

The Leafhoppers of Minnesota

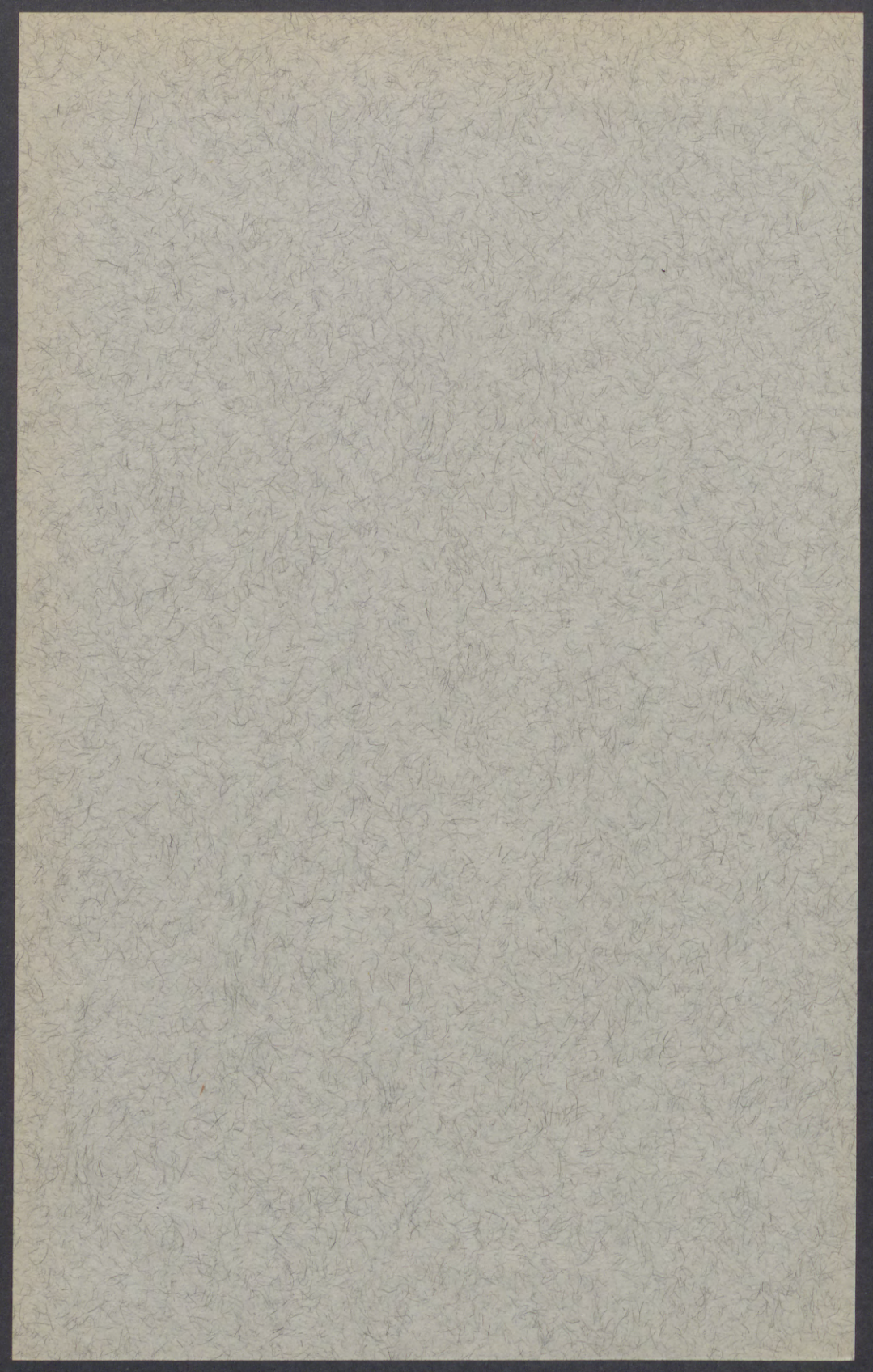
Homoptera: Cicadellidae

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John T. Medler

INTRODUCTION

THIS bulletin attempts to present as accurate and complete a guide to the leafhoppers of Minnesota as possible within the limits of the material available for study. It is realized that certain groups could not be treated completely because of the lack of available material. Nevertheless, it is hoped that in its present form this treatise will serve as a convenient and useful manual for the systematic and economic worker concerned with the forms of the upper Mississippi Valley. In all cases a reference to the original description of the species and genus is given. Keys are included for the separation of species, genera, and supergeneric groups. In addition to the keys a brief diagnostic description of the important characters of each species is given. Extended descriptions or long lists of references have been omitted since citations to this literature are available from other sources if actually needed (Van Duzee, 1917). A number of extra-limital species are included in the treatment, because they appear likely to occur within the state. The inclusion of these in this paper is of importance for their identification when they are actually found.

Acknowledgments

This project would never have been completed in its present form without the aid and encouragement of many persons to whom the writer is greatly indebted.

Thanks are due to H. A. Dorst, E. P. Breakey, R. H. Davidson, D. J. Knoll, R. H. Beamer, D. M. DeLong, and especially P. W. Oman for checking certain of the species determinations made by the writer and in some cases for the actual identification of the species.

The writer gratefully acknowledges the assistance of P. W. Oman for advice regarding certain taxonomic portions of the manuscript and his kindness in making accessible valuable un-

published information. Expression of deepest gratitude is made to Dr. Clarence E. Mickel who has given much advice and encouragement during the preparation of the manuscript and rendered valuable aid in checking many of the original references at a time when the writer was without facilities for this work.

The writer wishes to emphasize his indebtedness to Dr. A. A. Granovsky for suggestion of the problem and encouragement during the course of research; to Dr. W. A. Riley who read parts of the manuscript; to P. W. Oman and Dr. Clarence Mickel who read it in its entirety, for their helpful criticisms and suggestions; and to his wife for the immeasurable assistance rendered in typing the manuscript.

Sources of Material

The specimens on which this study is based came from two principal sources. A large part of the material was provided by the accumulated specimens in the insect collection of the University of Minnesota.

The second principal source of material was the collection of leafhoppers accumulated from the operation of insect light traps in Ramsey County, Minnesota, over a period of eight years. A total of 622,225 specimens have been identified in this light trap material, from which 2,000 specimens representing 210 species were pinned and deposited in the insect collection of the University of Minnesota.

In addition to the material mentioned above, a considerable number of specimens was collected by the writer during the three years he lived in Minnesota. Particular attention was directed toward the collection of the subfamily *Cicadellinae* which was less well represented in the University collection than the other subfamilies.

Unless otherwise noted, all specimens enumerated herein are deposited in the insect collection of the University of Minnesota.

SYSTEMATIC TREATMENT¹

THE GENERA of the leafhoppers found in Minnesota may be segregated into the relatively distinct groups which are indicated in the following key. These groups are recognized primarily for the purpose of associating apparently related genera, and their

¹Previous systematic studies of the midwestern leafhopper fauna have been made by Lawson (1920) for Kansas and Osborn (1928) for Ohio.

designation as subfamilies does not necessarily indicate equivalent categorical values. The recognition of an increased number of higher categories in the Nearctic fauna follows the trend of workers on the Cicadellidae throughout the world. The arrangement of the key is adapted to the needs of a particular faunal area and does not necessarily express the phylogenetic relationships of the family from a world point of view. The writer acknowledges the advice and assistance of Dr. P. W. Oman in the arrangement and recognition of these groups.

Key to Subfamilies

1. Dorsal surface of head formed in large part by upper part of front; ocelli thus on disc of crown remote from eyes and from anterior margin2
 Front confined to face except sometimes for a narrow border on crown; ocelli thus on face, on or near anterior margin of crown, or lacking5
2. Cylindrical in form; lateral sutures of front continued over obtuse anterior margin of crown to near ocelli; hind wing usually with three apical cells..... **Amblycephalinae**
 Broad and flattened in form; lateral sutures of front terminating below the usually sharp and distinct anterior margin of crown; hind wing with four apical cells.....3
3. Crown in profile acutely angled with front; elongate in form; fore wings not overlapping apically.....4
 Crown in profile obtusely rounded to and strongly overhanging the very short and concave front; short and broad in form; fore wings closely overlapped apically..... **Penthimiinae**
4. Dorsal surface of pronotum punctate..... **Ledrinae**
 Dorsal surface of pronotum transversely striate..... **Gyponinae**
5. Crown broad and wide, more or less rounded to the front; ocelli on face between the eyes.....6
 A more or less distinct margin between crown and front; ocelli on or near anterior margin of crown, or absent.....9
6. Lateral sutures of front extending above antennal pits to near ocelli; fore wing with a large and distinct appendix..... **Eurymelinae**
 Lateral sutures of front terminating at or near antennal pits; fore wing usually with appendix very small or lacking7
7. Lateral margin of pronotum as long as greatest diameter of eye and distinctly carinate **Bythoscopinae**
 Lateral margin of pronotum much shorter and not carinate.....8
8. Distance between ocelli usually greater than twice the distance from ocellus to eye; hind wing with three apical cells..... **Macropsinae**
 Distance between ocelli but slightly greater than distance from ocellus to eye; hind wing with four apical cells..... **Agalliinae**
9. Basal median suture of front carinate; ocelli removed from anterior margin of crown; a carina bordering the ocellular area **Evacanthinae**
 Basal suture of front obsolete; ocelli on or near anterior margin of crown, or absent.....10

10. Small, fragile species, often brightly colored; ocelli usually absent; nervures of the fore wing without cross veins anterior to apical cross veins **Cicadellinae**
 Larger species; ocelli on or near anterior margin of crown; nervures of fore wing branching and with cross veins anterior to apical cross veins 11
11. Crown blunt anteriorly, posteriorly expanded to about half the width of the prominent eyes, raised perpendicularly at the sides and base; ocellular area distinctly ledged over antennal pit; fore wing broad; hind wing with costal area widened for a short distance near base **Jassinae**
 Crown of various shapes, rarely expanded posteriorly; ocellular area without a distinct ledge above antennal pit; fore wing broad or narrow; costal area of hind wing not widened basally 12
12. Ocellus just behind anterior margin of crown (except *Xestocephalus*) and distant from eye **Aphrodinae**
 Ocellus on anterior margin of crown and proximal to eye 13
13. Crown produced, with entire anterior margin sharp, often thin and foliaceous; fore wing usually greenish-subopaque with degraded venation; legs without, or with only feeble bristles **Dorydiinae**
 Crown sometimes flattened and acutely angled, but seldom with entire anterior margin thin and foliaceous; fore wing usually hyaline or subhyaline and with complete venation; legs more or less strongly bristled 14
14. Usually slender, small leafhoppers; fore wing with only two antepical cells; hind wing with three apical cells **Balcluthinae**
 Usually medium size to large forms; fore wing usually with three antepical cells; hind wing with four apical cells **Athysaninae**

Subfamily EURYMELINAE Kirkaldy

1906. *Eurymelini* Kirkaldy. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1:350.

IDIOCERUS Lewis

1836. Ent. Soc. London, Trans. 1:47.

GENOTYPE: *Idiocerus stigmaticallis* Lewis, 1836. Monobasic.

Wedge-shaped, with prominent eyes. Crown parallel margined, short and broad (Pl. III, Fig. 1), rounding to a relatively flat face. Fore wing longer than abdomen, with a distinct appendix, closely folded behind. Male antenna of most species with a dark, dislike terminal swelling.

The members of this genus are limited to *Salix*, *Populus*, and *Crataegus* in Minnesota, in so far as known. Osborn and Ball (1898c) reported two generations for all species, the adults hibernating and depositing eggs in the spring.

