

A SYNOPSIS OF THE GENUS CHLOROTETTIX.*

By DWIGHT M. DeLONG, M. Sc.,
Instructor in Zoology and Entomology, Ohio State University.

(Including the descriptions of four new species by Herbert Osborn.)

The Genus *Chlorotettix* is primarily North American and was founded in 1892 by Van Duzee (*Psyche*, Vol. 6, p. 306). At that time he included four species, *C. unicolor*, *tergatus*, *viridius* and *galbanatus*, the first named being cited as the type. Additions have been made to this number by Van Duzee, Osborn, Ball, Baker, Crumb, Sanders and the author until the genus comprises thirty-one species and one variety which are treated in this paper. Not all of these are North American, but can be included in a survey of the genus. Two were described from Brazil (Baker), one from Mexico (Baker), one from Jamaica (Van Duzee), one previously recorded and three treated as new in this paper from Guatemala (Osborn), and the others are primarily nearctic forms, the majority of which seem to be distributed over the Eastern half of the United States.

In view of the fact that the original descriptions of these species are scattered in numerous publications, that five species and one variety have been added during the last two years, and several at hand are undescribed, it seems advisable to review the genus, presenting drawings and descriptions of both known and new species and a key for their separation. The species described as *C. nacreosa* (Crumb) does not belong to the genus, apparently, so is not included in this survey.

The genus is closely allied to *Thamnotettix*, *Eutettix* and *Phlepsius*, but can be separated from the last two very easily by the entire absence of the ramose pigment lines on the elytra which are characteristic of these two genera. The members of *Chlorotettix* are less easily distinguished, however, from the species of *Thamnotettix* since they have the same wing venation and resemble them in size, often in color and general appearance. Van Duzee in separating these two genera makes this distinction in his original description of the Genus *Chlorotettix*. "The head is still broader, well rounded before and of almost equal length

*Contribution from the Department of Zoology and Entomology, Ohio State University, No. 54.

across its whole width, thus recalling *Idiocerus*; the ocelli are plainly visible from above; the front is wide as in *Limotettix*, sides of pronotum of moderate length and distinctly carinated; elytra long with the appendix well developed, thin and subhyaline in texture with the nervures indistinct. This genus includes insects larger than we find in other groups here noticed, of a uniform green color of some shade, occasionally tinged with fulvous or marked with black on the tergum."

But many species which undoubtedly belong in this genus have since been described, so we find about half the species of *Chlorotettix* that are now known, possessing a bluntly angled vertex, which is often considerably longer on the middle than next the eyes. Also the size of the species may vary greatly, the smallest known having a length of only 3.5 mm., although the majority of the species are large (6-8 mm.).

Fitch's two species, *C. unicolor* and *tergatus*, were placed by Uhler in *Grypotes*, an old world genus, the members of which resemble in general appearance species of *Chlorotettix*. But in describing the Genus *Chlorotettix*, Van Duzee has mentioned the lack of the incurved clypeus which is characteristic of *Grypotes* and he places the genus as, "Closely related to and intermediate between," *Thamnotettix* and *Limotettix*, the last one mentioned is synonymous with *Athysanus* Burm. and now known as a subgenus of *Euscelis*. It seems to be then primarily a new world or North American Genus and perhaps an offshoot from *Thamnotettix*.

With few exceptions the species of *Chlorotettix* have a uniform green color, often fading to dull yellow in preserved material. As a rule the species are easily recognized by this uniform color together with the rounded or bluntly angled vertex. Very few of these bear color markings but when present are in the form of bands or spots on the head, pronotum or scutellum.

For the separation of species I have attempted to use the most prominent and constant characters. The comparative length of the head and the distinctive genitalia of both sexes offer structural characters easily discernible and very constant. Although color is a variable character, a few bright color markings may help to separate certain species quite readily from those which are only of a uniform green.

The members of this group are practically all grass feeding insects and consequently are of great economic importance,

especially where they occur abundantly. Some feed on sedges and swamp grasses, while others are numerous in pastures and meadows, often occurring more abundantly on areas shaded by trees and shrubs. This is no doubt due to the fact that the group as a whole live in moist locations and especially in low, swampy fields. One species however, *C. suturalis* DeLong, is an exception as regards its food plant, living entirely upon Canebrake (*Arundinaria tecta*) where it is abundant, but has not been found on any other plant.

