestis*

Aphrodes costata (Panzer)

Cicada costata Panzer, G. W. F. 1799. Faune Insectorum Germanicae. 61:14.

Cicada nervosa Shrank, F. von. 1781. Enum. Ins. Aust. 252.

Cercopis strigata Fabricius, J. C. 1803. Syst. Rhyng. 96.

Cercopis transversa Fabricius, J. C. 1803. Syst. Rhyng. 96.

Cercopis rustica Fabricius, J. C. 1803. Syst. Rhyng. 97.

Cercopis striatella Fabricius, J. C. 1803. Syst. Rhyng. 98.

Acucephalus bicinctus Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Acucephalus cardui Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Acucephalus faciatus Curtis, J. 1836. Brit. Ent. 13, pl.620.

Acucephalus obscurus Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Acucephalus pallidus Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Acucephalus rugosus Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Acucephalus sparsa Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Acucephalus unicolor Curtis, J. 1836. Brit. Ent. 13, pl. 620.

Aphrodes pulverulenta Curtis, J. 1837, Brit. Ent. 14, pl. 633.

Acocephalus Adustus Hardy, J. 1850. Trans. Tyneside Nat. Club. 1:429.

Length 5.5-8.0 mm. Vertex angularly produced between the eyes and thin margined; shorter than pronotum. Striae on vertex longitudinal; on pronotum transverse. Pronotum with light or yellowish transverse band; faint on light forms (Fig. 44B). A similar band is often present on vertex between the eyes. Elytra concolorous with vertex and pronotum, in darker forms main veins, especially outer claval vein hyaline. Aedeagus without lateral processes arising at apex of shaft (Fig. 44A).

Female not banded on pronotum or on vertex. The general coloration is of some shade of brown with irrorations or spotted. There are no reliable characters to separate the females. However, the males may be easily separated from the other species by the banded pronotum and the aedeagus.

Distribution: This species is recorded from across the northern part of the U. S. and is widely found in Michigan. UP. (July 11-August 2) Chippewa Co.: M.S.U. Sum. Camp; Luce Co.: Manistee Lake, Newberry; Mackinac Co.: Brevort; Menominee Co.; Ontonagon Co.: Silver City; School-

craft Co.: Manistique. NLP. (July 7-August 2) Cheboygan Co.: Cheboygan; Mason Co.; Missaukee Co.: Lake City. SLP. (June 13-July 29) Calhoun Co.; Clinton Co.: De Witt; Hillsdale Co.; Huron Co.: Pigeon; Ingham Co.: East Lansing, M.S.U.; Jackson Co.: Brooklyn; Kalamazoo Co.: Augusta; Lenawee Co.; Washtenaw Co.: Ann Arbor; Wayne Co.: Detroit.

Aphrodes flavostrigata (Donovan)

Cicada flavostrigata Donovan, E. 1799. Brit. Ins. 8:88.
Jassus rivularis Germar, E. F. 1821. Mag. Ent. 4:89.

Length 3.0-4.5 mm. Vertex angularly produced with thin anterior margin; shorter than pronotum. In profile, vertex depressed; frons subconvex. General coloration light to dark brown with darker markings or irrorations, in addition, elytra with hyaline spots scattered throughout, a few along margins. Male aedeagus with a pair of processes arising at middle of shaft (Fig. 43); seventh sternum of female with a deep "V"-shaped notch at middle of posterior margin.

The deep "V" notch of the female seventh sternite and the lateral process of the male which are at the middle of the aedeagal shaft will easily separate them from the other species.

Distribution: This species has been recorded only from N. Y., Ohio and Vt. In Michigan it has been rarely collected, but its sites indicate that it is spread throughout the state. UP. Menominee Co., July 12, 1955 (C. Taboada) 1♀. NLP.

Cheboygan Co., July 20, 1932 (J. Leonard) 1♂: August 7, 1939 (Hubbs) 1♀,[UM] ; Crawford Co.: Higgins Lake, Summer 1932 (Keller) 2♀,[UM] . SLP (July 13-August 25) Ingham Co.: East Lansing.

Aphrodes agrestis (Fallen)

Cicada agrestis Fallen, C. F. 1806. Nya Handl. Svenska Vet. Akad. 27:23.

Tettigonia mixta Say, T. 1825. Acad. Nat. Sci. Phila. Jour. 4:341.

Length 5.0-7.0 mm. Vertex angularly produced between the eyes and shorter than pronotum. General coloration light to reddish-brown with darker brown irrorations; elytra lighter in color.

Male with one pair of processes at apex of aedeagus shaft (Fig. 41). This character serves to distinguish this species from costata and flavostrigata. The characters of the female are not as dependable as those of the male.

This species may be found in grasses of moist lowlands.

Distribution: This species is widespread in the northeastern and midwestern states. Only one specimen has been found in Michigan. SLP. Livingston Co., Mar. 3, 1938 (I. J. Cantrall) 1♂, [CT].

Subfamily XESTOCEPHALINAE

The Xestocephalinae include some of the smaller leaf-

hoppers, usually not exceeding 4 mm. in length. They are robust, the head narrower than pronotum and bluntly rounded anteriorly. Ocelli on anterior margin of head and distant from the eyes. Antennae are near the eyes.

Only one genus is recorded in the United States for this subfamily.

XESTOCEPHALUS Van Duzee

Xestocephalus Van Duzee, E. P. 1894. Buffalo Soc. Nat. Sci. Bul. 5(16):214.

The members of this genus are robust and small leafhoppers. The head in lateral view is bluntly rounded, in dorsal view the vertex is distinctly produced between the eyes. The ocelli are near the eyes. Head narrower than pronotum. Pronotum broad; appendix of forewings small or absent.

The general coloration is from dark brown to light brown with spots. The present system of separating the species depends on color and markings. Until better diagnostic characters are found, they will continue to be difficult to separate.

This subfamily and the Aphrodinae are composed of species that stay close to the ground in decaying vegetation and roots of herbaceous plants. There are fourteen species found in the United States, two of these are found in Michigan.

Key to Species

Vertex and pronotum dark brown, almost black; unmarked..
.....nigrifrons
Vertex and pronotum pale brown, with hyaline markings
(Fig. 40).....pulicarius

Xestocephalus pulicarius V. D.

Xestocephalus pulicarius Van Duzee, E. P. 1894. Buffalo Soc. Nat. Sci. Bul. 5(16):215.

Length 2.5-3.75 mm. Vertex shorter than wide and shorter than pronotum. Anterior margin of vertex roundedly produced between the eyes. Overall color pale brown with darker markings on vertex, pronotum and elytra (Fig. 40). Hyaline markings on pronotum and elytra, often prominent; some markings on claval area meeting at commissure to form a "V."

Distribution: Recorded throughout the eastern half of the country. Five specimens have been recorded, but their points of collection indicates that this species may be better distributed than the records indicate. NLP. Missaukee Co.: Lake City, August 28, 1947, 1♀. SLP. Ingham Co.: East Lansing, August 14, 1956 (H. D. Niemczyk) 2♀, M.S.U., June 23, 1920, 1♂; Monroe Co.: La Salle, Sept. 2, 1920, 1♀.

Xestocephalus nigrifrons Osborn

Xestocephalus nigrifrons Osborn, H. 1915. Maine Ag. Exp.

Sta. Bul. 238:109.

Length 2.0-2.5 mm. Vertex shorter than wide and shorter than Pronotum. Anterior margin roundedly produced between the eyes; face dark. Gross appearance dark brown or black. Vertex, pronotum and elytra uniformly dark brown; often inconspicuous light areas around margins of wings.

Distribution: This species is distributed throughout the eastern states. In Michigan, it has been found in only one location. The habit of the adult of staying close to the ground in decaying vegetation and roots of herbaceous plants makes it more difficult to find; perhaps this is the reason why it has not been found elsewhere in the state.
SLP. Cass Co.: Union, June 12, 1955 (R. L. Fischer) 5♀.

Subfamily BYTHOSCOPINAE

The leafhoppers of this group are easily distinguished by the presence of short hairs on the elytra, the short vertex and their robust appearance.

Two genera, Stragania and Pachyopsis, are found in the United States.

STRAGANIA Stal

Stragania Stal, C. 1859. Handligar Kongliga Svenska Vetenskaps-Academiers. 3(6):49.

Gargaropsis Fowler, W. W. 1896. Biologia Centrali-Americana, Homoptera. 2:167.

The head is narrower than pronotum, with the vertex short. The ocelli on face near the margin of vertex. Pronotum and scutellum transversely stiate. The elytra are broad and clothed with many hairs.

There are 22 species in this group recorded in the United States. They are primarily distributed in the southwest and west to California. S. apicalis, one of the four eastern species has been found in large numbers in Illinois, and it is suspected that it occurs in Michigan.

Stragania apicalis (Osborn & Ball)

Macropsis apicalis Osborn, H. & E. D. Ball 1898. Davenport Acad. Sci. Proc. 7:64.