The North American species were last reviewed by Osborn and Ball (1898c). Additional species are listed by DeLong and Caldwell (1937c).

Key to Species

1. Crown unmarked, with no distinct spots.....2
Crown with dark markings, usually with two distinct spots.....7
2. 4.75 mm. or less in length; dark veins of hind wing visible through the fore wing.....**nervatus**
Larger, 5 mm. or more in length; veins of hind wing not visible.....3
3. Pronotum reddish brown, with a white median line.....**amabilis**
Pronotum yellow or green, without a median line, sometimes dark on posterior margin4
4. Commissure dark, usually a broad stripe; pronotum dark on posterior margin5
No distinct commissural marking; pronotum without dark markings 6
5. Stripe unbroken**suturalis**
Stripe interrupted with white on clavus..... **suturalis** var. **lunaris**
6. Species unicolorous, some shade of green.....**pallidus**
Species golden yellow; fore wing iridescent, dusky-tipped, especially in the male.....**duzeei**
7. Light-colored; 4.75 mm. or less in length.....**rotundens**
Usually dark-colored; 5 mm. or more in length.....8
8. Nervures concolorous with fore wing; a narrow dark stripe along the commissure**snowi**
Fore wing hyaline or subhyaline with dark nervures.....9
9. Spots on crown large and round, about their own diameter from the eyes10
Spots on crown small, often obscured by dark markings, at least twice their own diameter from the eyes.....12
10. A pair of black spots on anterior margin of pronotum.....**craiaegi**
Without black spots on pronotum11
11. Claval suture with a faint white stripe; costal margin of fore wing darkly marked**fitchi**
Claval suture with a bright yellow stripe; costal margin not darkened**provancheri**
12. Color cinnamon brown; fore wing subhyaline with tuberculate brown nervures; no outer anteapical cell.....**brunneus**
Color usually dark; fore wing hyaline, the brown nervures interrupted with white; usually a distinct outer anteapical cell13
13. Conspicuous white interruptions along the cubitus; a median white line on the pronotum.....14
Not as above15
14. First cross vein broadly white; male antenna without a disc**moniliferae**
First cross vein not white; male antenna with a moderate-sized disc**alternatus**
15. Size large, 6.5 mm. or more.....**lachrymalis**
Size smaller, 6 mm. or less.....**formosus**

Idiocerus amabilis Ball1902. *Idiocerus amabilis* Ball. Canad. Ent. 34:306.

Crown, pronotum, and scutellum fulvous brown; male darker, with black marks in basal angles of scutellum. Fore wing golden

iridescent, lighter toward costal margin. Commissure dark, outlining the scutellum in a dark V and interrupted by a white spot on the clavus. Length: male, 5.25 mm., female, 5.75 mm.

Specimens examined: 10; Jay Cooke Park, Eagle Bend, Owatonna, Minneapolis, Princeton (on tamarack); June-September.

Idiocerus nervatus Van Duzee

1894. *Idiocerus nervatus* Van Duzee. Buffalo Soc. Nat. Sci. Bul. 5:205.

Small, green; fore wing hyaline, the dark veins of the hind wing showing through. Antennal disc small, nearly circular. Length: female, 4.75 mm., male, 4.5 mm.

Not yet collected in Minnesota, but should be found on willow, since it is said to occur throughout the United States.

Idiocerus pallidus Fitch

(Pl. III, Fig. 1)

1851. *Idiocerus pallidus* Fitch. Homop. N. Y. State Cab., p. 59. (Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Large, uniformly pale green, with reddish-brown eyes. The color of many specimens becomes faded. Antennal disc oblong, black. Length: male, 6 mm., female, 6.25 mm.

A common species found on willow and also collected at lights. Specimens examined: 81; throughout the state.

Idiocerus suturalis Fitch

1851. *Idiocerus suturalis* Fitch. Homop. N. Y. State Cab., p. 59. (Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Yellowish green, with a dark-brown stripe along the commissure. Dark spots at base of pronotum, which sometimes are faded. Fore wing yellowish hyaline, with a dusky apex. Antennal disc moderately long, elongate. Length: male, 5.25 mm., female, 5.75 mm.

Nothing is known about the host plants in Minnesota, but according to authors it is found on willow, poplar, and birch.

Specimens examined: 150; found from the last of June to the middle of August in Carlton, Cook, Hubbard, Lake, Polk, Ramsey, and Washington counties.

Idiocerus suturalis var. *lunaris* Ball

1902. *Idiocerus suturalis* var. *lunaris* Ball. Canad. Ent. 34: 311.

Resembles *suturalis* in size and form, but differs by a light-colored crescent on the middle of the clavus which interrupts the broad dark stripe along the commissure.

This variety is found on willow, and also collected at lights. Specimens examined: 53; taken principally in northern counties; July and August.

Idiocerus duzeei Provancher

1890. *Idiocerus Duzeei* Provancher. Pet. Faune Ent. Canad. 3:292.

Crown and pronotum immaculate, yellow to greenish yellow. Fore wing golden iridescent, smoky-tipped in the females, fuscous in the males. Length: male, 6.25 mm., female, 7 mm.

The writer has taken this species rather commonly on young broad-leaved cottonwoods in July. The fresh specimens are sometimes distinctly green.

Specimens examined: 298; Grey Cloud Island, St. Anthony Park, St. Paul, Hennepin County, Hinckley, Ft. Snelling high prairies association, and Anoka County; June to July.

Idiocerus alternatus Fitch

1851. *Idiocerus alternatus* Fitch. Homop. N. Y. State Cab., p. 59. (Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Crown broadly curved, parallel margined, usually with triangular brown markings next to each eye, and with heavier markings between the two black spots. Face of male with longitudinal brown stripes, irregularly mottled in female. Pronotum dark brown with a median light stripe. Basal angles of scutellum black. Fore wing hyaline with the dark-brown veins interrupted with white on the commissure and along the cubitus. Length: male, 5 mm., female, 5.5 mm.

On willow from the last of May until the last of September.

Specimens examined: 31; Anoka, Carlton, Chippewa, Chisago, Clearwater, Lake, Olmsted, Pine, Ramsey, Red Lake, and Todd counties.

Idiocerus rotundens DeLong and Caldwell

1937. *Idiocerus rotundens* DeLong and Caldwell. Ohio Jour. Sci. 37:162.

Pale yellowish fading to white. Crown with a black spot on each side of a broad, faded orange band, which runs down the front. Scutellum pale, with basal angles dark. Nervures concolorous with fore wing, brownish beyond apical cross veins in males. Antennal disc black and circular. Length: male, 4.5 mm., female, 4.75 mm.

According to DeLong and Caldwell (1937b) this species has

been confused with *verticis* (Say) for many years. However, a neotype male of *verticis* by these authors has an irrorate crown, pronotum, and scutellum and is without black spots on the crown. Oman (in letter) has called the writer's attention to the similarity between Say's description of *Jassus verticis* and a female specimen of *Oncopsis distinctus* (V. D.). The type locality of *verticis* is within the range of *distinctus* on walnut.

Specimens examined: 17; Ramsey County, Sibley County (river near Blakeley), Olmsted County, Faribault, Winona County, and Washington County on willow; May to July.

Idiocerus moniliferae Osborn and Ball

1898. *Idiocerus moniliferae* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:71.

A broad species; fore wing with the first cross vein broadly white. Pronotum irrorate, brownish fuscous except for a median light line. Crown with brownish markings next to the eyes and with two rather small black spots between the eyes. Length: male, 5.5 mm., female, 5.75 mm.

Specimens examined: 1 male, Olmsted County.

Idiocerus formosus Ball

1902. *Idiocerus formosus* Ball. Canad. Ent. 34:305.

Resembles *lachrymalis* in structure and coloration, but distinguished by its smaller size. Length: female, 6 mm., male, 5.25 mm.

Specimens examined: 87; Cass, Carlton, Cook, Hennepin, Lake, Polk, Ramsey, and Red Lake counties; May to September.

Idiocerus lachrymalis Fitch

1851. *Idiocerus lachrymalis* Fitch. Homop. N. Y. State Cab., p. 58. (Also: 1893. N. Y. State Ent. Rpt. 9:398.)

Our largest species. Yellowish green to a pale yellowish brown. Crown slightly shorter on the middle than next to the eye. Markings variable; usually two rather small black spots on crown connected by a black band; a triangular black marking next to each eye; females usually with a spot below each ocellus. Fore wing hyaline, with dark brown tuberculate nervures and the claval veins with white interruptions at the commissure. Length: male, 6.5 mm., female, 7.5 mm.

Found on aspen.

Specimens examined: 22; Grey Cloud Island, St. Paul, St. Anthony Park, and Two Harbors; June to August.

Idiocerus brunneus Osborn and Ball

1898. *Idiocerus brunneus* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:72.

Broad, dull cinnamon brown. Crown with two black spots, each narrowly encircled with yellow; an interrupted yellowish line transversely across the face below the spots. Fore wing brownish, subhyaline, with tuberculate brown nervures. Length: male, 5.25 mm., female, 5.5 mm.

Specimens examined: 9; McIntosh, Lake City, and Big Stone County; July and August.

Idiocerus snowi Gillette and Baker

1895. *Idiocerus snowi* Gillette and Baker. Colo. Expt. Sta. Bul. 31:79.

Slender, pale green, immaculate except for a narrow dark stripe from tip of scutellum to tip of clavus and with two small black dots on crown. Length: male, 5.5 mm., female, 5.75 mm.

Oman (in letter) has informed the writer that the Minnesota specimens represent an eastern variety of the typical *snowi* named by Ball (MS). Collected commonly throughout the state on willow, especially the narrow-leaved varieties, from which the writer has made several collections in July.

Specimens examined: 734; throughout the state after the last of June.

Idiocerus crataegi Van Duzee

1890. *Idiocerus crataegi* Van Duzee. Canad. Ent. 22:110.

Olive drab. Six black spots on yellowish-green crown, pronotum, and scutellum as follows: a triangular pair at base of scutellum, a similar pair on anterior margin of pronotum, and a large round pair on crown. Length: female, 5.5 mm., male slightly smaller.

Not yet recorded from Minnesota, but it is reported from Iowa and Wisconsin and should be collected on *Crataegus*.

Idiocerus provancheri Van Duzee

1890. *Idiocerus Provancheri* Van Duzee. Canad. Ent. 22:111.

Chestnut brown; males darker than the females. It is distinguished by a bright yellow stripe along the claval suture. Length: male, 5 mm., female, 5.5 mm.

Not yet recorded for Minnesota, but it is reported from Iowa and Wisconsin and should occur here on *Crataegus*.

Idiocerus fitchi Van Duzee1909. *Idiocerus Fitchi* Van Duzee. Canad. Ent. 41:383.

Chestnut brown, crown with two round spots. Face of male marked with a longitudinal median dark stripe, immaculate in female. Pronotum dark on anterior margin with light spots behind. Fore wing brownish with a faint white stripe along claval suture. Costal margin of fore wing dark, a hyaline band crossing it before the tip. Length: male, 5 mm., female, 6 mm.

Specimens examined: 2; St. Paul, Kellog (g); June and July.

Subfamily MACROPSINAE Evans

1936. *Macropsini* Evans. Roy. Soc. Tasmania, Papers and Proc. 1935:63.