In the preparation of this paper I have examined specimens of all the described species except those from Brazil and Jamaica, which are not included in the key. In making the drawings type material was used so far as possible. I have specimens collected at the type locality and compared with Mr. Crumb's types, also have had at hand specimens collected by Prof. Osborn at Fitch's home and compared with his types of *tergatus* and *unicolor*. I have used material from the Ohio State University collection and the private collections of Dr. Herbert Osborn, Mr. E. P. Van Duzee, Dr. E. D. Ball and Mr. F. H. Lathrop. Dr. Osborn's collection containing many types and records of all parts of the United States and Guatemala, Mr. Lathrop's collection of South Carolina and Oregon material, and specimens and records from Dr. Ball and Mr. Van Duzee have been a valuable assistance; these together with my own collection containing type specimens from Wisconsin and Tennessee, and representatives of all the described nearctic species except three, have furnished an abundance of material.

To those who have assisted with the loan of material and records for distribution, I wish to express my sincere thanks, and especially to Dr. Osborn who has given me access not only to his type material, but also to his private library, and has offered valuable suggestions and assistance in the preparation of this paper.

The following pages are concerned only with the systematic study of this group, but a further study has already been undertaken and it is planned to publish as soon as possible the results, dealing exclusively with the biological and ecological phases of this subject.

Key to the Species of Chlorotettix.*

1. Vertex with anterior margin rounded, usually broadly curved, the length at middle equaling or slightly exceeding length next the eyes.....2.
- Anterior margin of vertex distinctly but usually bluntly angulate; at least one-third longer on the middle than next the eyes (except *C. minimus*)...14.
2. Size small, not exceeding 5 mm. in length.....3.
- Size larger, more than 6 mm. in length.....4.
3. With definite markings, elytral suture and two veins bordering claval veins, brown.....*lineatus*.
- Pale yellowish green without definite markings; length 4 mm., female segment, produced at middle.....*minor*.
4. General color brownish or sordid green, usually very dark.....5.
- General color light, pale green, yellowish or whitish.....6.
5. Uniform sordid green without definite bands or stripes, often appearing almost black in color.....*tergatus*.
- Head pale with a broad brown band between the eyes; elytra dark with rather broad, pale nervures, giving it a striped appearance.....*necopinus*.
6. Vertex or elytra with red or dark markings.....7.
- Vertex and elytra greenish or yellowish, unmarked.....9.
7. Margin of vertex with a broad red band between the eyes, elytra unmarked, female segment with a spatulate process.....*rugicollis*.
- Vertex without markings, elytra pale with darker stripes.....8.
8. Vertex narrower than pronotum, elytra greenish-white with four longitudinal brown lines, scutellum marked with brown.....*vittatus*.
- Vertex as wide as pronotum, elytra pale yellowish green, a dull, three-lobed, fuscous stripe along the suture.....*suturalis*.
9. Head subangulate, body quite narrow, a cross nervure between the two inner veins of the clavus.....*occidentalis*.
- Head rounded, almost parallel margined; body usually broad, inner veins of clavus without a cross nervure.....10.
10. Female ventral segment broadly notched, a broad spatulate process extending from its apex; male plates long, gradually tapering.....*spatulatus*.
- Female segment notched but without spatulate process.....11.
11. Size large, 7.5 mm. broad, female segment with notch or incision, sides not toothed.....12.
- Smaller not exceeding 7 mm., narrower, female segment with sides of notch each bearing a lateral median tooth.....13.
12. Female segment evenly, somewhat concavely and rather deeply notched, male plates narrowed at half their length then produced.....*unicolor*.
- Female segment narrowed posteriorly, lobes strongly concavely rounded to median notch which terminates anteriorly in an incision.....*similis*.
13. Color bright apple green, female segment with short, blunt, lateral tooth, male plates very short, broadly rounded.....*viridius*.
- Color yellowish green, female notch narrower, lateral tooth more produced and rounded, male plates long, gradually tapering to apices.....*curridens*.
14. Vertex with a distinct, transverse band across middle between the eyes....15.
- Vertex without definite markings in the form of spots and bands.....17.
15. Size large, 7.5 mm., distinctly reddish brown in color.....*lusorius*.
- Size smaller, not exceeding 6 mm. in length, color yellowish green.....16.
16. Band on vertex narrow, scutellum without color markings; female segment with well rounded notch, lobes either side broad.....*lobatus*.
- Band broader, distinct; basal angles of scutellum each with a large black spot which extends under pronotum, female segments with rather sharp lateral angles.....*scutellatus*.
17. Not exceeding 6.5 mm. in length.....18.
- Larger, 7 mm. or more in length.....24.

*The specimens of three species, *C. emarginatus* Baker, *breviceps* Baker, and *tethys* Van Duzee, could not be obtained so are not included in the key. The original descriptions are quoted at the end of this paper.