Macropsis alabamensis Baker, C. F. 1900. Psyche. 9:58.

Length 4.5-5.0 mm. Color varies from its usual bright-green to yellowish. Elytra hyaline-green with greenish hairs (Fig. 42); often with brownish markings. General appearance is short and robust. Vertex wide and parallel margined; posterior margin concave. Appendix of elytra broad. Male valves produced posteriorly; seventh sternum of female roundedly produced and with a mesal notch.

Distribution: Distributed from the southeastern to the middlewestern states. Up to date this species has not been collected in Michigan, but since the host plant, honey locust, Gleditsia sp. is present in the state, it should be found here.

Explanation of Plate 11

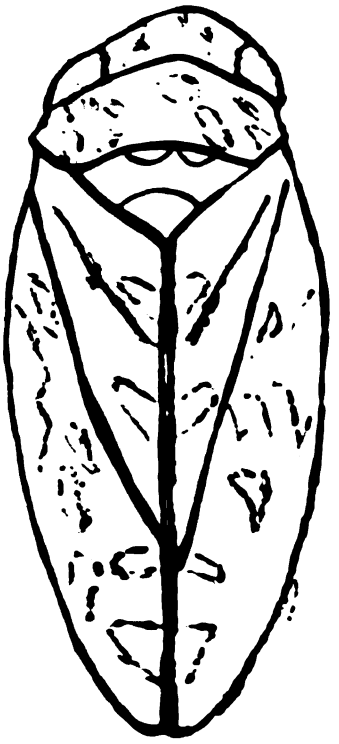
Fig. 40. *Xestocephalus pulicarius*, adult.

Fig. 41. *Aphrodes agrestis*, aedeagus of male.

Fig. 42. *Stragania apicalis*, adult.

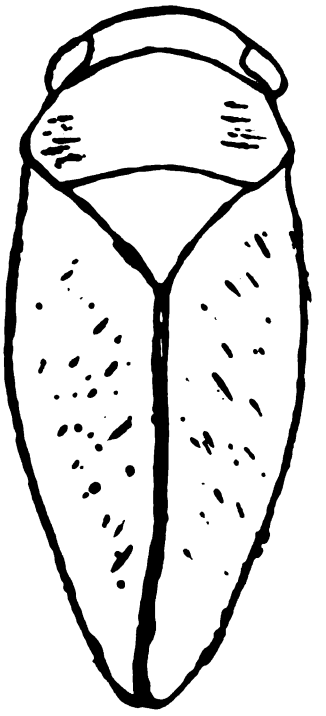
Fig. 43. *Aphrodes flavostrigata*, aedeagus of male.

Fig. 44. *Aphrodes costata*, A; aedeagus of male, B; adult male.



40 XESTOCEPHALUS PULICARIUS

41 APHRODES AGRESTIS

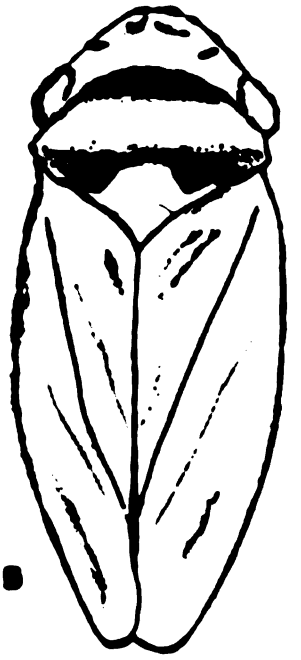


42 STRAGANIA APICALIS

43 APHRODES FLAVOSTRIGATA

44 A

APHRODES COSTATA



44 B

Plate 11

Subfamily GYPONINAE

The members of this group are large, most are 8-9 mm., robust and somewhat depressed. The head is usually produced, the margin of vertex is sharp, but sometimes rounded as in the genus Polana. The ocelli are on the disc of the vertex and are far from the eyes, rarely close to the margin.

DeLong (1942) lists 11 genera and 158 species for the United States, Canada and Mexico. In the United States, the majority of the species are distributed in the southeast to the southwest and occur on many types of vegetation.

Four genera are found in Michigan.

Key to Genera

1. Anterior margin of vertex in profile thickened.....
.....Ponana

Anterior margin of vertex sharp or foliaceous..... 2

2. Elytra reticulate veined, at least on apical portion; appendix narrow..... 3

Elytra with reticulations absent; appendix broad.....
.....Gypona

3. Elytra, usually the vertex and pronotum, appearing rugose or roughened.....Rugosana

Elytra, vertex and pronotum not rugose or roughened..
.....Gyponana

GYPONA Germar

Gypona Germar, E.F. 1821. Magazin der entomologie. 4: 73.

Large, stout and appearing depressed. Pronotum broader than vertex, lateral margins thin; at least central portion transversely striated. Anterior margin of vertex thin and foliaceous; in dorsal view rounded or slightly angular; surface finely striated. Appendix of forewing broad. The general coloration is usually yellowish-green to green, frequently some species exhibit sexual dimorphism in color and size. Usually in the light forms a round black spot is present on pronotum behind the eye; spots not visible in black males.

One of the eight species that are recorded for the United States, occurs in Michigan, the others are western and southwestern in distribution.

Gypona melanota Spangberg

Gypona melanota Spangberg, J. 1878. Bihang till Kongliga Svenska Vetenskags-Akandemiens Handlingar. 5: 19.

Gypona dorsalis Spangberg, J. 1878. Bihang till Kongliga Svenska Vetenskags-Akademiens Handlingar. 5: 30.

Gypona bipunctulata Woodworth, C.W. 1887. Ill. State Lab. Nat. Hist. Bul. 3(2): 30.

Gypona nigra Woodworth, C.W. 1887. Ill. State Lab. Nat. Hist. Bul. 3(2): 31.

Length of male 8.5-9.0 mm. and female 9.0-11.5 mm.

The females are yellowish-green to green in color; vertex, pronotum and scutellum in males vary from dark-brown to dark gray, to shiny black with yellow margins; elytra somewhat lighter in color. Light forms with a conspicuous dark round spot on pronotum behind the eye, absent or reduced in dark forms.

Males with aedeagal shaft thick, apex blunt; lateral processes long, their sharp ends extending to about midpoint of the shaft. Posterior margin of last ventral segment of female broadly V-shaped with a shallow mesal notch.

This species has been found commonly on Quercus.

Distribution: From northeast to Colorado and Idaho. It is not commonly found in the Lower Penninsula of Michigan. NLP. Bay Co.: Bay City, Sept. 17, 1948 (D. Bray) 1♂; Crawford Co., Sept. 10, (year) 1♂ [UM]; Mecosta Co., August 10, 1935 1♀ [D]; Midland Co., August 4, 1930 1♀ [D]; Roscommon Co.: Houghton Lake, August 11, 1956 (C. Taboada) 1♂. SLP. (July 24-August 23) Ingham Co.: East Lansing; Van Buren Co.: Lawton.

PONANA Ball

Ponana Ball, E. D. 1920. Ent. Soc. Am. Ann. 13(1): 93.

Large, averaging 8 mm. in length, stout and appearing more cylindrical than depressed. Head conspicuously narrower than pronotum. Anterior margin of vertex blunt, transversely striated with a transverse depression immediately behind the

apical margin in both dorsal and ventral aspects. Striae of vertex mostly transverse; ocelli on disc large, located about half the distance between eye and meson. Pronotum somewhat convex sloping to vertex; central portion transversely straited. Elytra with well developed appendix. Color, in general, is usually straw-yellow, yellowish-green to orange and variously marked with fuscous areas or spots. The coloration of the species is constant and the separation of the species in Penera is primarily on these color characters. Very few diagnostic characters are based on male genitalia.

There are twenty-two species recorded in the United States, most of which occur in the southeast and the southwest, and variously distributed in the northeastern half of the country, including adjacent areas of Canada.

Tilia is reported to be the plant food of puncticolis. Perhaps this is an indication that other species, for which no food plants have been recorded, are also woody plant feeders.

Key to Species

1. Elytra with central area dark-brown to almost black; costal areas, vertex and pronotum yellow to yellowish-orange.....pectoralis

Elytra same color throughout with spots or irrorations.2

2. Vertex and pronotum marked with small red dots.....
.....Scarlatina

Vertex and pronotum without red dots..... 3

3. Anterior margin of pronotum with black spots; elytra sparsely spotted.....quadralaba

Anterior margin of pronotum without spots; elytra heavily marked with dark brown spots.....rubida

Porpona scarlatina Fitch

Gypona scarlatina Fitch, A. 1851. N.Y. State Univ. Regents Ann. Rep. 4: 57.

Gypona irrorata Spangberg, J. 1878. Bihang ill Kongliga Svenska Vetenskaps-Akademien Handlinger. 5: 60.

Gypona spadix DeLong, D.M. 1918. Ohio Journ. Sci. 18(8): 235.

Gypona modora Ball, E.D. 1920. Ent. Soc. Am. Ann. 13(1): 96.