Key to Genera

Pronotum distinctly angulate on anterior margin; pronotal striae oblique, converging anteriorly on a median line (Pl. III, Fig. 6).....**Macropsis**
 Pronotum broadly rounded on anterior margin; pronotal striae transverse, or nearly so (Pl. III, Fig. 7).....**Oncopsis**

MACROPSIS Lewis

1836. Ent. Soc. London Trans. 1:49.

GENOTYPE: *Cicada virescens* Gmelin, 1789. Subsequent designation.

This group includes many species similar in form and appearance. Crown short and angled so that anterior margin of pronotum is produced before the eyes. Pronotum with oblique striations converging anteriorly along a median line (Pl. III, Fig. 6). Fore wing longer than abdomen, appendix usually absent. Many forms have black markings on the epimeron which are of specific value.

Osborn and Ball (1898b) and Ball (1903) discussed the food plants of some species. Breakey (1932) revised the genus. New species have since been added by Knull (1940).

Key to Species

1. A small shiny black spot at apex of crown.....**virescens** var. **graminea**
 Without a spot at apex of crown.....2
2. Nervures of fore wing closely lined with fuscous dots.....**tristis**
 Nervures of fore wing not lined with fuscous.....3
3. Fore wing brownish opaque, with one to three clear round spots.....4
 Fore wing otherwise and without clear spots.....5
4. One clear spot on each fore wing which may be obscure or covered with whitish bloom.....**insignis**
 Three clear spots in a row on each fore wing, the anterior one sometimes obscure**trimaculata**

5. Males	6
Females	20
6. Fore wing some uniform shade of green, yellow, or light amber.....	7
Fore wing marked or colored differently.....	10
7. Tarsi black	8
Tarsi not black.....	9
8. Face unmarked	<i>trivialis</i>
Face banded or spotted with black.....	<i>reversalis</i>
9. Epimeron with a black spot.....	<i>viridis</i>
Epimeron unmarked	<i>gleditschiae</i>
10. Fore wing of nearly the same shade or color throughout.....	11
Fore wing with distinctly contrasting bands or irregular spots.....	15
11. Head and thorax predominantly green; fore wing smoky hyaline.....	12
Head and thorax black or brown.....	13
12. Fore wing smoky hyaline.....	<i>erythrocephala</i>
Fore wing dark brown or amber.....	<i>suturalis</i>
13. Dorsum black, sharply contrasted with the light venter.....	<i>bicolor</i>
No sharp contrast between venter and dorsum.....	14
14. Pronotum concolorous	<i>basalis</i>
Pronotum darkly maculate with fuscous in the anterior impression	<i>bifasciata</i>
15. Scutellum green, basal angles black.....	16
Scutellum not green.....	17
16. Fore wing hyaline, black at base and apex.....	<i>nigricans</i>
Fore wing opaque, brownish black, costal margin usually green	<i>fumipennis</i>
17. Dorsum showing green; fore wing with a black basal band.....	<i>osborni</i>
Dorsum dark	18
18. Fore wing uniformly reddish brown except for a narrow hyaline band before the apex.....	<i>ferrugineoides</i>
Fore wing irregularly mottled with fuscous.....	19
19. Fore wing smoky hyaline, banded across the middle and at the apex	<i>canadensis</i>
Fore wing irregularly infuscated, without bands.....	<i>sordida</i>
20. Fore wing uniformly green or yellow.....	21
Fore wing banded or not uniformly green or yellow.....	26
21. Head and thorax reddish brown.....	<i>rufcephala</i>
Head and thorax concolorous with fore wing.....	22
22. Epimeron with a heavy black dash.....	<i>erythrocephala</i>
Epimeron immaculate	23
23. Less than 4.75 mm. in length.....	24
5 mm. or more in length.....	25
24. Bright green; fore wing sometimes smoky apically.....	<i>gleditschiae</i>
Light green, pronotum and face yellowish green; without smoky fore wing	<i>reversalis</i>
25. Posterior margin of sternite VII without a median notch.....	<i>viridis</i>
Sternite VII with a distinct median notch.....	<i>trivialis</i>
26. Fore wing nearly uniform in color.....	27
Fore wing banded with distinctly contrasting colors.....	29
27. Fore wing dark brown; dorsum contrasting sharply with the light venter	<i>bicolor</i>

- Fore wing reddish brown; no sharp contrast between venter and dorsum 28
28. Crown sharply pointed; an indistinct hyaline band before apex of fore wing **ferrugineoides**
- Crown obtusely pointed; costal margin of fore wing greenish **fumipennis**
29. Fore wing greenish hyaline except for entirely black clavus **suturalis**
Fore wing more extensively marked with black 30
30. Fore wing with transverse bands crossing clavus 31
Fore wing with irregular fuscous markings; banding, if present, not crossing clavus 34
31. A deep-brown or dark-fuscous band at base of fore wing 32
Without a band at base of fore wing 33
32. 6 mm. in length; head and thorax concolorous with body **osborni**
5 mm. in length; head and thorax much darker than remainder of body **basalis**
33. Band to clavus oblique; a large black spot on epimeron **bifasciata**
Band to clavus nearly transverse; epimeron immaculate **canadensis**
34. Fore wing with irregular fuscous mottlings **sordida**
Black on fore wing usually restricted to ill-defined markings at base of costal margin **nigricans**

Macropsis virescens var. *graminea* (Fabricius)

1798. *Cicada graminea* Fabricius. Ent. Syst., Suppl., p. 521.

1916. *Macropsis virescens* var. *graminea* Van Duzee. Check List Hemip., p. 64.

Golden green, immaculate except for a shiny black spot at the apex of a distinctly pointed crown, and a black spot at the base of the hind tibia. Length: female, 5 mm.

Weiss and Dickerson (1919) studied the life history of this species on Lombardy poplar.

Specimens examined: 2; Ramsey County.

Macropsis reversalis (Osborn and Ball)

1898. *Pediopsis reversalis* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:69.

Small, green, the female immaculate; male with a black spot on epimeron with black on extremities of legs, and with two black stripes across face; the latter variable, sometimes broken and reduced to three spots. Length: male, 4 mm., female, 4.5 mm.

Not yet recorded in Minnesota, but it has been taken in Iowa on willow and should occur here.

Macropsis trivialis (Ball)

(Pl. III, Fig. 6)

1902. *Pediopsis trivialis* Ball. Canad. Ent. 34:304.

Pronotum acutely angled anteriorly; face angled or slightly rounded to crown in lateral view. Female yellowish green, some-

times faded to yellow, immaculate except for a dark-tipped rostrum and rarely a dark spot on epimeron. Posterior margin of sternite VII with a distinct median notch. Male green, characteristically marked with black on tip of rostrum, apices of anterior, and sometimes middle tibiae, and the distal segments of all the tarsi. Some specimens of both sexes are heavily marked on the fore wing with bronze. Usually a round black spot on epimeron, but this may be lacking or reduced to a dot. Length: female, 5.75 mm., male, 5 mm.

A willow species, nymphs being found in large numbers during the last of June and early July on willow.

Specimens examined: 89; throughout the state.

Macropsis viridis (Fitch)

1851. *Pediopsis viridis* Fitch. Homop. N. Y. State Cab., p. 59.
(Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Females uniformly yellowish green. Male light brown with a black dash on epimeron; rarely green with a brownish fore wing. Length: male, 4 mm., female, 5 mm.

Females of this species closely resemble *trivialis* and probably have been confused with it. Usually *viridis* may be distinguished by its smaller size, posterior margin of sternite VII lacking a median notch, and a definite constriction of the female pygofer near its apex. Found on willow.

Specimens examined: 8; Washington County, Polk County, Itasca Park, Carlton County (Elkhorn Creek), Warren, and Ramsey County; June and July.

Macropsis suturalis (Osborn and Ball)

1898. *Pediopsis suturalis* Osborn and Ball. Davenport Acad. Sci. Proc. 7:67.

Female bright green; clavus black, the stripe extending to apex of fore wing. Male green, suffused with fuscous; basal angles of scutellum dark. Fore wing very dusky, translucent, the claval area sometimes black. Epimeron with a black dash. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 25; Itasca Park, Kittson County, Eagle Bend, Hennepin County, Huot, and Polk County; June to August.

Macropsis bicolor (Osborn)

1915. *Pediopsis bicolor* Osborn. Maine Agr. Expt. Sta. Bul. 238:90.

Brownish black above, with fuscous spreading onto upper half of face; yellowish green or yellow below. Female usually with a

black mark on pygofer near the middle; male with black dash on epimeron. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 7; Itasca Park, Aitkin County (tamarack), Kittson County, Polk County, and Anoka County; June and July.

Macropsis sordida (Van Duzee)

1894. *Pediopsis sordida* Van Duzee. Canad. Ent. 26:89.

Grayish green, sometimes yellowish brown, but mottled and darkly overlaid with fuscous. Fore wing smoky hyaline, irregularly clouded with fuscous. Epimeron of both sexes with a black dash. Length: male, 4.25 mm., female, 5 mm.

Specimens examined: 1; Kittson County; June 25, 1936.

Macropsis canadensis (Van Duzee)

1890. *Pediopsis canadensis* Van Duzee. Canad. Ent. 22:111.

Yellowish green; the scutellum, anterior portion of pronotum, crown, and face yellowish brown; basal angles of scutellum dark brown. Fore wing hyaline, with a broad reddish-brown band near the middle and a smaller band at the apex. Length: female, 5 mm.

This species may be confused with some varieties of *basalis*, but may be distinguished by the light-colored head and thorax.

Specimens examined: 1; Washington County; July 4, 1940.

Macropsis rufoccephala Osborn

1932. *Macropsis rufoccephalus* Osborn. Ohio Jour. Sci. 32:513.

Scutellum, pronotum, and upper half of face reddish brown in contrast to the yellowish-green wings. Scutellum with basal angles dark. Epimeron of female immaculate. Male unknown. Length: female, 5.5 mm.

This is a distinctly marked species, but much like *basalis* in size and form, and conceivably may be a variety with the markings on the fore wing lacking.

Specimens examined: 3; Holt, Ramsey County, and Faribault; June and July.

Macropsis ferrugineoides (Van Duzee)

1889. *Pediopsis ferrugineoides* Van Duzee. Ent. Amer. 5:171.

Large, reddish brown, except for yellow below and on lower half of face. Fore wing with an irregular hyaline band beyond the middle. A large black spot on the epimeron of both sexes. Length: male, 5 mm., female, 5.75 mm.

Specimens examined: 4; Winona and Ramsey counties; July to September.

Macropsis erythrocephala (Gillette and Baker)

1895. *Pediopsis erythrocephala* Gillette and Baker. Colo. Expt. Sta. Bul. 31:72.

A large and distinctive species. Female dull green, sometimes tinged with brown on head and thorax, the yellowish-brown legs contrasting sharply with the general body color. Male dark brown or greenish brown; fore wing smoky hyaline; tarsi sometimes black. Basal angles of scutellum usually black, and with black dots on pronotum posterior to eyes. The epimeron of both sexes has a heavy black dash. Both sexes show great variation in markings and color and in some cases the head, pronotum, and face have a reddish tinge. Length: male, 5 mm., female, 6 mm.

Commonly collected on willow by the writer during early July, 1940, in Washington County.

Specimens examined: 33; Ramsey, Winona, Hennepin, Wabasha, and Scott counties; last of June and July.

Macropsis osborni Breakey

1932. *Macropsis osborni* Breakey. Ent. Soc. Amer. Ann. 25: 817.

Yellowish green; fore wing with a coppery cast; a broad black band contiguous to scutellum. Male darker; basal angles of scutellum dark; epimeron with a dark spot. Length: male, 5 mm., female, 6 mm.