18. Vertex distinctly angled, almost twice as long at middle as next the eyes, sometimes conical.....19.
- Vertex more bluntly angled, not more than one-half longer at middle than next the eyes.....20.
19. At least 5.5 mm. in length, male valve sinuate, apex notched, apices of plates not produced in long finger-like processes.....*vividus*.
- Length 4.5 mm., male valve obtusely rounded, apices of plates produced in finger-like processes as long as plates.....*della*.
20. Small, not exceeding 5 mm. in length.....21.
- Larger, 6 mm. or more in length.....22.
21. Female segment with a rather broad V-shaped notch, lateral angles slightly produced, male plates broad.....*borealis*.
- Female segment with a very narrow notch, lateral angles strongly produced; male plates narrow and parallel on apical half.....*minus*.
22. Female segment with lateral lobes broad and rounded; male valve broad and obtusely angled.....*galbanatus*.
- Female segment with lateral lobes angled or angularly rounded; male valve narrow, rounded, as long as broad.....23.
23. Vertex about one-third longer at middle than next the eyes, female segment with the sides of notch convexly rounded.....*vacuus*.
- Vertex longer, one-half longer at middle than next the eyes, sides of female notch concavely rounded.....*distinctus*.
24. Female segment deeply notched, bearing a spatulate process at its apex, male valve short and broad, obtusely angled.....*balli*.
- Female segment usually notched but without a spatulate process.....25.
25. Color brownish green, often with a reddish brown tint; length 7 mm.....26.
- Color greenish or yellowish green, length 7.5 mm.....27.
26. Lorac broad, well rounded; color reddish brown, female segment deeply, broadly, concavely notched, lateral angles sharp.....*irridescens*.
- Lorac narrower, color brownish green, female segment broadly but shallowly emarginate, a minute notch and brown spot at the center, male plates short, bluntly rounded.....*lunicatus*.
27. Female segment slightly emarginate with a brown spot at center; male valve notched at middle.....*stolatus*.
- Female segment black margined, with notch at center, broadly, shallowly emarginate either side; male valve rounded, without notch.....*nudatus*.

Chlorotettix lineatus n. sp. Osborn.*

(Figs. 1: a, b.)

Pale straw with yellow scutellum and venter, and faint brown line on claval suture and bordering claval veins. Length ♂ 5 mm.

Head arched; vertex short, rounded in front scarcely longer at middle than next the eye; front moderately convex; pronotum with submarginal impression distinct, striae faint; elytra subhyaline on costal half, more opaque internally.

Color: Light yellowish, straw color, the front somewhat more yellow. The central part of the scutellum and the ventral segments of abdomen yellow, the elytral suture and the two narrow lines bordering the claval veins faintly brown.

*The species *curvidens*, *lobatus scutellatus* and *lineatus* are here described as new by Herbert Osborn. They are included in this paper in order that it may be made as complete as possible for the American fauna.

Genitalia: Male valve broad, short, rounded behind, plates long, border rounded slightly at base, narrowed from middle and tapering to acute tip: three times as long as the width at base.

Described from one specimen taken at Los Amates, Guatemala, by Prof. J. S. Hine, in Feb., 1905. Type in Ohio State University collection.

***Chlorotettix minor* n. sp.**

(Figs. 2: a, b.)

Very small, the head well rounded, yellow with a green tint. Length, 3.5-4. mm.

Vertex slightly longer on the middle than next the eye, rounded anteriorly, twice as wide as long. Front a little longer than wide. Pronotum short, more than twice as wide as long, anterior margin broadly rounding to humeral angles which slope to the concave posterior border. Elytra hyaline, through which the abdomen is visible.

Color: Dull yellow without definite markings, but tinged with green. Disc of pronotum darker. Face embrowned, with a median line and faint indications of paler arcs. Ovipositor and a spot on the middle of posterior border of last ventral segment brown.

Genitalia: Last ventral segment of female two and one-half times as long as preceding; posterior margin sinuated so as to be roundly produced at the middle, either side of which it is shallowly, broadly emarginate to the lateral angles which are quite prominent. Pygofers stout, ovipositor brown. Male valve very short, truncated, plates broad at base, long, gradually narrowed to produced, finger-like apices.

This is the smallest species belonging to the genus which has been described, and is distinct in size and genital characters from anything I have been able to find. Described from a male and female from Juarez, Mexico, and a female from Brewster Co., Texas. Type in author's collection, paratype in collection of Dr. Osborn.

Chlorotettix tergatus (Fitch.)

(Figs. 3: a, b, c.)