Length 8.5-9.0 mm. Head narrower than pronotum; vertex broadly rounded and about twice as wide as long. Brown to yellowish-brown. Vertex and pronotum marked with numerous small red dots; in well marked specimens the entire dorsal surface heavily marked with red dots. Elytral veins often red. In ventral view, lateral process of male aedeagus forceps-like in structure; shaft with a small pair of curved lateral processes at apex. Posterior margin of seventh sternum of female concavely excavated on either

side of a slightly notched broad median lobe.

Distribution: This species is widely distributed in the eastern United States and west to Kansas and Texas. Only seven specimens have been found in Michigan, but they may be found in other areas of the state in the future. MP. Cheboygan Co., July 16, 1931 (C.W. Sabrosky) 1♂; July 2, 1950 1♂ [D]; Clare Co., July 3, 1938 1♂ [D]; Midland Co., May 29, 1937 1♂ [D], July 8, 1937 1♂ [D]; Roscommon Co., June 14, 1936 1♂ [D], June 11, 1939 1♂ [D].

Ponana quadralaba DeLong

Ponana quadralaba DeLong, D.M. 1943. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 98.

Length 7.0-8.5 mm. Head narrower than pronotum; vertex broadly rounded and about one-half as long at meson as width between the eyes. General color is yellow to yellowish-brown; often, six black spots or blotches near anterior margin of pronotum. Ventral view of lateral processes of aedeagus of male enlarged at about middle; median shaft narrow and long with long divergent slender pointed apices which are inwardly curved, between which is a membranous wall up to one-fourth from the apices. Seventh sternum of female with median third slightly produced; broadly and shallowly notched at middle forming a pair of rounded lobes.

Distribution: Primarily middlewestern in distribu-

tion and ranging east to New Jersey, south to Kentucky and Tennessee then west to Nebraska and southwest to Texas and Arizona. Only two specimens have been collected in Michigan and both are from the same location. SIP. Ingham Co., East Lansing, July 22, 1941 and Aug. 8, 1947 1♂.

Penana pectoralis (Spangberg)

Gypona pectoralis Spangberg, J. 1878. Bilhang till Kong-Liga Svenska Vetenskaps-Akademiens Handlingar. 5: 46.

Gypona albimarginata Woodworth, C.W. 1887. Ill. State Lab. Nat. Hist. Bul. 3: 31.

Gypona bimaculata Woodworth, C.W. 1887. Ill. State Lab. Nat. Hist. Bul. 3: 32.

Gypona woodworthi Van Duzee, E.P. Can. Ent. 46(11): 389.

Length 9.0-10.0 mm. Vertex broadly rounded; width between eyes about twice the length. Pronotum wider than head. Vertex, pronotum, costal areas of clytra yellow to yellowish-orange, often including the anterior half of claval area. Central area of clytra and apical portion dark-brown to black, usually with subhyaline areas with brownish spots. Some specimens show some feeble contrast in colors. Male genitalia in ventral view with lateral processes broad at enlarged at median area and almost straight to pointed apices; aedeagus slender, enlarged near terminus to form two sharp processes. Posterior margin of seventh sternum of female broadly notched at middle and

broadly joined on either side.

Distribution: Recorded from the District of Columbia, Mississippi, Ohio, Illinois, Kansas, Texas and now from limited, but widely distributed areas of Michigan. MTP. (June 6 - Aug. 3) Charlevoix Co.: Boyne Falls; Cheboygan Co.; Emmet Co.; Midland Co.; Oceana Co.; Roscommon Co. STP. Allegan Co., Fennville, June 16, 1936 (I.C. Gentner) 1♀; Kalamazoo Co., M.S.U. Bio. Sta., July 6, 1956 (R. Hodges) 1♀; St Joseph Co., Mottawa, June 23, 1943 (C.W. Sabrosky) 1♀; Oakland Co., June 19 (year ?) 1♂ and 1♀, [UM]; Washtenaw Co., Ann Arbor, June 17, (year ?) 1♂ and 1♀, [UM].

Ponana rubida DeLong

Ponana rubida DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 95.

Length 9.0-10.0 mm. Pronotum wider than head; length of vertex a little more than half the width between the eyes. The coloration is yellowish-brown to smoky-brown; elytra with many dark-brown spots which vary in number and size, often some are linear. In ventral view, lateral processes of the male aedeagus is forceps-like with blunt terminal apices; central shaft long and slender, somewhat constricted before a pair of small terminal pointed processes. Seventh sternum of female slightly produced posteriorly on either side of a median shallow notch.

The absence of the black spots on the pronotum easily

distinguishes this species from quadrulaba, and the distinctive lateral processes on shaft of aedeagus.

A male was collected by the writer with an ultraviolet light trap.

Distribution: This species is primarily distributed in the midwestern states, including the southern part of the adjacent provinces of Canada, and east to Pennsylvania. It has rarely been collected in Michigan, but its locations indicate that it is distributed throughout the state. UP. Marquette Co., July 7, 1955 (S. Takeuda) 1♂. NLP. Wexford Co., July 16, 1940 (D. Bray) 1♂. SLP. Ingham Co., East Lansing, July 14, 1939 1♀ and July 20, 1940 1♂; Livingston Co., June 26, 1939 1♂ [UM]; Kalamazoo Co., June 27, 1953; Washtenaw Co., Ann Arbor, June 29, 1922 (F.H. Wurbell) 4♂ [UM].

RUSSANA DeLong

Russana DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 34.

Slender leafhoppers appear depressed, stout and large, varying in length from 7.0 mm to 12.0 mm. Head narrower than pronotum; anterior margin of vertex sharp or foliaceous. In general, very similar to Gyponana, but elytra and often the vertex and pronotum conspicuously rugose. Elytra with many crossveins at apex; appendix narrow. Color usually straw-yellow.

The nine species of this genus are southeastern in distribution, however, querci is found in Michigan, the eastern and northern states.

As far as is known the members of this group feed on different species of Quercus.

Rugosana quercí DeLong

Rugosana quercí DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, p. 9.

Length 9.0-10.0 mm. Head narrower than pronotum; vertex broadly rounded, about twice as wide as long; lateral view depressed and foliaceous. Coloration pale-yellow or straw-yellow; sub-red orange stripes on vertex and pronotum. Elytra rugose and very cross-veins at apex; often elytra are so colored as to accentuate the rugae. Male aedeagus distinctive: in ventral view, apex with finger-like projection, base of which gives rise to two long processes and crossing at apex of projection and giving the appearance of two crossed swords. Seventh sternum of female subtruncate deeply excavated, the center of which bears a centrally notched median lobe extending to one-third of the excavation.

Quercus is the host plant of this species.

Distribution: This species, in addition to being found along with the other members of the genus in the southwest, is also widely distributed in the eastern and

southeastern states. In Michigan, although rarely found, may be more widespread than its records indicate. W. Chippewa Co., Drummond Isl. Aug. 30, 1954 (R.L. Fischer) 1♂. HLP. Wexford Co., Lake City, July 16, 1940 (D. Gray) 1♂. SLP. Genesee Co., Flint (Date?); Ingham Co., Aug. 31, 1942 1 , Sept., 5, 1940 1♂, & Sept. 8, 1939 1♂.

CYRTONA Bell

Cyrtonia Bell, E.D. 1926. Ent. Soc. Am. Ann. 13(1): 84.

Large, averaging about 9 mm. and only a few 7, or 11 to 12 mm. in length; depressed with head nearly or than pronotum . Vertex flat and broadly rounded with foliaceous margin ; pronotum convexly sloping to vertex, central portion transversely strailed. Elytra reticulate veined, more pronounced at apex; appendix narrow. The color varies from pale-green to yellow, or yellowish-brown, in a few red, or with reddish longitudinal lines on vertex and pronotum. The structural characters and colors are so similar that only the male genitalia may be relied upon to separate the species. The females are not separable.

This genus constitutes the largest group in this subfamily. DeLong (1942), lists 65 species for North America. About two-thirds are found in the eastern half of the U.S. The others are southwestern, western and northwestern. Thirteen species are found in Michigan.

This genus oviposits in twigs of perennials and feeds

on trees and shrubs in the early and late part of the season. However, during the middle of the season they feed on herbaceous plants. Severin (1946), has shown that basta, which is found west of Missouri, transmits aster-yellows in California.