According to Breakey (1932) two female paratypes of this species are in the University of Kansas collection labeled: Grey Cloud Island, July 12, 1929 (H. H. Knight).

Specimens examined: 2; St. Paul, July 12; Savage Creek, June 14, 1932.

Macropsis nigricans Van Duzee

1916. *Macropsis nigricans* Van Duzee. Check List Hemip., p. 64.

1932. *Macropsis nigricans* Breakey. Ent. Soc. Amer. Ann. 25:819.

Female a dull, greenish brown, often faded to yellow; basal angles of scutellum usually dark. Fore wing dull hyaline, marked with fuscous on basal half along costal margin, this color irregularly spreading on to claval suture with great variation in amount and pattern of markings. Scutellum of male dark, with basal

angles pitch black. Fore wing smoky hyaline, distinctly dark on basal half and at apex. Epimeron of both sexes with a black spot. Length: male, 4.75 mm., female, 5.5 mm.

A series of females is included here which agrees closely with the above description except for a loss of the marking on the epimeron.

Specimens examined: 15; Washington County, Alma township east of Argyle, Hennepin County, Owatonna, Eagle Bend, Polk County, Gentilly, and Ramsey County; June to August.

Macropsis bifasciata (Van Duzee)

1889. *Pediopsis bifasciata* Van Duzee. Ent. Amer. 5:173.

Female dull greenish fuscous, yellow below. Fore wing grayish hyaline, with two fuscous bands, one crossing obliquely near middle, displaced on the claval suture, the other crossing just before the apex. Male darkly fuscous, yellow below; basal angles of scutellum dark. Fore wing fuscous hyaline, without bands. Length: male, 5 mm., female, 5.5 mm.

Several specimens have been taken by the writer on quaking aspen near Marine, Minnesota.

Specimens examined: 1; Whitefish Lake; July 1-5, 1921.

Macropsis tristis (Van Duzee)

1890. *Pediopsis tristis* Van Duzee. Canad. Ent. 22:249.

Brown, distinctly black-marked on face, with a band above and a large spot below. Nervures of fore wing margined with fuscous. Length: female, 5.5 mm., male, 4.75 mm.

Specimens examined: 3; Alexandria, Crookston, and Sacred Heart; June and July.

Macropsis basalis (Van Duzee)

1899. *Pediopsis basalis* Van Duzee. Ent. Amer. 5:171.

Upper part of face, pronotum, and scutellum usually brownish red or olive green; underneath greenish, but the color varies greatly. Fore wing hyaline, females variously banded as follows: (a) a red, dark-brown, or black band on basal part of clavus contiguous to margin of scutellum; (b) in addition to the basal band a reddish-brown band across posterior part of clavus, widening toward the costa, and a reddish-brown band at apex; (c) as in (b) but lacking the distinct basal band; (d) with a black basal band, the remainder of fore wing very heavily infuscated; (e) without a basal band, but fore wing infuscated.

Females usually lack the mark on epimeron, but a dark dot may be present in the more heavily colored forms. Male dark

brown; basal angles of scutellum dark; fore wing smoky amber with basal part dark. Length: male, 4.5 mm., female, 5 mm.

Specimens examined: 15; Washington, Clearwater, Ramsey, Crow Wing, Cass, Cook, and Itasca counties; on aspen; July.

Macropsis fumipennis (Gillette and Baker)

1895. *Pediopsis fumipennis* Gillette and Baker. Colo. Expt. Sta. Bul. 31:73.

Yellowish green, the epimeron immaculate. Fore wing reddish brown, costal margin green-tinged. Length: female, 5 mm.

Specimens examined: 1; Ramsey County; July 11, 1923.

Macropsis gleditschiae (Osborn and Ball)

1898. *Pediopsis gleditschiae* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:67.

Deep green, sometimes faded to lighter green or yellow. A slender species with distinctly angled crown. Both sexes are without markings, but the fore wing of some specimens is tinged with fuscous. Length: male, 4.25 mm., female, 4.75 mm.

Reported to be found on honey locust.

Specimens examined: 26; Clearwater, Todd, Cass, Ramsey, Hennepin, and Mille Lacs counties; June to August.

Macropsis trimaculata (Fitch)

1851. *Pediopsis trimaculatus* Fitch. Homop. N. Y. State Cab., p. 60. (Also: 1893. N. Y. State Ent. Rpt. 9:400.)

Females dark gray or brownish; males nearly black with a black bar on the epimeron sometimes obscured by a heavy fuscous stain. Fore wing with three whitish spots in a row, sometimes the anterior one obscured. Length: female, 4.25 mm., male, 4 mm.

Hartzell (1937) summarized our knowledge of the life history. The species is distributed in the eastern United States, south to Virginia, north to Ontario and Quebec, and as far west as Colorado. The principal wild host is *Prunus americana*, but it also occurs on other *Prunus* sp. The habits are unlike most leafhoppers, for it is only occasionally observed on foliage; both nymphs and adults prefer to feed on twigs. It seldom flies or hops, but seeks concealment in the forks of limbs or behind branches with exceptional agility. There is only one generation during the year. Winter is passed in the egg stage in slits beneath the outer bark of plum or sometimes peach.

Although reported by Breakey (1932) in Minnesota, specimens are not represented in the Minnesota collection.

Macropsis insignis (Van Duzee)1889. *Pediopsis insignis* Van Duzee. Ent. Amer. 5:171.

Female reddish brown; male dark brown. Pronotum with distinct striations and lighter in color than fore wing. Scutellum with brown in basal angles. Fore wing brownish opaque except for a small clear spot at base of middle anteapical cell, sometimes obscure. Some specimens covered with a whitish bloom. Length: male, 4.25 mm., female, 5 mm.

Reported to occur on wild plum.

Specimens examined: 43; Sacred Heart, Olmsted County, Lake City, Traverse County, and Ramsey County; June and July.

ONCOPSIS Burmeister1838. *Genera Insectorum* 1:27.

GENOTYPE: *Cicada flavicollis* Linnaeus, 1761. Subsequent designation.

Species with a very short crown; face tumid in lateral view. Anterior margin of pronotum acutely rounded and extended before the eyes. Pronotum with striations, sometimes obscure, which are transverse or slightly rounded anteriorly, but not obliquely angled (Pl. III, Fig. 7). Fore wing short, broadly rounding at the apex, without an appendix.

Revisional work in this genus (as *Bythoscopus*) was last done by Van Duzee (1890). New species described since are listed by DeLong and Caldwell (1937c).

Key to Species

- | | |
|---|-------------------|
| 1. Fore wing with two anteapical cells..... | distinctus |
| Fore wing with three anteapical cells..... | 2 |
| 2. Face marked with black..... | pruni |
| Face unmarked..... | 3 |
| 3. Amber brown in color..... | sobrius |
| Predominantly yellow in color..... | 4 |
| 4. Clavus yellow, outlined with dark brown..... | variabilis |
| Unicolorous yellowish green..... | fagi |

Oncopsis variabilis (Fitch)

1851. *Athysanus variabilis* Fitch. Homop. N. Y. State Cab., p. 60. (Also: 1893. N. Y. State Ent. Rpt. 9:400.)

Minnesota specimens (except below) are the variety with the clavus yellow, or yellowish white, usually outlined with dark brown along the claval suture. Length: female, 5 mm.

A single female, Kittson County, July 2, 1938, is unicolorous sulfur yellow. Sternite VII with a median U-shaped notch which is about one fourth as deep as the sternite.

Birch is reported as a host plant by Osborn (1915).

Specimens examined: 4; Floodwood, Two Harbors, Cook County, and St. Louis County; July and August.

Oncopsis sobrius (Walker)

1851. *Bythoscopus sobrius* Walker. List Homop. Ins. Brit. Mus. 3:874.

Amber brown, without markings, the underparts lighter in color than the dorsum. Fore wing amber, hyaline. Sternite VII with a small median notch on posterior margin. Length: female, 5.5 mm.

Birch is its normal host, according to Osborn (1915).

Specimens examined: 1; St. Louis County (shore Lake Superior at Split Rock); July 1, 1935.

Oncopsis pruni (Provancher)

1890. *Bythoscopus pruni* Provancher. Pet. Faune Ent. Canad. 3:290.

Cinereous or grayish yellow, variable in markings but usually distinguished by black on each side of a broad yellow band connecting the ocelli. Pronotum yellow, much darkened by fuscous punctures and black behind the eyes. Fore wing smoky hyaline, the nervures brown. Sternite VII triangular, truncate on posterior margin with a shallow median notch. Length: male, 4.5 mm., female, 5 mm.

Osborn (1915) considered birch the usual food plant, although occasionally it is taken on various other plants.

Specimens examined: 38; found in late summer in the region around Lake Superior.

Oncopsis fagi (Fitch)

1851. *Athysanus fagi* Fitch. Homop. N. Y. State Cab., p. 61.
(Also: 1893, N. Y. State Ent. Rpt. 9:401.)

Unicolorous, greenish yellow, the fore wing fading to semi-hyaline. Sternite VII with a median U-shaped notch about one fourth the length of sternite. Length: female, 5.5 mm.

Specimens examined: 1; Lake County; July 4, 1938.

Oncopsis distinctus (Van Duzee)

(Pl. III, Fig. 7)

1890. *Bythoscopus distinctus* Van Duzee. Ent. Amer. 6:225.

Variable in markings, but easily distinguished by the presence of only two anteapical cells. Fore wing subhyaline, clouded with fuscous, but usually distinctly marked with dark at the middle

and apex of clavus. Basal angles of scutellum black, pronotum with black on anterior margin behind the eyes. Length: male, 4 mm., female, 4.5 mm.

Specimens examined: 42; Minnetonka Lake, Olmsted County (on walnut), Madison, New Ulm, and Ramsey County; June.

Subfamily AGALLIINAE Kirkaldy

1906. *Agalliinae* Kirkaldy. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1:345.

Key to Genera

1. Surface of pronotum transversely striate (Pl. III, Fig. 5) *Aceratagallia*
Surface of pronotum not striate but finely granulated..... 2
2. Crown shorter medially than next to the eye, a distinct widening next to the eye; posterior margin irregularly curved and elevated (Pl. III, Fig. 4)..... *Agalliopsis*
Crown of nearly uniform length, no distinct widening next to the eye; posterior margin rounded and regularly curved (Pl. III, Fig. 3) *Agallia*

AGALLIOPSIS Kirkaldy

1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 3:11, 30.

GENOTYPE: *Jassus novellus* Say, 1831. Original designation.

Narrow, wedge-shaped, with crown distinctly widening next to the eyes (Pl. III, Fig. 4). Since the basic revision of *Agalliopsis* by Oman (1933), new species have been added by Oman (1935) and Ball (1936a). Ball (1936b) gave a useful key to the species occurring north of Mexico, and discussed their food plant relationships.

Agalliopsis novella (Say)

(Pl. III, Fig. 4)

1831. *Jassus novellus* Say. Acad. Nat. Sci. Phila. Jour. 6: 309. (Also: 1891. Compl. Writ. 2:384.)

Usually reddish brown, but often may be darker or lighter. Crown with a black spot next to each eye and above each ocellus. Pronotum with a black spot equidistant from anterior and posterior margins on each side of a dark median stripe. Length: male, 3.5 mm., female, 3.75 mm.

Oman (1933) studied the internal male genitalia and noted variations in the shape of the pygofer hook in specimens from various parts of the United States. Dissections of males from various places in Minnesota revealed marked local variations also.

There is only one generation a year, adults first appearing in the middle of May and being found until the middle of August.

Osborn and Ball (1898a) reported nearly full grown nymphs in Iowa passing the winter under leaves and rubbish, and it is probable they overwinter here in the same way.

DeLong and Davidson (1931) discussed this species among those injuring economic crops, but it is of relatively little importance in this region. Ball (1936b) stated that there is no definite food plant record. Minnesota specimens have been collected from poplar woods, tamarack swamps, alfalfa, and grasses.

Specimens examined: 38; throughout the state, but collected most commonly in the southeastern portion.

AGALLIA Curtis

1833. Ent. Mag. 1:193.

GENOTYPE: *Jassus puncticeps* Germar, 1832. Monobasic.

Crown of uniform short length, evenly curved on posterior margin, and with a black spot above each ocellus. Surface of pronotum finely granulated (Pl. III, Fig. 3). The genus has been revised by Oman (1933).

Only *Agallia 4-punctata* (Prov.) has been found in the state, but *Agallia constricta* V. D. is included in the key since it is reported from Iowa and may be present in southern Minnesota.

Key to Species

Plate constricted near middle, tip bluntly rounded; sternite VII constricted, posterior margin roundly produced, with a small median notch; form not robust, fore wing long and narrow.....**constricta**
 Plates not constricted, together forming a slightly rounded triangle; posterior margin of sternite VII almost truncate; form robust, sides of fore wing with a bulge.....**4-punctata**

Agallia 4-punctata (Provancher)

(Pl. III, Fig. 3)

1872. *Bythoscopus 4-punctatus* Provancher. Nat. Canad. 4: 376.

Broad, robust, dark brown. Two black spots on margin of crown. A pair of black spots near posterior margin of pronotum wider apart than those on crown. Length: female, 4 mm., male slightly smaller. The male sex is not represented in the Minnesota collection.

Osborn and Ball (1898a) reported overwintering nymphs and a single generation in Iowa. The same life cycle probably holds true for Minnesota. Wolcott (1937) listed white clover as its usual host and reported two generations a year in New York. The Minnesota specimens are from tamarack swamps and grasses.

Specimens examined: 52; throughout state; May to August.

ACERATAGALLIA Kirkaldy

1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent.
Bul. 3:11, 30.

GENOTYPE: *Bythoscopus sanguinolentus* Provancher, 1872.
Original designation.

Crown of nearly uniform length with a black spot above each ocellus. Surface of pronotum transversely striated, without black spots but marked with longitudinal dark stripes (Pl. III, Fig. 5). New species have been added by Oman (1935) since his revision of the genus (1933).

Of the species occurring in Minnesota, *Aceratagallia sanguinolenta* (Prov.) is economically important and commonly found.

Key to Species²

- Form short and robust; fore wing barely exceeding abdomen in female; posterior margin of sternite VII slightly sinuate and with a small median notch; plate with the lateral margin rounded to the truncate tip, exceeded in length by the pygofer..... **sanguinolenta**
- Form slender; fore wing definitely longer than abdomen in female; posterior margin of sternite VII with a deep V-shaped notch; plate truncate apically and about equal to pygofer in length..... **uhleri**

Aceratagallia sanguinolenta (Provancher)

(Pl. III, Fig. 5)

1872. *Bythoscopus Sanguinolentus* Provancher. Nat. Canad.
4:376.

Rather small, broad, grayish brown, but may be darker. Crown with a brown patch next to each eye, a black spot above each ocellus, and a median double brown stripe. Pronotum with three pairs of longitudinal brown stripes widening towards the posterior margin. Fore wing brownish; dark veins on clavus interrupted with white to give a mottled appearance. Length: male, 2.75 mm., female, 3 mm.

Adults hibernate under dead leaves or rubbish, appearing early in the spring on many economically important plants or common weeds. The writer found a specimen hibernating under leaves in Hennepin County, February 11, 1940, and large numbers were collected on alfalfa in Anoka County, March 25, 1939. It has been recorded on legumes, potatoes, grasses, *Salix longifolia*, and many weeds.

² In addition to the species keyed here, *Aceratagallia accola* Oman, swept from a recently mown meadow in Minnesota just east of Wahpeton, N. D., July 24, 1935 (P. W. Oman), is in the U. S. National Museum collection.

DeLong and Davidson (1931) and Oman (1933) discussed this species as a pest in eastern United States where it attacks many truck and field crops and is especially common on plants belonging to the *Leguminosae*. Watkins (1939) reported on its biology in New York, listed 38 species of host plants, and obtained evidence of three, with perhaps a partial fourth, generations.

Specimens examined: 106; throughout the state.

Aceratagallia uhleri (Van Duzee)

1894. *Agallia uhleri* Van Duzee. *Canad. Ent.* 26:91.

Similar to *sanguinolenta* in general appearance, but is slightly larger and more slender in form. General color, brownish cinereous. Dark veins of the fore wing interrupted by whitish portions in claval and basal areas. Length: male, 3.5 mm., female, 3.75 mm.

It has been collected in Minnesota on beets, potato, alfalfa, wheat, and Russian thistle, but little is known about its hosts. Oman (1933) stated that it probably is economically important on sugar beets in Colorado and western Kansas.

Specimens examined: 87; Cook, Kittson, Norman, Polk, Ramsey, Anoka, and Hennepin counties; May to October.

Subfamily BYTHOSCOPIINAE Dohrn³

1859. *Bythoscopidae* Dohrn. *Catalogus Hemipterorum*, p. 84.

STRAGANIA Stål

1860. Rio Janeiro Hemip. 2:49.

GENOTYPE: *Gypona* (*Stragania*) *ornatula* Stål, 1862. Subsequent designation.

Crown short and broad, curved slightly forward of eyes, the face appearing compressed. Pronotum with lateral margin longer than diameter of eye, distinctly carinate. Crown, pronotum, and scutellum with fine transverse striations (Pl. III, Fig. 2, 2A). Fore wing thickly set with minute setae.

According to Oman (in letter), the American forms, *Stragania* Stål and *Pachyopsis* Uhler, differ from the European *Bythoscopus* Germar and *Batracomorphus* Lewis by the fact that the submarginal vein of the fore wing, separating the apical cell from the appendix, is evanescent distally, never extending beyond the base of the second apical cell.

³The North American genera of this subfamily have been reviewed by Oman (1936 [1933]).

Stragania apicalis (Osborn and Ball)

(Pl. III, Fig. 2, 2A)

1898. *Macropsis apicalis* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:64.

Short, robust, bright green, sometimes faded to yellow. Crown over three times wider than long. Fore wing subhyaline, set with fine light-green hairs. Length: female, 5 mm., male, 4.5 mm.

Specimens examined: 23; St. Paul; July.

Subfamily PENTHIMIINAE Kirschbaum

1868. *Penthimiidae* Kirschbaum. Nassau. Ver. f. Naturk. Jahrb. 21 and 22:14.

PENTHIMIA Germar

1821. Mag. Ent. 4:38, 46.

GENOTYPE: *Cicada nigra* Goeze, 1778. Monobasic.

Compact in form, the head narrower than pronotum. Crown in profile rounding and overhanging the face, which is almost flat. Clavus truncate posteriorly, the apical part of fore wing appressed to abdomen and closely overlapped.

Lawson (1933) illustrated the two species of this genus found in North America.

Penthimia americana Fitch1851. *Penthimia americana* Fitch. Homop. N. Y. State Cab., p. 57. (Also: 1893. N. Y. State Ent. Rpt. 9:397.)

Cercopidlike, oval, almost as broad as long. Males dark brown or black; females reddish brown, head and thorax black underneath. Length: male, 5 mm., female, 5.5-6 mm.

Specimens examined: 28; Ramsey, Anoka, Hennepin, Olmsted, Winona, and Morrison counties; May to July.

Subfamily GYPONINAE Stål⁴1870. *Gyponina* Stål. Svenska Vetensk. Akad. Öfversigt af . . . Forhandl. 17:736.

Key to Genera

- | | |
|---|------------------|
| 1. Fore wing reticulate near apex | Gyponana |
| Fore wing venation regular, not reticulate | 2 |
| 2. Crown convex in profile, the margin thick but not greatly produced | Ponana |
| Crown flat in profile, the margin with front foliaceous | 3 |
| 3. Fore wing with dots or lines | Prairiana |
| Fore wing without dots or lines | Gypona |

⁴This subfamily has been reviewed by DeLong (1942, The North American Species of the Subfamily Gyponinae, exclusive of *Xerophloea*. Ohio State Univ. Studies 5:1-187).

GYPONANA Ball

1920. Ent. Soc. Amer. Ann. 13:84, 85.

GENOTYPE: *Tettigonia 8-lineata* Say, 1825. Original designation.

Crown in profile sharply angled with the front, the margin foliaceous. Fore wing elongate, narrowed at apex, the venation broken by numerous irregular reticulations.

Ball (1935) presented a key to the North American species and referred to his earlier work on this group.

Key to Species

1. Black spots usually on pronotum and hinge⁵; fore wing yellowish opaque, rugose; posterior margin of sternite VII rectangularly notched **rugosa**
 No black spots; fore wing usually greenish subhyaline; sternite VII not notched 2
2. Stripes on pronotum and most reticulations of fore wing scarlet **octolineata**
 Markings not scarlet; reticulations of fore wing some shade of green 3
3. Reticulations of fore wing including the clavus **cana**
 Reticulations of fore wing mostly at apex 4
4. Light green; broad; size usually 9 mm. or more **striata**
 Dark shining green; slender; size 8 mm. or less **tenella**

Gyponana 8-lineata (Say)

1825. *Tettigonia 8-lineata* Say. Acad. Nat. Sci. Phila. Jour. 4:340. (Also: 1891. Compl. Writ. 2:257.)

A large green species, the crown, pronotum, and fore wing heavily overlaid with scarlet which is usually arranged in six or eight longitudinal stripes on the pronotum. Length: female, 11 mm.

The biology and life stages of this species were discussed by Brittain (1920).

Specimens examined: 2; Olmsted and Ramsey counties.

Gyponana cana (Burmeister)

1838. *Gypona cana* Burmeister. Genera Ins. 1:50.

Compact, green to yellowish green. Fore wing coriaceous, the venation very conspicuous, with heavy reticulations throughout, including the clavus. Length: male, 9 mm., female, 11 mm.

Specimens examined: 15; Grey Cloud Island, Hennepin County, Faribault County, Cass County, Crookston, Beltrami County, Kawishiwi River, Winton, Lake County (Baptism Creek), Norman County, and Cramer; June to August.

⁵ Hinge—the portion of the claval suture just posterior to the lateral margin of the pronotum.

Gyponana striata (Burmeister)

(Pl. III, Fig. 12)

1838. *Gypona striata* Burmeister. Genera Ins. 1:49.

Large, light green, with six to eight orange-yellow longitudinal stripes on the pronotum. The size, color, and reticulations vary greatly, but reticulations mostly confined to apical part of fore wing. Length: male 8-9 mm., female, 10-12 mm.

Nymphs may be found in June and July, and are easily recognized by stripes on the pronotum and their long threadlike antennae.

Specimens examined: 247; throughout the state from the first of July until September.

Gyponana tenella (Spångberg)1878. *Gypona tenella* Spångberg. Spec. Gyponae, p. 34.

Shiny green, with relatively few reticulations on the apical portion of fore wing. It is distinguished from *striata* by its smaller size and more slender form. According to Ball and Reeves (1927) it is found on pine. Length: female, 8 mm.

Specimens examined: 3; Willow River and Cloquet; August.

Gyponana rugosa (Spångberg)1878. *Gypona rugosa* Spångberg. Spec. Gyponae, p. 6.