Key to Species

1. Terminal processes short and twisted or looped..... 2

   Terminal processes of various lengths, not twisted or looped..... 3

2. Terminal processes with basal half at right angles to aedeagus, other half twisted and curved (Fig. 46). .....octolineata

   Terminal processes looping near base, often towards each other (Fig. 50).....serpenta

3. Processes about two-thirds or more the length of aedeagus..... 4

   Processes about one-half or less the length of the aedeagus..... 7

4. Shaft of aedeagus enlarged at center; processes broadly arching to base of aedeagus (Fig. 49)..... .....ringua

   Aedeagus shaft not enlarged at center..... 5

5. Processes crossing each other..... 6

   Processes not crossing each other (Fig. 45).....mali

6. Processes crossing each other at about half the

distance of shaft; apical third of style finger-like and slightly curved, middle third wide with two closely opposed enlargements on ventral margin (Fig. 54).....vinculo

Processes crossing each other close to apex; apical two-fifths of styles slightly curved, ventral margin with enlargements widely separated (Fig. 53).....tenella

7. Processes about one-fourth the distance of shaft..... 8

Processes about one-third to one-half the distance of shaft..... 9

8. Processes divergent and arising from narrow apex of shaft; base of aedeagus wide and tapered to apex (Fig. 57).....brevihama

Processes with convergent apices and arising from a wider aedeagus (Fig. 56).....arcta

9. Processes about one-half the length of shaft..... 10

Processes about one-third the length of shaft..... 12

10. Aedeagus shaft enlarged at terminus; processes extending basally, the apical portions converging on shaft (Fig. 51).....lamina

Aedeagus slender at terminus; processes not convergent..... 11

11. Base of aedeagus wide and rapidly tapered to a long narrow shaft; processes arising near the apex, extending outwardly then basally to about half

the length of shaft (Fig. 52).....tetenta

Base of aedeagus very broad, slowly tapering to a slender apex; processes parallel to shaft (Fig. 47).....salsa

12. Processes arising some distance from apex of aedeagus 13

Processes arising near or at the apex..... 14

13. Processes extending laterally, then curving basally; aedeagus narrowed near middle and enlarging towards apex (Fig. 49).....extenda

Processes somewhat straight and diverging from shaft; apex of aedeagus constricted near origin of processes (Fig. 58).....tubera

14. Aedeagus broad; processes arising from wide apex and paralleling shaft (Fig. 58).....panda

Aedeagus narrower and tapering apically; processes slender arising from narrow apex (Fig. 55)...amara

Cyphonana pingua DeLong

Cyphonana pingua DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 37.

Length 10.0 mm. Structural characters similar to the other species in the group. Color pale-yellow and resembling octolineata, by having reddish or faint orange longitudinal stripes on vertex, pronotum and scutellum. Aedeagus in ventral view enlarged at center portion with

lateral processes arising before a narrow apex and arching basally to about two-thirds the length of shaft. Apical third of style curved, serrated on ventral margin and with a tooth midway, then curved dorsad to a blunt tip (Fig. 49). Seventh sternum of female with posterior margin broadly and concavely rounded.

Distribution: This species is northeastern and southeastern in distribution, ranging through the following states, Maine, Maryland, Florida and Tennessee, and is now recorded in Michigan from only two locations. 1♂. Cheboygan Co., Burt Lake, July (day?), 1932 (C. Peet Jr.) 1♂. SLP. Ingham Co., East Lansing, Aug. 25, 1♂ and Aug. 31, 1940 2♂.

Gyponana Vincula DeLong

Gyponana vincula DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, p. 47.

Length 9.0-10.0 mm. Similar to other species of the genus and resembling octolineata, by having reddish or faint orange longitudinal stripes on vertex, pronotum and scutellum. The general coloration is pale-yellow. In ventral view, male aedeagus appearing wide at base and gradually tapered to a slender apex. Lateral processes long, arising near apex, crossing each other and extending more than two-thirds the distance towards base (Fig. 54). Apical third of style about same width and slightly

Explanation of Plate 12

Figs 45-53 Gymnura male genitalia. Ventral view of aclasper on left and lateral view of stylo on right.

Fig. 45. mali

Fig. 46. octolineata

Fig. 47. salsa

Fig. 48. extenda

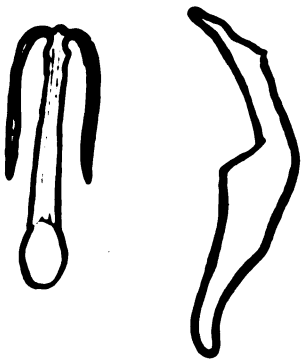
Fig. 49. pinqua

Fig. 50. serpenta

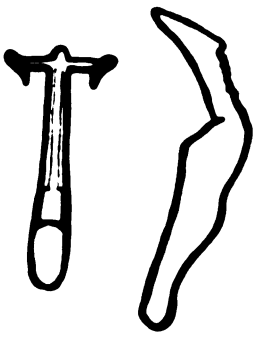
Fig. 51. lamina

Fig. 52. preterta

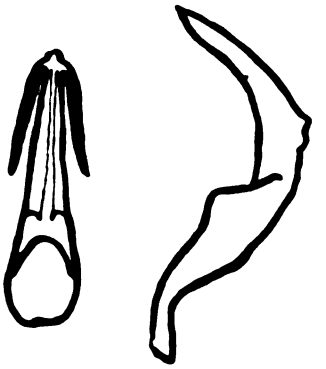
Fig. 53. tenella



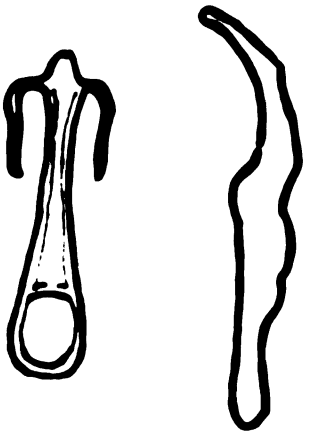
45 MALI



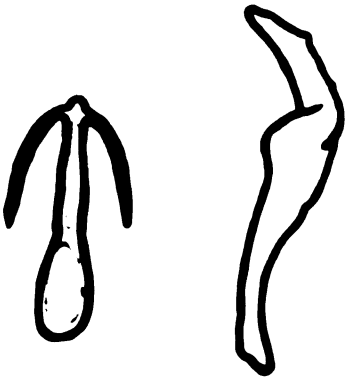
46 OCTOLINEATA



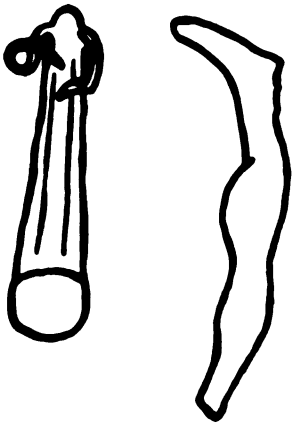
47 SALSA



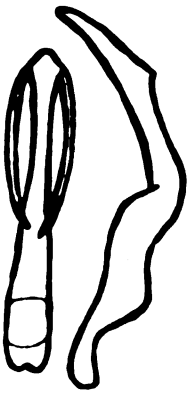
48 EXTENDA



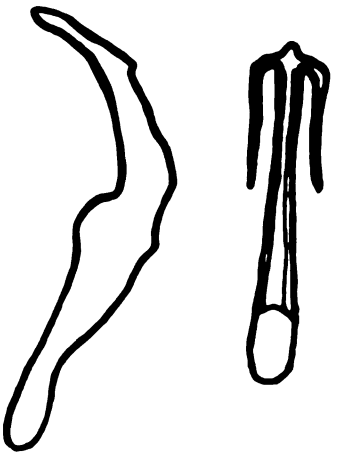
49 PINGUA



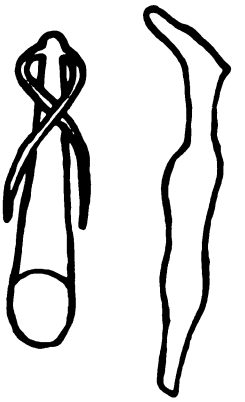
50 SERPENTA



51 LAMINA



52 PROTENTA



53 TENELLA

Plate 12

Explanation of Plate 13

Figs. 54-59 Synorgya male genitalia. Ventral view of aedeagus on left and lateral view of style on right.

Fig. 54. vincula

Fig. 55. amara

Fig. 56. arcta

Fig. 57. brevihema

Fig. 58. tubera

Fig. 59. panda

curved dorsally; a sharp tooth on ventral margin. Seventh sternum of female with posterior margin concavely rounded.

The structure of the aedeagus shaft, the lateral processes and the styles will distinguish this species from tenella.

Distribution: From Connecticut to the Middlewest to Utah and Texas. Only one specimen has been found in Michigan. NLP. Necedta Co., July 14, 1948 1♂, [D].

Gyponana tenella (Spangberg)

Gyponana tenella Spangberg, J. 1878. Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlinger. 5: 34.

Length 7.0-8.0 mm. Color pale green to pale yellow. Ventral view of male aedeagus shaft broad at base and rapidly narrowing to a slender apex; lateral processes arising below apex, cross each other and extend to rear the base of aedeagus (Fig. 53). Style with apical third narrowed and curved dorsally with a tooth on ventral margin. Seventh sternum of female with a broadly concave posterior margin.

The narrowness of the shaft, the position of the lateral processes and the styles will easily separate this species from vincula.