Yellowish green, the fore wing opaque, rugose, shiny; nervures and reticulations prominent. Pronotum usually with a median black spot behind each eye, and a black spot on each hinge. Posterior margin of sternite VII deeply rectangularly notched. Length: male, 9 mm., female, 10 mm.

Specimens examined: 2; Ramsey County; August.

GYPONA Germar

1821. Mag. Ent. 4:38, 73.

GENOTYPE: *Cercopis glauca* Fabricius, 1803. Monobasic.

Very broad and robust species are included in this genus. Crown long and flat, in profile sharply angled with the front, the margin foliaceous. Venation of fore wing constant, with five apical and three antepical cells.

Ball (1920) reviewed the North American species. Ball and Reeves (1927) and Ball (1935) added new species and notes.

Gypona melanota Spångberg1878. *Gypona melanota* Spångberg. Spec. Gyponae, p. 19.

Female large, broad, pale green, unmarked except a round

black spot on pronotum behind each eye and a spot on each hinge. Male variable, green to black, with the black mostly on head and pronotum, and showing through fore and hind wing from abdomen beneath. Length: male, 8 mm., female, 10 mm.

Specimens examined: 12; Anoka County, Traverse County, North Branch, Big Stone County, Hennepin County, Isanti County (Bradford), and Ramsey County.

PRAIRIANA Ball

1920. Ent. Soc. Amer. Ann. 13:84, 90.

GENOTYPE: *Gypona cinerea* Uhler, 1877. Original designation.

Narrow in form; crown angularly produced, nearly equalling the pronotum in length; in profile flat, the margin with front thin and foliaceous. Gray or brown in color, the fore wing with linear markings or fuscous dots lining the nervures.

Ball (1920) reviewed the species in this genus. Ball and Reeves (1927) and Ball (1935) added notes and described new species.

Prairiana cinerea (Uhler)

1877. *Gypona cinerea* Uhler. U. S. Geol. and Geog. Survey Bul. 3:460.

Dark gray, the nervures of fore wing heavily lined with black dots. Crown obtusely rounded, not as long as pronotum, and with a dark spot behind each ocellus on posterior margin. Crown and pronotum peppered with fuscous dots. Length: male, 6 mm., female, 7 mm.

Specimens examined: 2; Hennepin and Ramsey counties; June and July.

Prairiana kansana Ball

1920. *Gypona (Prairiana) cinerea* var. *kansana* Ball. Ent. Soc. Amer. Ann. 13:91.

Brownish cinereous, finely peppered with fuscous dots. Crown angulate, as long as pronotum. Length: male, 8 mm.

Specimens examined: 1 male, Polk County, July 5, 1937.

The following specimens differ from the above in their long and narrow form (male, 9 mm., female, 10 mm.). They were thought by the writer to be distinct, but after examining them, DeLong, who is revising the genus, stated (in letter) that they are *kansana* Ball.

Specimens examined: 6; Wilkin County, Breckenridge, and Crookston; July.

PONANA Ball

1920. Ent. Soc. Amer. Ann. 13:84, 93.

GENOTYPE: *Gypona scarlatina* Fitch, 1851. Original designation.

Crown shorter than broad, in profile convex with a slight depression before the margin. The anterior margin may be distinct, but is not foliaceous or produced. Ocelli located in front of middle of crown, farther from each other than from the eyes.

Ball and Reeves (1927) presented a key to the species in this genus and discussed varieties. Additional notes were given by Ball (1935).

Key to Species

- | | |
|---|----------------------|
| 1. Ground color some shade of brown..... | 2 |
| Ground color yellow or green..... | 3 |
| 2. Pronotum unmarked | <i>scarlatina</i> |
| Anterior margin of pronotum with black spots..... | <i>puncticollis</i> |
| 3. Fore wing fulvous brown except for a narrow creamy margin along
costa | <i>limbatipennis</i> |
| Black or smoky marking of fore wing reduced to broad band along
the commissure | <i>pectoralis</i> |

Ponana scarlatina (Fitch)

1851. *Gypona scarlatina* Fitch. Homop. N. Y. State Cab., p. 57. (Also: 1893. N. Y. State Ent. Rpt. 9:397.)

Brown, the fore wing brownish subhyaline, with scattered dark-brown or reddish-brown transverse reticulations which vary greatly in number. The crown and pronotum unmarked, lacking the scarlet spotting described in eastern examples of this species. Length: male, 9 mm., female, 10 mm.

Specimens examined: 63; Cass, Chippewa, Clearwater, Beltrami, Kittson, Le Sueur, Nicollet, Norman, Polk, and Ramsey counties; June and July.

Ponana limbatipennis (Spångberg)

1878. *Gypona limbatipennis* Spångberg. Spec. Gyponae, p. 47.

Fulvous brown, the fore wing smoky brown, except for a narrow, creamy costal margin. Length: male, 8 mm.

Specimens examined: 1; Le Sueur County, fish hatchery lights; July 23, 1922.

Ponana pectoralis (Spångberg)

1878. *Gypona pectoralis* Spångberg. Spec. Gyponae, p. 46.

Green or yellowish green; an indefinitely margined smoky band extending from scutellum to apex of fore wing. Fore wing often with irregular black dots near middle. Length: 8-10 mm.

Specimens examined: 27; Clearwater, Polk, Red Lake, Olmsted, and Ramsey counties; June and July.

Ponana puncticollis (Spångberg)

1878. *Gypona puncticollis* Spångberg. Spec. Gyponae, p. 54.

Yellowish brown, the fore wing sometimes with a reddish cast; reticulations scant. Pronotum with a pair of black spots behind each eye, a pair near the anterior margin behind ocelli, and a black spot on each hinge. Length: female, 8-9 mm.

Specimens examined: 4; Chisago and Hennepin counties; August.

Subfamily LEDRINAE Stål

1870. *Ledrina* Stål. Svenska Vetensk. Akad. Öfversigt af . . . Forhandl. 17:731.

XEROPHLOEA Germar

1839. Ztschr. f. Ent. 1:190.

GENOTYPE: *Cercopis viridis* Fabricius, 1794. Monobasic.

Members of this genus are usually uniformly green in color, though the males vary to yellow or brown. The entire dorsal surface distinctly punctate, the punctures bearing minute setae. Fore wing held rooflike, nearly vertical at apex.

Lawson (1931b) discussed the species of this genus in North America.

Xerophloea viridis (Fabricius)

1794. *Cercopis viridis* Fabricius. Ent. Syst. 4:50.

Female light green, often with minute black dots along veins of fore wing. Male yellowish green, rarely gray, usually with a dark longitudinal median line on the crown. Crown angularly produced in front, the margin thin. Length: male, 6.5 mm., female, 7.5 mm.

Specimens examined: 32; Lincoln, Yellow Medicine, Steele, and Ramsey counties; July to September.

Subfamily AMBLYCEPHALINAE China

1939. *Amblycephalinae* China. Ann. and Mag. Nat. Hist. (Ser. 11) 4:587.

Key to Genera

1. Fore wing reticulate veined at apex..... *Draeculacephala*
Fore wing not reticulate veined at apex..... 2
2. Fore wing exposing sides of abdomen; head and pronotum deflexed, the crown in profile rounded to front with margin lacking *Cuerna*
Fore wing broader, covering sides of abdomen; head and pronotum scarcely deflexed; crown in profile meeting front with a margin ... 3

3. Olive green or green in color; dorsal surface of pronotum minutely pustulate **Helochara**
 Variously marked; dorsal surface of pronotum not pustulate 4
4. Crown in profile flat, meeting the front at a sharp angle, the margin usually black lined (Pl. III, Fig. 9A) **Graphocephala**
 Crown in profile convex, the margin obtusely rounded and not black edged 5
5. Appendix and apical cells of fore wing smoky hyaline; crown usually with transverse black bands **Kolla**
 Appendix and apical cells not differing from remainder of fore wing; crown usually with scroll markings and a black spot at apex **Neokolla**

CUERNA Melichar

1924. Mus. Nat. Hungarici Ann. 21:199.

GENOTYPE: *Cercopis lateralis* Fabricius, 1798. Subsequent designation.

Crown obtusely curved anteriorly, convex in lateral view and rounding to the somewhat inflated roughened face. A distinct ledge over the antennal pit. Head wider than pronotum; eyes prominent. Fore wing narrow, the ventral margin of abdomen exposed. Ball (1901) revised the group, then known as *Oncomeptopia*.

Cuerna lateralis (Fabricius)

1798. *Cercopis lateralis* Fabricius. Ent. Syst., Suppl. p. 524.

Crown and pronotum black, irrorate with yellow. Fore wing dark red, nervures black, a narrow yellow line running from lower corner of eye along lateral margin of abdomen to the pygofer. Length: 7-8 mm.

Specimens examined: 104; throughout the state, except the southwestern counties; April to September.

Cuerna limbata (Say)

1825. *Tettigonia limbata* Say. Acad. Nat. Sci. Phila. Jour. 4:340. (Also: 1891. Compl. Writ. 2:258.)

Smaller and narrower than *lateralis*. Shining black, except for a white lateral line extending from eye back along abdomen. Length: 7 mm.

Specimens examined: 8; Fort Snelling, Sauk Rapids, and Itasca Park; April to June.

NEOKOLLA Melichar

1926. Mus. Nat. Hungarici Ann. 23:343.

GENOTYPE: *Tettigonia hieroglyphica* Say, 1831. Subsequent designation.

Head somewhat swollen, the eyes not prominent. The antennal ledge is fused with the margin of the crown. Venation of fore wing simple, not reticulate at apex.

Ball (1901) reviewed the species included in this genus which was at that time known as *Tettigonia*. Olsen (1922) also studied this genus (as *Cicadella*).

Neokolla dolobrata (Ball)

1901. *Tettigonia hieroglyphica* var. *dolobrata* Ball. Iowa Acad. Sci. Proc. 8:52.

Shiny black, with ivory markings on crown and pronotum. Scutellum yellow, the basal angles black. Claval suture thinly marked with white. Length: male, 5.5 mm.

Specimens examined: 1; Willmar (Eagle Lake); August 2, 1935.

Neokolla gothica (Signoret)

1854. *Tettigonia gothica* Signoret. Soc. Ent. de France Ann. (Ser. 3) 2:345.

This common species varies from olive to red, but may be easily recognized by the black spot at apex of crown, scroll markings on crown and pronotum, and the dark lined nervures of fore wing. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 131; throughout the state; May to October.

KOLLA Distant

1908. Fauna British India. Rhynchota 4:223.

GENOTYPE: *Kolla insignis* Distant, 1908. Original designation.

Moderately sized species with a short head, which is distinctly subconical in shape. Lateral areas of front are strongly transversely striated. One species is found in Minnesota.

Kolla bifida (Say)

1831. *Tettigonia bifida* Say. Acad. Nat. Sci. Phila. Jour. 6: 313. (Also: 1891. Compl. Writ. 2:387.)

Green and black. Two transverse black bands on crown, and a black spot in front of each eye. Pronotum margined with black anteriorly, with ivory green posteriorly, a black line adjacent to the latter. Fore wing green, nervures broadly black, the apical cells and appendix smoky hyaline. Length: male, 5.5 mm., female, 6 mm.

Specimens examined: 6; Olmsted, Goodhue, Ramsey, and Le Sueur counties; July.

HELOCHARA Fitch

1851. Homop. N. Y. State Cab., p. 56.

GENOTYPE: *Helochara communis* Fitch, 1851. Monobasic.