Distribution: In the southeastern states of Florida, Georgia, Virginia, North Carolina and west to Illinois. With the discovery of this species in Michigan, the

northern limits of its range has been extended. SLP. Ingham Co., East Lansing, Aug. 7, 1941 1♂.

Gyponana protenta DeLong

Gyponana protenta DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 41.

Length 9.5 mm. Color yellowish to yellowish-green with orange stripes on vertex and pronotum. Pronotum slightly longer than vertex. Male aedeagus in ventral view, narrowing from base to about one-third the distance of body, remainder almost parallel margined; lateral processes arise below apex and extend laterally for short distance, then curve basally to about one-half the distance of the shaft (Fig. 52). Style with apical half broadly curved dorsally, terminus blunt.

The narrow terminus of the aedeagus and the style may easily separate this species from extenda.

Distribution: Previously recorded from Ohio and Illinois. Only one specimen has been collected in Michigan, this record suggests that this species has a wider range than previously indicated. SLP. Ingham Co., East Lansing, Aug. 1, 1948 1♂.

Gyponana nali DeLong

Gyponana nali DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 44.

Length 9.0 mm. Color pale yellow to greenish-yellow. Vertex and pronotum often speckled with subhyaline spots. Male aedeagus in ventral view narrow and tapered to a thin apex; enlargements near base of processes often conspicuous; processes long and reaching more than half the length of shaft (Fig. 45). Apical fifth of style with a broad pointed tooth on ventral margin; narrowed to blunt apex. Seventh sternum of female with angularly excavated posterior margin.

The long tapered aedeagal shaft will easily differentiate this species from pinqua.

Pyrus is the only known host plant and at times this species becomes an economic pest.

Distribution: This species was originally described from Ohio and is also recorded from Illinois. Only one specimen has been found in Michigan, but since there are large apple growing areas in the state it will undoubtedly be found in these areas in the future. SLP. Clinton Co., July 15, 1940 (C.T. Pederson) 1♂.

Gyponana ontario DeLong

Gyponana ontario DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 39.

Length 10.0-12.0 mm. In general appearance similar to the other species in the group. Vertex produced; one fourth wider between eyes than median length. Color pale-

yellow with faint green or reddish longitudinal stripes on vertex, pronotum and scutellum. In ventral view male aedeagus narrowed near middle of shaft and enlarged at apex (Fig. 48). Lateral processes arising subapically, straight then curved basally to about one-third the distance of shaft. Apical third of style, strongly curved dorsally and narrow with a blunt apex. Seventh sternum of female angularly excavated on posterior margin.

Easily distinguished from tubera by the enlarged apex of aedeagus, the lateral processes and style.

Distribution: Widely distributed from Iowa to the east of the country. Only six specimens have been collected from widely distributed areas of Michigan. NLP. Manistee Co.: Junction Pine Creek and Big Manistee River, July 26, 1939 (W. H. Burt) 1♂ [UM]. SLP. Ingham Co., East Lansing, July 25, 1940 2 , Aug. 25, 1949 1♂. Wayne Co., July 4, 1918 (A. W. Andrew) 1♂[UM].

Gyponana tubera DeLong

Gyponana tubera DeLong, D. M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 33.

Length 9.5-10.5 mm. General appearance similar to the other species in the group. Color pale yellow to faint greenish-yellow. Lateral processes diverging from a constricted apex of aedeagus; shaft tapering to a broad base (Fig. 58). Style appearing slender, one-fourth of the

apical half serrated on ventral margin to a broad sharp tooth, then slightly curved dorsally to a blunt and narrow apex. Seventh sternite of female broadly and angularly excavated on posterior margin.

This species may be distinguished from extenda by the narrow apex of aedeagus, position of the processes and the styles.

Distribution: From Tennessee to northeastern states and west to Iowa, Nebraska and South Dakota. This species has been collected from only two, but wide-apart localities in the state. Intermediate areas may yield this species in the future. UP. Chippewa Co., Drummond Isl., Aug. 30, 1954 (R. L. Fischer) 1♂. SLP. (Aug. 25-Sept. 16) Ingham Co.: East Lansing.

Gyponana panda DeLong

Gyponana panda DeLong, D. M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5. P. 32.

Length 9.5-10.0 mm. Vertex one-third longer between eyes than median length. Generally pale yellow in color with orange longitudinal stripes on vertex, pronotum and scutellum. Male aedeagus broad with short lateral processes arising near apex and extending basally about one-third the length of the body (Fig. 59). Apical fifth bent dorsally, almost parallel-margined with a blunt apex. Seventh sternum of female concavely rounded on posterior margin.

The broadness and width of apex of aedeagus, lateral processes and the styles will distinguish this species from amara.

Distribution: Oregon, southwestern and some southern states, and the middlewest, including a limited area of Michigan. SLP. Ingham Co., Dansville, July 5, 1955 (R. L. Fischer) 1♂, East Lansing, July 13, 1956 (H. Niemczyk) 1♂.

Gyponana amara DeLong

Gyponana amara DeLong, D. M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5. p. 32.

Length 9.0-9.5 mm. Similar in structure to the other species of the genus and to some also in color which is pale yellow and orange longitudinal stripes on vertex, pronotum and scutellum. Vertex one-third longer between the eyes than median length. Aedeagus of male with broad base and rapidly narrowed to a slender apex; lateral processes short, arising just before apex and extended to about one-third the length of aedeagus body (Fig. 55). Style with slightly curved outer margin and an upturned blunt apex. Seventh sternum of female with produced rounded lateral angles and roundedly excavated on meson.

This species is easily distinguished by the narrowness of the aedeagal shaft and styles.

The writer collected members of this species from maple, Acer spp. Perhaps this is one of their food plants.

Distribution: Missouri, Illinois, Ohio and Michigan. NLP. Isabella Co., Mt. Pleasant, Aug. 11, 1956 (O. Taboada) 1♂, [OT]. SLP. Jackson Co., Liberty, July 7, 1956 (O. Taboada) 2♂.

Gyponana lamina DeLong

Gyponana lamina DeLong, D. M. 1942. The Ohio State Univ., Grad. Sch Stud. No. 5. p. 47.

Length 10.0 mm. Color yellowish with vertex twice wider than median length. In general appearance and form similar to other species of the group. Male aedeagus narrowed at center portion of shaft with enlarged base and apex; long, recurved lateral processes arising subapically and extending basally to more than half way to base of body (Fig. 51). Apical half of style curved dorsally; apex blunt and widened to a ventral tooth one-half the distance from apex; ventral margin concave and serrated next to tooth.

Easily distinguished from salsa by the narrowed central area of the aedeagus and styles.

Distribution: Described from Ohio, Illinois and Michigan. This species is found in two areas of the Lower Pennisula. SLP. Kent Co., Grand Rapids, Aug. 3, 1937 1♂; Ingham Co.: Aurelius, Aug. 1938 1♂, East Lansing, Aug. 29, 1939 1♂, M.S.U., Aug. 7, 1920 1♂.

Gyponana octolineata (Say)

Tettigonia octolineata Say, T. 1824. Acad. Nat. Sci. Phila. Jour. 4:340.

Gypona geminata Osborn, H. 1905. New York State Ent. Rep. 20:513.

Length 9.0-10.0 mm. Color pale green to pale yellow with reddish or orange longitudinal stripes on vertex, and pronotum. The lateral processes of the aedeagus are very conspicuous in that they arise near apex and extend straight out and then are twisted on apical portions; aedeagus body long and slender (Fig. 46). Apical two-fifths of style slightly curved dorsally; a broad tooth half the distance from blunt apex; ventral margin serrated basally from tooth. Seventh sternum of female roundedly excavated at posterior margin.

The aedeagus body is similar to serpenta, but can be distinguished from that species by the twisted lateral processes and style.

The writer collected 2 specimens with an ultraviolet light trap which was placed next to a hardwood area.

Distribution: Most of the eastern areas of the country west to Wyoming, Colorado and Texas. In Michigan it is found in widely scattered areas, although not numerous in number. UP. Mackinac Co.: Horse Shoe Bay, Aug. 14, 1921 (S. Moore) 1♂, [UM]; Marquette Co.: Huron Mts. July 11, 1921 (T.H. Hubbell) 1♂, [UM]. NLP. Cheboygan Co.: Aug. 11,

1939 (J. Leonard) 2♂, [UM]; Mason Co.: Ludington, July 20, 1955 (O. Taboada) 2♂; Oceana Co.: Silver St. Pk., July 25, 1934 1♂, [UM]; Oscoda Co.: Luzerne, July 6, 1955 (W. Drew, R. Hodges & A. Wells) 1♂. SLP. Kent Co.: Alto, Sept. 1, 1939 1♂; Livingston Co.: Aug. 12, 1936 (I.J. Cantrall) 1♂, [UM].

Gyponana serpenta DeLong

Gyponana serpenta DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5. p. 53.

Length 9.0-11.0 mm. Color pale yellow and similar to octolineata with reddish longitudinal stripes on vertex, pronotum and scutellum. Male aedeagus with a wide base slowly tapered to a narrow apex; lateral processes arising near apex and looped (Fig. 50). Apical one-fifth of style with a blunt curved apex; ventral margin serrated next to a broad tooth. Seventh sternum of female with posterior margin broadly and shallowly excavated.

The looped lateral processes will separate this species from octolineata.

Two specimens were collected from Salix, spp., by the writer.

Distribution: Common in the eastern states and west to Wyoming and Texas. Although not numerous, it is found in various areas of the state. UP. Mackinac Co.: St. Ignace, Aug. 31, 1954 (R.I. Fischer) 1♂. NLP. Che-

boygan Co.: Aug. 11, 1932 (J. Leonard) 2♂, [UM]; Mecosta Co.: Big Rapids, Aug. 6, 1946 1♂, Borland, Aug. 20, 1955 (C. Taboada) 1♂, [CT]; Iosco Co., Tawas City, Aug. 11, 1956 (C. Taboada) 1♂. SLP. Gratiot Co.: Aug. 19, 1955 (R.L. Fischer) 1♂; Ingham Co.: East Lansing, Aug. 1, 1940 1♂ and Sept. 16, 1939 1♂; Oakland Co.: Milford, Sept. 4, 1921 (R.F. Hussey) 1♂, [UM].

Gyponana salsa DeLong

Gyponana salsa DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5. p. 49.

Length 9.0-10.0 mm. Color pale yellow or greenish and similar in appearance to the other species of the genus, to some in having faint orange or reddish longitudinal stripes on vertex, pronotum and scutellum. Vertex almost twice as wide between the eyes as median length. Aedeagus of male with a broad base and slowly tapered to a slender apex; lateral processes straight, arising near apex and extending to about half way of body. Style with apical half arching dorsally; ventral tooth two-thirds the distance from a rapidly narrow and sharp apex; inner margin slowly widening to half distance of style (Fig. 47). Seventh sternum of female posterior margin broadly and shallowly excavated.

The arching styles, the slowly tapered aedeagus and the straight lateral processes will distinguish this

species from lamina.

The author collected this species with an incandescent light trap.

Distribution: Ohio, Pennsylvania and New York. This species is rarely represented in both upper and lower peninsula of Michigan. UP. Chippewa Co.: Drummond Isl., Aug. 30, 1954 (R.L. Fischer) 1♂; Schoolcraft Co.: Big Spring St. Pk., Aug 23, 1954 (C. Tabeada) 4♂. NLP. Cheboygan Co.: July 6, 1931 (C.W. Sabrosky) 1♂; Crawford Co.: July 9, 1939 2♂, [D]; Presque Isle Co., July 7, 1940 (C.W. Sabrosky) 1♂; Roscommon Co.: Houghton, July 7, 1936 (C.W. Sabrosky) 1♂. SLP. Ingham Co., July 22, 1949 1 , M.S.U. July 18, 1892 1♂.

Gyponana brevihama DeLong

Gyponana brevihama DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 24.

Length 9.5 mm. Similar to other species of the genus and resembling octolineata, by having reddish or faint orange longitudinal stripes on vertex, pronotum and scutellum. The general coloration is pale-yellow. In ventral view, male aedeagus appearing wide at base and gradually tapered to apex. Lateral process short, arising near apex and extending not more than one-fourth the distance towards base (Fig. 57). Apical fourth of style broad at base and tapered to a blunt apex; a sharp tooth on ventral

margin. Seventh sternum of female with posterior margin shallowly excavated.

The diverging lateral processes of the aedeagus and the blunt apices of the styles will distinguish this species from arcta.

Distribution: From Pennsylvania west to Missouri. Numerous specimens have been found in a limited area of the state. SIP. (June 26-Sept. 17) Ingham Co.: Dansville, East Lansing; Kent Co.: Alto; Shiawassee Co.: Owosso.

Gyponana arcta DeLong

Gyponana arcta DeLong, D.M. 1942. The Ohio State Univ., Grad. Sch. Stud. No. 5, P. 29.

Length 8.5-10.5 mm. Color yellow with pale longitudinal lines on vertex, pronotum and scutellum. In ventral view, male aedeagus wide at base and gradually tapered to apex. Lateral processes short, arising near apex and with tips curved to aedeagus shaft. Apical third of style about same width except for an abruptness near apex which has a sharp tip (Fig. 56). Seventh sternum of female with the posterior margin shallowly excavated.

The curved tips of the aedeagal processes and the sharp apices of the styles will easily distinguished this species from brevihama.

The writer collected a specimen from Aspen sp.

Distribution: From New York west to Illinois. To

date only three specimens have been collected in the state. UP. Gogebic Co., July 26, 1919 (T.H. Hubbell) 1♂, [UM]. HLP. Arenac Co., Standish, Aug. 11, 1956 (C. Taboada) 1♂, [OT]; Cheboygan Co., July 20, 1939 (Frances Hubbs) 1♂, [UM].

Subfamily LEDRINAE

Several characteristics will identify the members of this group, the most obvious character is the large circular pits on the head, pronotum and elytra. The vertex is strongly produced and the ocelli are on the disc (Fig. 2). The clypeus is small, the frontal sutures are almost parallel and terminate close to the margin of the vertex. The anterior part of the body is dorsoventrally compressed and the posterior part of the elytra are laterally compressed.

Members of this group are present throughout the world, only one genus, Xerophloea, in the Nearctic region.

XEROPHLOEA Germar

Xerophloea Germar, E.F. 1839. Zeitschrift fur die Entomologie. 1: 190.

Mesodicus Fieber, F.X. 1866. Verhandlungen kaiserlich-koniglichen Zoologische-Botanischen Gesellschaft, Wien. 16: 501.

Parapholis Uhler, P.R. 1877. U.S. Geol. & Geog. Surv. Ter. Bul. 3(14): 461.

These are large and wedge-shaped leafhoppers averaging 8.0 mm. in length with the head narrower than the pronotum. The vertex is produced between the eyes and is either broadly angled or broadly rounded. The pronotum is large, posterior margin is bilobed (Fig. 2). The color varies from green to straw-green, often with brownish markings.

There are thirteen species in this genus which was revised by Lawson (1931).

All thirteen species in this genus are grass feeders and are distributed throughout most of the country. One of the four species that occur in the eastern United States, is believed to be present in Michigan.

Xerophloea viridis (Fabricius)

Cercopis viridis Fabricius, J. C. 1794. Entomologia systematica. 4:50.

Xerophloea grisea Germar, E. F. 1839. Zeitschrift fur die Entomologie. 1:190.

Xerophloea virescens Stal, C. 1854. Fordhandlingar Ceversigt af Kongliga Vetenskaps-Akademiens. 35(8):253.

Parapholis peltata Uhler, P. R. 1877. U. S. Geol. & Geog. Surv. Ter. Bul. 4:461.

Length 6.0-7.5 mm. Color green, pale-green or brownish; entire dorsal area and most of elytra with conspicuous circular pits, in brownish forms pits are darker brown. Females usually green; males often brown. Head and pronotum often

marked with brown; vertex angularly produced between the eyes; head slightly narrower and shorter than pronotum.

This species is known to occur on grasses of prairies and meadows.

Distribution: Widely distributed throughout the United States. This species has not been collected in Michigan, but since this state falls within its normal range and since it has been found in the neighboring states, it will undoubtedly appear here in future collecting.

Subfamily PENTHIMIINAE

The Penthimiinae are easily distinguished by the head, which in profile, appears concave due to the overhang of the anterior margin of the vertex and the concavity of the clypeus (Fig. 60B), and the stout appearance of the body (Fig. 60A). The ocelli are on the disc and the wings overlap with their large appendices.

Penthimia is the only genus of this subfamily found in the U. S.

PENTHIMIA Germar

Penthimia Germar, E. F. 1821. Magazin der entomologie 4:38.

Appearing generally short and broad. Head narrower than pronotum, anterior margin of vertex broadly rounded, in profile, with a slight overhang close to eyes; remainder of face appearing concave. Pronotum transversely striate.

Wings broad, distally overlapping and appressed close to body; appendices broad.

The two species recorded in this genus are americana Fitch, which is distributed in the eastern half of the U. S. and Colorado, and floridana Lawson, which is found only in Florida.

Penthimia americana Fitch

Penthimia americana Fitch, A. 1851. N. Y. State Univ., Regents Ann. Rep. 4:57.

Penthimia vicaria Walker, F. 1851. List of the specimens of Homopterous insects in the collection of the British Museum. 3:841.

Penthimia picta Provancher, A. L. 1872 Nat. Can. 4(11):352.

Length 5-6 mm. Short and stout in general appearance. In addition to the description given above under the generic description, the color varies from reddish-brown to black. Often, the black forms are with brown spots on vertex and pronotum, and the brown forms are with black spots (Fig. 60A).

This species is usually found on shrubs and is also known to occur on Quercus spp.