Similar in form to members of the genus *Draeculacephala*, but fore wing with prominent veins, no reticulations, three antepical and five apical cells. Head slightly wider than thorax, broader than long, with sides of face reflexed upon the crown and showing concentric lines.

This genus contains one species which is widespread in North America and commonly collected in Minnesota.

Helochara communis Fitch1851. *Helochara communis* Fitch. Homop. N. Y. State Cab., p. 56. (Also: 1893. N. Y. State Ent. Rpt. 9:396.)

Deep green, fading to yellowish olive, living specimens being much brighter. Face light, arcuately marked with black in female, usually entirely black in male. Male antenna with a black elongated disc. Length: male, 4.5-5 mm., female, 6 mm.

This species prefers grassy locations in swamps or beside streams. It is collected from early spring to late fall and overwinters as a hibernating adult.

Specimens examined: 1,247; throughout the state.

GRAPHOCEPHALA Van Duzee

1916. Check list Hemiptera, p. 66.

GENOTYPE: *Cicada coccinea* Forster, 1771. Original designation.

Head narrower than the pronotum. Crown angular, rounded anteriorly, in profile flat and strongly angled with front (Pl. III, Fig. 9, 9A). Fore wing long, opaque, and marked with brilliantly colored stripes.

Ball (1901) revised this genus, then known as *Diedrocephala*. Notes and new species were added by Ball (1936e).

Graphocephala coccinea (Forster)

(Pl. III, Fig. 9, 9A)

1771. *Cicada coccinea* Forster. Nov. Spec. Insect., p. 69.

A brilliantly colored species; crown and face yellowish orange, with a black band on the margin between. General color reddish, with prominent green or blue-green stripes on pronotum and fore wing. Length: male, 7-8 mm., female, 8 mm.

Specimens examined: 142; all parts of the state; late June to early October.

DRAECULACEPHALA Ball

1901. Iowa Acad. Sci. Proc. 8:39, 66.

GENOTYPE: *Tettigonia mollipes* Say, 1831. Original designation.

Green or straw-colored, relatively slender in form, and usually with crown acutely angled (Pl. III, Fig. 10). The species are readily separated from related forms by the reticulate venation of the apical half of the fore wing.

Ball (1927) revised this group and gave a key to the North American species. Additional notes by Ball and China (1933) established the identity of many of Walker's types.

Key to Species

- | | |
|--|---------------------|
| 1. Males | 2 |
| Females | 7 |
| 2. Pygofer greatly exceeding plate in length | 3 |
| Pygofer slightly or not at all exceeding plate | 4 |
| 3. Spots at apex of crown small and close together; plate narrowed sharply beyond the middle | angulifera |
| Spots at apex of crown large and not approximate; plate not narrowed near the middle | prasina |
| 4. Plate long and slender, about the same width throughout | paludosa |
| Plates together triangular in shape | 5 |
| 5. Apex of plate with a drawn-out, laterally diverging tip | crassicornis |
| Apex of plate may be folded but not angled laterally | 6 |
| 6. 6 mm. or less in length | mollipes |
| 7 mm. or more in length | minor |
| 7. Margin at apex of crown thin and protruding | 8 |
| Margin at apex rounded, the margin thickened | 10 |
| 8. Large, more than 10 mm., face usually light, the arcs distinct | paludosa |
| Smaller, less than 10 mm., face usually dark, the arcs obscured | 9 |
| 9. Large, more than 8 mm., crown and pronotum broad | minor |
| Smaller, less than 8 mm., crown and pronotum narrow | mollipes |
| 10. Crown longer than pronotum | angulifera |
| Crown about equalling or shorter than pronotum | 11 |
| 11. Apical dots of crown very small and close together; markings in front of eyes linear | crassicornis |
| Apical dots large, separated; markings in front of eye broad | prasina |

Draeculacephala paludosa Ball and China

1933. *Draeculacephala paludosa* Ball and China. Kans. Ent. Soc. Jour. 6:3.

A large species which is easily recognized. Crown about as long as broad, the front in lateral view straight with a definite angle at the base. Plate over three times as long as wide, slender, the tip usually slightly folded dorsally. Posterior margin of sternite VII with a concave curve on each side of a median truncate ridge which is equal to the width of the ovipositor. Length: male, 7.5-8 mm., female, 10-11 mm.

Specimens examined: 245; Chippewa, Cook, Hennepin, Le Sueur, Nicollet, Polk, Ramsey, Wilkin, and Winona counties; July, August, and September.

Draeculacephala mollipes (Say)

1831. *Tettigonia mollipes* Say. Acad. Nat. Sci. Phila. Jour. 6:312. (Also: 1891. Compl. Writ. 2:386.)

A small species, apparently rare in Minnesota. Crown about as long as broad, very sharply angled in front, scarcely longer than pronotum. Pronotum crossed by five bluish or green stripes, which may continue on to the crown and scutellum and are the same color as the nervures. Plates together triangular, slightly constricted near the middle, the apices slightly folded. Length: male, 6 mm.

Specimens examined: 5; Anoka County, Plummer, Taylors Falls, and Ramsey County; August and September.

Draeculacephala angulifera (Walker)

1851. *Tettigonia angulifera* Walker. List Homop. Ins. Brit. Mus. 3:771.

Crown rounding to front, not acutely angled in lateral view; heavily marked with black in male. Plate about half as long as pygofer, the apex slightly folded. Posterior margin of sternite VII arcuated, a small median notch on the slightly produced central portion. Length: male, 7-8 mm., female, 8-9 mm.

Specimens examined: 52; Cass, Polk, Todd, Lake, Cook, Pine, Ramsey, Hennepin, and Carver counties; July and August.

Draeculacephala crassicornis Van Duzee

1915. *Draeculacephala crassicornis* Van Duzee. Ent. News 26:181.

Crown wider than long, the margins rolled, with a black dash in front of each eye and two at the apex. Plates together triangular, the apex of each drawn out into a broad filament which is bent sharply to each side. Apical half of male antenna black and enlarged. Sternite VII sinuate on posterior margin and with a slight notch at the middle. Length: male, 6-6.5 mm., female, 7-7.5 mm.

Specimens examined: 7; Cook County; August 21, 1938.

Draeculacephala prasina (Walker)

1851. *Tettigonia prasina* Walker. List Homop. Ins. Brit. Mus. 3:768.

Resembling *angulifera*, but differs by its shorter and broader crown, and the larger black spot in front of each eye. Crown

shorter than pronotum in both sexes. Plates broadly triangular together, about two thirds the length of pygofer, their outside margins lined with fine hairs. Length: male, 7-8 mm., female, 8-9 mm.

Specimens examined: 362; throughout the state; July and August.

Draeculacephala minor (Walker)

(Pl. III, Fig. 10)

1851. *Tettigonia minor* Walker. List Homop. Ins. Brit. Mus. 3:772.

A very common species in Minnesota, and heretofore confused with *mollipes*. Crown acutely angled, the face in lateral view straight, with a distinct bend near the tip. Face arcuately marked with black in female, distinctly black in male. Plates together triangular, about twice as long as their width at the base, sparsely lined with spines at the outside margins. Length: male, 7-7.5 mm., female, 9-10 mm.

Specimens examined: 4,569; all parts of the state; last of June until the first of September.

Subfamily EVACANTHINAE Baker

1923. *Euacanthidae* Baker. Philippine Jour. Sci. 23:353, 362.

EVACANTHUS LePeletier and Serville

1828. Encyclopédie Méthodique, 10:612.

GENOTYPE: *Cicada interrupta* Linnaeus, 1758. Original designation.

Species in this genus have a distinct median keel on crown and front, the crown also with an additional obscure carina from apex to each eye and enclosing the ocellus (Pl. III, Fig. 15). The pronotum and scutellum are pubescent, other parts with scattered hairs. Fore wing without anteapical cells, shorter than abdomen in females.

Only two species are included in this genus in North America, one of which has been collected in Minnesota.

Evacanthus acuminatus (Fabricius)

(Pl. III, Fig. 15)

1794. *Cicada acuminata* Fabricius. Ent. Syst. 4:36.

Male black, female brown; nervures of fore wing irregularly white, the costal area white near apex. Crown of female with a pair of spots near posterior margin. Anterior margin of pronotum

with two transverse bars divided by a broad black stripe extending from apex of crown to tip of scutellum. Length: male, 5.5 mm., female, 6 mm.

Specimens examined: 3; Cook County, Eagle Bend, and Lutsen; July and August.

Subfamily APHRODINAE Kirkaldy

1906. *Aphrodinae* Kirkaldy. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1:307.

Key to Genera

1. Four mm. or less in length; fore wing smooth **Xestocephalus**
More than 4 mm. in length; fore wing roughened.....2
2. Crown with a median longitudinal carina (Pl. III, Fig. 8).....**Aphrodes**
Crown without a median longitudinal carina..... **Stroggylocephalus**

STROGGYLOCEPHALUS Flor

1861. *Rynchota* Livlands 2:198, 210.

GENOTYPE: *Cicada agrestis* Fallén, 1806. Monobasic.

Crown angulately produced, the dorsal surface longitudinally striate, except where paralleling the anterior margin. Ocelli above a rather sharp margin, only slightly closer to eyes than to apex of crown. Pronotum coarsely transversely striate. Veins of fore wing conspicuous, sparsely margined with pubescence.

Stroggylocephalus agrestis (Fallén)

1806. *Cicada agrestis* Fallén. Svenska Vetensk. Akad. Handl. 27:23.

A puzzling species, varying in color, size, and markings. A constant structural feature seems to be an indentation of the eye next to the antennal pit. Length: male, 6 mm., female, 6.5 mm.

Specimens examined: 6; Hennepin County, Walker, Ramsey County, Mille Lacs County, and Anoka County; April and May.

APHRODES Curtis

1831. *Guide Brit. Ins.*, p. 193.

GENOTYPE: *Cicada albifrons* Linnaeus, 1758. Monobasic.

Crown angular and well produced before the eyes, somewhat depressed before the margin, the ocelli on the margin about midway from eye to apex. Crown usually with a distinct median longitudinal carina (Pl. III, Fig. 8).

Key to Species

- Length less than 5 mm., species dark brown in color.....**albifrons**
Length 5 mm. or more, species light yellow in color.....**bicinctus**

Aphrodes bicinctus (Schrank)

1776. *Cicada bicincta* Schrank. Beiträge zur Naturgeschichte, p. 75 (reference not seen).

1781. *Cicada bicincta* Schrank. Enum. Ins. Austria, p. 254.

1781. *Cicada nervosus* Schrank. Enum. Ins. Austria, p. 252. (nec. *Cicada nervosus* Linn., 1758.)

Yellowish brown, with a contrasting, distinct, yellow transverse band on pronotum. Dorsal surface of crown and pronotum striate. Fore wing opaque, the veins prominent. Length: male, 6 mm.

Specimens examined: 1; Cook County; August 5, 1939.

Aphrodes albifrons (Linnaeus)

(Pl. III, Fig. 8)

1758. *Cicada albifrons* Linnaeus. Syst. Nat. Ed. 10, p. 437.

A small, rather robust, dark-brown species with irregular black markings. Dorsal surface of crown, pronotum, and scutellum finely punctate, the pronotum sometimes transversely striate; fore wing rugose, especially the claval area. Length: female, 4 mm.

According to Osborn (1916) this species is found principally on timothy, living at least part of the time on the crown of the plant. However, Ball (1932a) reported that it feeds on the plantain growing between timothy clumps.

Specimens examined: 3; Hennepin and Ramsey counties; July to October.

XESTOCEPHALUS Van Duzee

1892. Amer. Ent. Soc. Trans. 19:298.

GENOTYPE: *Xestocephalus pulicarius* Van Duzee, 1894. Subsequent designation.