Distribution: This species is distributed throughout the eastern half of the U. S., including Colorado. In Michigan, its distribution is confined to the Lower Peninsula. NLP. Cheboygan Co., June 20 and July 5, 1932 1♂; July 10, 1932 1♀ (J. Leonard) [UM]; Lake Co., June, 1940. SLP.

(April 29-June 19) Allegan Co.: Fennville; Barry Co.; Cass Co.: Union; Genessee Co.; Ingham Co.: East Lansing; Kent Co.; Monroe Co.; Saginaw Co.

Subfamily DORYDIINAE

This group has the vertex produced and flat, margin thin or foliaceous. The ocelli are on the margin and close to eyes.

There are seven genera recorded in the U. S., two of these occur in Michigan.

Key to Genera

Vertex decidedly longer than wide; head slightly wider than pronotum (Fig. 62).....Hecalus

Vertex shorter than wide; head slightly narrower than pronotum (Fig. 65B).....Parabolocratus

HECALUS Stal

Hecalus Stal, C. 1854. Forhandlinger Cefversigt af Kongliga Vetenskaps - Akademiens. 11:65.

Glossocratus Fieber, F. X. 1866. Verhandlungen kaiserlich-koniglichen Zoologishe-Botanischen Gesellshaft, Wien. 16:502.

Broad flat-headed species. Vertex longer than wide with thin anterior margins. Pronotum slightly narrower than

head, appearing broad. The females brachypterous (Fig. 62) and the males with forewings slightly shorter than abdomen.

Two species are found in the U. S., one is found only in Florida and the other is distributed in the eastern half of the U. S.

Hecalus lineatus (Uhler)

Hecalus lineatus Uhler, P.R. 1877. U.S. Geol. & Geo. Survey Ter. Bul. 3(14):463.

Length of male 7 mm. and female 9 mm. General coloration green with four orange-red stripes extending from the anterior margin of vertex to posterior margin of pronotum, the median pair extending to posterior margin of scutellum. Head slightly wider than pronotum, vertex thin margined. Pronotum appearing narrow; elytra shorter than abdomen, much shorter in female than male. Forewing veins orange-red, the male usually with two dark broad bands, one traversing medially and the other apically (Fig. 62).

Bierne (1956) suggests grasses as being the host plants of this species.

Distribution: Throughout the eastern half of U.S. Only one specimen has been found in Michigan, but according to the distribution of the species it undoubtedly should be found in other parts of the state. SLP. Livingston Co.: Hamburg, July 22, 1934 (G. Steyskal) 1♂ [UM].

PARABOLOCRATUS Fieber

Parabolocratus Fieber, F. X. 1866. Verhandlungen kaiserlich-koniglichen Zoologishe-Botanischen Gesellshaft, Wien. 16:502.

Color pale-green, pale-yellow or dark; pale forms usually with dark band below anterior margin of vertex. Head as wide as, or narrower than pronotum. Vertex produced, but shorter than wide, with thin or somewhat rounded margin (Fig. 65B). In profile, upper half of frons convex, or straight. Ocelli on margin close to eyes. Pronotum short and wide, strongly carinate laterally. Forewings of female often abbreviated.

The members of this group inhabit grasses in marsh areas.

Two of the twenty-one species that are found in the U. S. occur in Michigan.

Key to Species

1. Females..... 3
   Males..... 2
2. Lateral process of aedeagus arising apically and curved anteriorly, appearing anchor-like (Fig. 63).. .....viridis
   Lateral process of aedeagus arising subapically and curved posteriorly (Fig. 65A).....major

3. Anterior margin of vertex angularly produced; with a dark brown line below the margin.....viridis

Anterior margin of vertex broadly rounded, dark brown line absent.....major

Parabolocratus viridis (Uhler)

Glossocratus viridis Uhler, P.R. 1877. U.S. Geol. & Geo. Surv. Ter. Bul. 3(14):462.

Length of male 5.0-6.5 mm. and female 6.5-8.5 mm. Color bright green, pale green to yellowish-green. Head slightly narrower than pronotum, vertex wider than long with a dark brown line below the margin.

male macropterous, female brachypterous or macropterous with the ovipositor exposed. Male with lateral process of aedeagus arising apically and continued anteriorly (Fig. 63) Seventh sternum of female truncate or slightly produced posteriorly.

Distribution: In northern states from east to west. Although this species has scarsely been collected in Michigan's Lower Penninsula, it should be present throughout the state as indicated by its continental distribution. NLP. Mecosta Co.: Borland, Aug. 20, 1955 (O. Taboada) 1♀; Missaukee Co.: Lake City, June 30, 1947, 1♀; Muskegon Co.: North Muskegon, July 22, 1939 (W. H. Burt) 1♂, [UM]. SLP. Ingham Co.: Aug. 17, 1948, 1♀, East Lansing, June 14, 1948, 2♀, Aug. 14 and 17, 1♀, 1948 (C. E. Pederson).

Parabolocratus major Osborn

Parabolocratus major Osborn, H. 1915. Main Ag. Exp. Sta. Bul. 238:120.

Length of male 6.0-7.0 mm. and female 7.5-9.0 mm. Color green, or pale-green to yellowish-green. Head slightly narrower than pronotum, vertex broadly rounded anteriorly, male with a dark line below margin, often faint. Elytral veins darker in color; male macropterous, in female brachypterous. Male with lateral processes of aedeagus arising subapically and curved posteriorly (Fig. 65A). Seventh sternum of female slightly produced posteriorly.

Distribution: Northern states between Colorado and Maine. Undoubtedly it is more widespread in Michigan than the records indicate. UP. Alger Co.: Chatham, July 7, 1948, 3♀. NLP. Cheboygan Co., June 31, 1941 (C. Hubbs) 1♂, Douglas Lake, July 3, 1931 (C. Sabrosky) 1♀; Oceana Co.: Shelby, June 6, 1950, 3♀, 1♂. SLP. (May 12-Aug. 23) Ingham Co.: East Lansing, M.S.U.; Kent Co.: Alto; Livingston Co.; Washtenaw Co.: Ann Arbor; Vanburen Co.: Gobles.

Subfamily JASSINAE

This subfamily may be identified by the appearance of the head which is distinctly narrower than the pronotum; the vertex appears blunt anteriorly and narrow between the eyes; the ocelli on the front margin; the face is decidedly broad and the forewings broad distally.

Two genera are recorded in the United States for this subfamily. Only Jassus occurs in Michigan.

JASSUS Fabricius

Jassus Fabricius, J. C. 1803. Systema rhyngotorum. p. 85.

The members of this genus are large, with head distinctly narrower than pronotum, the vertex narrow between the eyes. Anterior margin blunt with ocelli situated on rounded area (Fig. 64). Frons long, but overall face appearing broad. Pronotum short with a large scutellum. Elytra broad apically, with distinct appendix.

Five species of this genus are found in the United States. Only one has been found in Michigan.

Jassus olitorius Say

Jassus olitorius Say, T. 1831. Acad. Nat. Sci. Phila. Jour. 6:310.

Jassus fuscipennis Spanberg, J. 1878. Fordhandlinger Cef-versigt af Kongliga Ventenskaps-Akademiens 35(8):20.

Length 6-7.5 mm. Color varies from brown to dark brown. Male darker than female or almost black. Both, usually with yellow vertex and face. Face with light brown to reddish stripes along frontal sutures, vertex with two dark spots. Lateral margins of pronotum often light. Basal angles of scutellum black; discal spots black. Elytra with dark veins, female usually with two transverse bands disec-

ting elytra into almost three equal parts (Fig. 64), absent in male. Seventh sternum of female produced posteriorly and deeply incised mesally.

Salix and Fraxinus are the host plants.

Distribution: This species is abundantly found throughout the eastern half of the United States, and the southwest to Arizona. This species is not found in the Upper Penninsula, but may be found there at some future date. MLP. Bay Co.: Pinconning, Aug. 11, 1956 (O. Taboada) 3♂ ; Gladwin Co.: July 29, 1939 (R. Driesbach). SLP. (July 20-Sept. 24) Berrien Co.: Benton Harbor; Genesee Co.; Gratiot Co.; Ingham Co.: East Lansing; Ionia Co.; Saranac Co.: Jackson Co.: Jackson; Kent Co.: Alto, Grand Rapids, Lowell; Shiawassee Co.: Owosso; Vanburen Co.: Covert, Gobles, Lawton; Washtenaw Co.: Ann Arbor; Wayne Co.: Detroit.

Subfamily EVACANTHINAE

This subfamily is characterized by having a median carina on the meson of the vertex (Fig. 61), which continues down on the frons, and another on anterior margin of vertex between the eyes. The ocelli are behind the anterior margin of vertex and about midway between the eye and the apex of of vertex.

Only one genus belongs in this subfamily.

EVACANTHUS Le Peletier & Serville

Evacanthus Le Peletier de Saint - Fargeau, A.L.M. and A. Serville. 1828. Encyclopedie Methodique 10:612.

Head slightly shorter than pronotum. Vertex with carina on anterior margin between eyes, another extending mesally from pronotum to clypeus. Ocelli closer to eyes than apex of vertex. Head, vertex and forewings sparsely pubescent. Forewings appearing broad without anteapical cells.

Only two species are found in the U. S. One is found throughout the country, except the southwest, and the other is southeastern in distribution.

Evacanthus acuminatus (Fabricius)

Cicada acuminata Fabricius, J. C. 1794. Entomologia systematica 4:36.

Cicada interstincta Fallen, C. E. 1826. Hemiptera Suciae. Cicadariae. P. 29.

Amblycephalus germari Curtis, J. 1833. Ent. Mag. 1(19):192.

Evacanthus orbitalis Fitch, A. 1851. N. Y. State Univ., Regents Ann. rep. 4:57.

Length 5.5-6.5 mm. Vertex longer than wide and slightly shorter than pronotum. Anterior margin between eyes carinate and also a mesal carina extending from pronotum to clypeus (Fig. 61). Ocelli above anterior carina. Head, pronotum, scutellum and forewings sparsely pubescent. Overall color dark-brown to almost black, veins of forewings light

in color with light areas posteriorly on forewings and on head around eyes and between vertex and frons. Forewings appear broad and short with anteapical cells absent.

This species is known to occur in herbaceous vegetation in moist shaded areas.

Distribution: This species has been recorded from throughout the country except from the southwest area. Only four specimens have been collected in Michigan, but their sites seems to indicate that this species may be distributed throughout the state. UP. Keweenaw Co.: Isle Royale, Aug. 3-7, 1936 (C. Sabrosky) 1♂. SLP. Ingham Co., July 23, 1891 1♀, July 25, 1892 1♀; Wayne Co.: Detroit, July 13, 1946 (G. Steyskal) 1♂ [UM].

Explanation of Plate 14

Fig. 60. Penthimia americana A; adult, B; lateral view of head.

Fig. 61. Evacanthus acuminatus, adult.

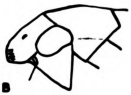
Fig. 62. Hecalus lineatus, adult female.

Fig. 63. Parabolocratus viridis, ventral view of aedeagus of male.

Fig. 64. Jassus olitorius, adult.

Fig. 65. Parabolocratus major, A; ventral view of aedeagus of male, B; adult female.

60 A

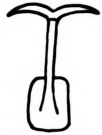


60 B

PENTHIMIA AMERICANA

61 EVACANTHUS ACUMINATUS

62 HECALUS LINEATUS



63 PARABOLOCRATUS VIRIDIS

64 JASSUS OLITORIUS

65 A

65 B

PARABOLOCRATUS MAJOR

Plate 14

V. SUMMARY

This work is a faunistic study of the family Cicadellidae or leafhoppers of Michigan, excluding the subfamilies Athysaninae and Cicadellinae. Keys for the identification of 87 species in the subfamilies, Tettigoniellinae, Evacanthinae, Penthimiinae, Jassinae, Dorydiinae, Ledrinae, Nestocephalinae, Aphrodinae, Eurymelinae, Macropsinae, Agallinae, Gyponinae and Bythoscopinae are included. Brief descriptions of the higher groups and of each species are given, with notations on the available taxonomic information, known hosts, economic importance and distribution in the United States with particular emphasis on Michigan.

VI. LITERATURE CITED

Beamer, R. H., and L. Tuthill
1935. A monograph of the general Alapus and Hebecephalus (Cicadellidae, Homoptera). Univ. Kansas Sci. Bul. 22: 527-547.

Beamer, R. H., and P. B. Lawson
1938. The genus Acinopterus (Homoptera, Cicadellidae). Ann. Ent. Soc. Amer. 31: 476-488.

Beirne, B. P.
1951. The Nearctic Species of Oncopsis (Homoptera: Cicadellidae). Can. Ent. 83: 185-194.

1952. The Nearctic Species of Macrosteles (Homoptera: Cicadellidae). Can. Ent. 84: 208-232.

1954. North American Species of Streptanus (Homoptera: Cicadellidae). Can. Ent. 86: 461-463.

1956. Leafhoppers (Homoptera: Cicadellidae) of Canada and Alaska. Can. Ent. 88, Sup. 2. pp. 3-180.

Black, L. M. & P. W. Oman
1947. Parthenogenesis in a Leafhopper, Agallia Quadrupunetata (Provancher) (Homoptera: Cicadellidae). Ent. Soc. Wash. Proc. 49: 19-20.

Breakey, E. P.
1932. A Review of the Nearctic Species of Macropsis (Homoptera, Cicadellidae). Ann. Ent. Soc. Amer. 25: 787-844.

Christian, P. G.
1953. A Revision of the North American Species of Typhlocyba and its Allies (Homoptera, Cicadellidae). Univ. Kansas Sci. Bul. 33: 1103-1277.

DeLong, D. M.
1916. The Leafhoppers or Jassoidea of Tennessee. Tenn. State Bd. Ent. Bul. 17: 1-113.

1923. Family Cicadellidae in Guide to the Insects of Connecticut. Part IV. The Hemiptera or Sucking Insects of Connecticut. Conn. State Geol. and Nat. Hist. Surv. Bul. 34: 56-163. 2 pls., 11 figs.

1926. A Monographic Study of the North American Species of the Genus Deltocephalus. Univ. Stud., Ohio State Univ. 2.

DeLong, D. M.
1936. The Genus Elymana in North America (Homoptera: Cicadellidae). Ann. Ent. Soc. Amer. 39: 636-639.

1942. The North American Species of the Subfamily Gyponinae. Ohio State Univ., Grad. Sch. Stud. No. 5.

1948. The Leafhoppers or Cicadellidae of Illinois (Eurymelinae-Balcluthinae) Illinois Nat. Hist. Surv. 24: 97-146.

DeLong, D. M. & D. J. Knull
1945. Check list of the Cicadellidae (Homoptera) of America, North of Mex. Ohio Sta. Univ. Grad. Sch. Stud. Biol. Sci. Ser. No. 1, 102 pp.

DeLong, D. M. & C. O. Moker
1937. The Genus Graminella (Homoptera-Cicadellidae). Amer. Mid. Nat. 18: 622-630.

Evans, J. W.
1946. A Natural Classification of Leafhoppers. Part I. External Morphlogy and Systematic Position. Trans. Royal Ent. Soc. London, 96: 47-60.

Hepner, L. H.
1942. A Revision of the Genus Aligia (Homoptera, Cicadellidae) North of Mexico. Univ. Kansas Sci. Bul. 28: 145-183.

Johnson, D. M.
1935. Leafhoppers of Ohio. Subfamily Typlocylinae (Homoptera: Cicadellidae). Ohio Biol. Surv. Bul. 6: 39-122.

Knull, D. J.
1946. The Genus Bandara Ball (Homoptera: Cicadellidae). Ann. Ent. Soc. Amer. 39: 259-264.

Kramer, S.
1950. The Morphology and Phylogeny of the Auchernorhyncus Homoptera. Ill. Biol. Monographs. No. 4:20: 78.

Lathrop, F. H.
1919. The Cicadellidae or Leafhoppers of South Carolina. South Carolina Agr. Exp. Sta. Bul. 199: 5-199.

Lawson, P. B.
1931. The Genus Xerophloea in North America (Homoptera: Cicadellidae). Pan-Pacific Ent. 7(4): 159-69. 1 pl.

Medler, J. T.
1942. The Leafhoppers of Minnesota. Univ. Minn. Agr. Exp. Sta. Tech. Bul. 155.

Oman, P. W.
1933. A Classification of North American Agallian Leafhoppers. USDA Tech. Bul. No. 372, 253 pp.

1938. Revision of the Nearctic Leafhoppers of the Tribe Errhomenellia (Homoptera: Cicadellidae). Proc. United States Nat. Mus. 85: 163-180.

1949. The Nearctic Leafhoppers. Mem. Ent. Soc. Washington 3.

Osborn, H.
1915. Leafhoppers of Maine. Maine Agr. Exp. Sta. Bul. 238: 81-159.

1928. The Leafhoppers of Ohio (Cicadellidae). Ohio Biol. Surv. Bul. 3: 199-374.

Phillips, J. H. H.
1951. An Annotated List of Hemiptera.Inhabiting Sour Cherry Orchards in the Niagara Peninsula, Onterior. Can. Ent. 83: 194-205.

Severin, H. H. P.
1946. Transmission of California Aster-Yellows Virus by the First Reported Leafhopper Vector in Gyponinae. Hilgardia, Vol. 17 No. 3.

Van Duzee, E. P.
1917. Catalogue of the Hemiptera of America north of Mexico Excepting the Aphididae, Coccidae, and Aleurodidae. Calif. Univ. Pub. Ent. 2, 902 pp.

Young, D. A.
1952. A Reclassification of Western Hemisphere Typhlocybinae (Homoptera, Cicadellidae). Univ. Kansas Sci. Bul. 35: 3-217.