Small, robust species which are elliptical in form. Head subconical, narrower than pronotum, the ocelli on the rounded margin distant from the eyes. Fore wing without an appendix, usually marked with semitransparent yellow or light-brown spots.

Peters (1933) gave a key to the species in this genus and illustrated several of the male genitalia.

Key to Species

- | | |
|---|-------------------|
| 1. Species black with a white-marked fore wing..... | coronatus |
| Species brown | 2 |
| 2. Crown with distinct lines or dots..... | pulicarius |
| Crown without markings..... | superbus |

Xestocephalus coronatus Osborn and Ball

1897. *Xestocephalus coronatus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:184.

Nearly the same form and size as *pulicarius*, but shiny black with conspicuous white markings on head, pronotum, and fore wing. Length: male, 2.5 mm., female, 3 mm.

Not yet collected in Minnesota. It should be found since it occurs in Iowa and has been reported from Wisconsin.

Xestocephalus pulicarius Van Duzee

1894. *Xestocephalus pulicarius* Van Duzee. Buffalo Soc. Nat. Sci. Bul. 5:215.

Small, brown; the crown marked with yellow spots at apex and next to the eyes, and usually with yellowish lines on the disc. Fore wing dark brown, mottled with yellow or clear spots. Length: male, 2.5 mm., female, 2.75 mm.

Its normal host plant is *Carex vulpinoidea* according to Osborn (1915).

Specimens examined: 3,543; Crookston, Houston County, Cook County, Taylors Falls, Lake County, Grand Marais, Baudette, and Ramsey County; May to August.

Xestocephalus superbus (Provancher)

1890. *Deltocephalus superbus* Provancher. Pet. Faune Ent. Canad. 3:339.

Large, uniformly light brown, without definite markings on crown or pronotum. Length: female, 3.75 mm.

Specimens examined: 5; Ramsey County.

Subfamily DORYDIINAE Van Duzee

1892. *Dorydini* Van Duzee. Amer. Ent. Soc. Trans. 19:297.

Key to Genera

- | | |
|--|-----------------------|
| 1. Crown with lineate markings..... | Hecalus |
| Crown without markings..... | 2 |
| 2. Some shade of green; crown not greatly prolonged
(Pl. III, Fig. 16)..... | Parabolocratus |
| Brown in color; crown greatly prolonged and foliaceous | Dorycephalus |

DORYCEPHALUS Kouchakéwitch

1866. Soc. Ent. Rossica Horae 4:102.

GENOTYPE: *Dorycephalus Baeri* Kouchakéwitch, 1866. Monobasic.

Distinctive species with a very long and flattened head. Crown approximately three times as long as wide, with a distinct longitudinal median carina, and the entire margin thin and foliaceous.

Dorycephalus platyrhynchus Osborn

1894. *Dorycephalus platyrhynchus* Osborn. *Canad. Ent.* 26: 216.

An elongate form; females light brown; males darker, grayish brown. Length: male, 9 mm., female, 14 mm.

Osborn and Ball (1897) found that this species passes the winter as a nymph. Ball (1932a) added a note on the life cycle.

Specimens examined: 7; Hennepin and Norman counties; June to October.

HECALUS Stål

1864. *Soc. Ent. de France Ann.* (Ser. 4) 4:65.

GENOTYPE: *Petalocephala Paykulli* Stål, 1854. Subsequent designation.

Crown longer than broad, parabolically rounded anteriorly, the margin sharp and foliaceous. Fore wing much shorter than abdomen in the female, but only slightly shorter in the male. This genus is intermediate between *Dorycephalus* and *Paraboloctratus* in the form of the crown.

Hecalus lineatus (Uhler)

1877. *Glossocratus lineatus* Uhler. *U. S. Geol. and Geog. Survey Bul.* 3:463.

Bright green, with four orange-red stripes extending from apex of crown across pronotum, the median two continued to tip of scutellum. Nervures of fore wing broadly orange, the male with a black band at apex, which extends on to tip of abdomen. Length: male, 6 mm., female, 10 mm.

Reported by Osborn and Ball (1897) on slough grass (*Spartina cynosuroides*) in Iowa.

Specimens examined: 6; Big Stone County, Traverse County, Polk County, Crookston, and Freeborn County; July and August.

PARABOLOCRATUS Fieber

1866. *Zool.-Bot. Gesell. Wien, Verhandl.* 16:502.

GENOTYPE: *Paraboloctratus glaucescens* Fieber, 1866. Monobasic.

Crown about as long as pronotum, parabolically or elliptically produced, with the margin thin and foliaceous in female, but scarcely so in male (Pl. III, Fig. 16). Fore wing short in female, usually reaching to base of pygofer; in the male extending beyond tip of abdomen.

Shaw (1932) revised the group and figured the species. New species were added by DeLong (1938a).

Key to Species

1. Front in profile nearly straight; margin with crown very thin and foliaceous *kansiensis*
 Front in profile inflated; margin with crown relatively thick and not foliaceous 2
2. Species robust; crown broadly rounded, distinctly shorter than pronotum *major*
 Species rather slender; crown somewhat angulately rounded, about the same length as pronotum *viridis*

Parabolocratus kansiensis Shaw

1932. *Parabolocratus kansiensis* Shaw. Kans. Ent. Soc. Jour. 5:47.

Yellowish green, the crown shorter than wide, angulately rounded, the margin with front very thin, foliaceous, and strongly reflexed. Fore wing unicolorous; last abdominal segment exposed in the female; wing exceeding abdomen in the male. Length: male, 5.5-6 mm., female, 8 mm.

According to Shaw (1932) paratype(s) of this species from Lakeland, Minnesota is (are) in the Snow Entomological collection, University of Kansas.

Parabolocratus viridis (Uhler)

(Pl. III, Fig. 16)

1877. *Glossocratus viridis* Uhler. U. S. Geol. and Geog. Survey Bul. 3:462.

Uniformly grass green, the crown of the female parabolic in shape, of the male distinctly angular, a black line often under the margin. Length: male, 5-6 mm., female, 6.5-7 mm.

According to Osborn and Ball (1897) wild oat (*Stipa spartea*) is the normal food plant of this species.

Specimens examined: 152; Ramsey, Pope, Hennepin, Kittson, Lincoln, Clearwater, Wadena, Goodhue, Polk, Cook, and Lake counties; May through August.

Parabolocratus major Osborn

1915. *Parabolocratus major* Osborn. Maine Agr. Expt. Sta. Bul. 238:110.

Uniformly green, sometimes faded to yellowish green; the crown broadly rounded and with a thin margin. Female without a black line under margin, often obscure in the male. Similar to *viridis* but distinctly larger and with a more broadly rounded crown. Length: male, 6-7 mm., female, 7.5-8 mm.

The normal food plant is reported by Osborn (1915) to be *Calamagrostis canadensis*.

Specimens examined: 28; Hennepin, Ramsey, Itasca, Houston, and Mille Lacs counties; May through August.

Subfamily JASSINAE Amyot and Serville

1843. *Jassinæ* Amyot and Serville. Hist. Nat. des Ins., Hemiptères, p. 581.

JASSUS Fabricius

1803. *Systema Rhyngotorum*, pp. 12 and 85.

GENOTYPE: *Jassus nervosus* Fabricius, 1803. Subsequent designation.

Robust species, with head narrower than pronotum. Crown narrowly quadrate, blunt anteriorly, and broadly rounded to the long front, perpendicularly raised at the sides and base (Pl. III, Fig. 11). Ocelli large and situated about halfway from the eye to the median line. Face with transverse striae and an indication of a median carina. Fore wing broadly rounded behind, with one closed antepical cell, petiolate basally; appendix distinct. Lawson (1927) discussed this genus.

Jassus olitorius Say

(Pl. III, Fig. 11)

1831. *Jassus olitorius* Say. Acad. Nat. Sci. Phila. Jour. 6: 310. (Also: 1891. Compl. Writ. 2:385.)

Brownish, the crown yellowish. Face yellow, usually with two red stripes. Fore wing brown, the nervures darker, in the female transversely crossed by two hyaline bands; in the male darker brown and without bands. Length: male, 6 mm., female, 7 mm.

DeLong (1923) reported sassafras as the food plant of this species.

Specimens examined: 3; Wabasha County, Lake City, and Houston; July and August.

Subfamily ATHYSANINAE Van Duzee

1892. *Athysanini* Van Duzee. Amer. Ent. Soc. Trans. 19: 297, 299.

Key to Genera

1. Genae visible behind eyes in dorsal view (Pl. IV, Fig. 1, 1A). Crown acutely angled, the front long and narrow. Fore wing with reflexed veinlets to costal margin (Pl. VII, Fig. 1).....2
- Genae not visible behind eyes in dorsal view. Crown variable, but front rarely long and narrow. Fore wing with or without reflexed veinlets to costal margin.....3

2. Second cross vein absent; few or no veinlets to costal margin **Japananus**
 Second cross vein present; usually many reflexed veinlets to costal margin **Scaphytopius**
3. Crown acutely angled; in lateral view, flat and meeting front with a rather sharp and distinct margin (Pl. IV, Fig. 2, 2A). Fore wing without second cross vein; with reflexed veinlets to costal margin (*Scaphoideus* and allies).....4
 Species otherwise7
4. Fore wing with reticulate veinlets along claval suture (Pl. VII, Fig. 7) **Prescottia**
 Fore wing without reticulations along claval suture.....5
5. Outer anteapical cells nearly parallel sided to costal margin; without extra veinlets to costal margin (Pl. VII, Fig. 4)..... **Osbornellus**
 Outer anteapical cell narrowed posteriorly; with supernumerary veinlets to costal margin (Pl. VII, Fig. 5).....6
6. Head and pronotum ivory white or yellowish. Plate narrow and almost as long as pygofer..... **Lonenus**
 Head and pronotum with fuscous markings. Plate distinctly shorter than the pygofer..... **Scaphoideus**
7. Fore wing uniformly inscribed with numerous small brown pigment lines (Pl. VI, Fig. 1).....8
 Fore wing variously marked and inscribed otherwise; or without markings9
8. Crown not produced; anterior margin rounded or acute (Pl. IV, Fig. 13) **Phlepsius**
 Crown produced; anterior margin thin, usually foliaceous at apex (Pl. IV, Fig. 14)..... **Paraphlepsius**
9. Fore wing with two anteapical cells. Species always macropterous (Pl. VI, Fig. 8)..... **Macrosteles**
 Fore wing with three anteapical cells. Species usually macropterous but sometimes brachypterous.....10
10. Brachypterous; if macropterous the venation usually obscured, sometimes with only two anteapical cells. Ovipositor usually greatly exceeding the pygofer in length.....11
 Species rarely brachypterous. Venation conspicuous; three anteapical cells present. Ovipositor normal and little exceeding pygofer.....14
11. Usually black, with fore wing opaque. Crown broad and almost parallel margined **Driotura**
 Usually gray, with fore wing subhyaline. Crown angulately produced12
12. Anterior margin of crown rather sharp, and acutely angled with the front **Doratula**
 Anterior margin of crown obtusely rounded to the front without a sharp margin13
13. Usually 3 mm. or more in length; crown with a large black spot on either side of the apex. Ovipositor long and slender **Athysanella**
 Species less than 2.75 mm. in length; crown unmarked (except *L. rotunda*) **Lonatura**
14. Crown usually acutely produced or as wide as long. Fore wing with the second cross vein present, the nervures usually distinct (*Deltocephalus* and allies).....15