- Bythoscopus tergatus* Fitch, N. Y. Sta. Cab., p. 58, (1951); Walker, Homop. 4, p. 1161, (1852).
- Grypotes tergatus* Uhler, Stand. Hist., 2, p. 246, (1884); V. D., Psyche, 5, p. 390, (1890).
- Athysanus tergatus* Southwick, Science, 19, p. 288, (1892).
- Chlorotettix tergatus* V. D., Psyche, 6, p. 306, 309, (1892); Lintner's 9th Rept., p. 398, 410, (1893); V. D., Trans. Amer. Ent. Soc., 21, p. 304, (1894); V. D., Bull. Buff. Soc. Nat. Sci., 5, p. 200, (1894); Osb., Rept. Ohio Acad. Sci., 8, p. 68, (1900); Osb., Rept. N. Y. State Ent., 20, p. 533, (1901); Wirtner, Anns. Car. Mus., 3, p. 225, (1904); Barber, Bull. Amer. Mus. Nat. Hist., 33, p. 535, (1914); Osb., Maine Agr. Exper. Sta. Bull., 238, p. 144, (1915); DeLong, Tenn. State Ent. Bull., 17, p. 84, (1916); Sand. & DeL., Anns. Ent. Soc. Amer., 10, p. 92, (1917).

The original description as given by Fitch is very short and is quoted here: "Sordid green, immaculate; elytra smoky; tergum black; beneath greenish yellow; tarsi pale brown. Length 0.30. On willows."

This species can be best separated from the others of the genus by a more detailed description. It resembles *unicolor* in form and size, large, robust, but with head narrower, and a uniform dark fulvous green color. Length, 7 mm.

Vertex a little more than twice as wide as long, slightly longer on the middle than next the eye; anterior margin somewhat produced, obtusely rounded. Front a little longer than broad, cheeks narrow, clypeus almost rectangular.

Color: Almost uniform sordid green; front, pronotum and scutellum often marked with yellowish green. Elytra smoky, abdomen and dorsal surface black, beneath pale yellow.

Genitalia: Last ventral segment of female twice as long as preceding, posterior margin with a broad, V-shaped notch extending half way to the base, lateral lobes rounded; pygofer long, almost equaling the ovipositor. Male valve triangular, apex obtusely rounded, sides somewhat concave near base. Plates large, broad, covering pygofer, sides slightly sinuated, apices broad and obtuse; margins armed with short spines and a fringe of soft white hairs. Pygofer produced superiorly in a prominent angle, and below in a curved appendage enclosing the styles.

Specimens are at hand which were collected at Fitch's home by Prof. Osborn and have been compared with the Fitch types in Albany. I have also examined specimens from Michigan, Ohio, Tennessee, Wisconsin, Illinois, New Jersey and South Carolina.

In addition to these states it has been reported as occurring in Pennsylvania, Iowa, Washington, Florida and Maine. These records give the species a wide north and south distribution, covering the eastern half of the United States, and extending across the northern part from the Atlantic to the Pacific oceans.

***Chlorotettix tergatus* var *melanotus* DeLong.**

Chlorotettix tergatus var *melanotus* DeLong, Tenn. Sta. Ent. Bull., 17, p. 84, (1916).

Differs from typical *tergatus* by having a slightly more rounded vertex, a distinctly blacker color, and the plates of the male are a little broader at the tip. Length, 7 mm.

The structural characters are very similar to the preceding, except that the vertex in the specimens at hand is slightly shorter.

Color: Black in appearance, but in reality very dark green, eyes black, light margined. Pronotum with a large black spot behind each eye. Elytra with costal margins and apex smoky subhyaline.

Genitalia: Agreeing with *tergatus* except that the male plates are a little broader and more strongly rounded.

The specimens which were given this varietal ranking were collected by the author in Tennessee during the summer of 1915 and are now in the author's collection.

***Chlorotettix necopinus* Van Duzee.**

(Figs. 4: a, b, c.)

Chlorotettix necopina V. D., Can. Ent., 25, p. 282 (1893); V. D. Trans. Amer. Ent. Soc., 21, p. 304 (1894); V. D., Bull. Buff. Soc. Nat. Sci., 9, p. 228 (1908); Metcalf Eli. Mitch. Sci. Soc., 31, p. 27, (1915); Barber, Bull. Amer. Mus. Nat. Hist., 33, p. 535 (1914); DeLong, Tenn. State Ent. Bull., 17, p. 84 (1916).

Form and size of *tergatus* nearly. Vertex with a black transverse band between the eyes. Color above greenish testaceous, marked and clouded with brown; elytra fuscous with strong, white nervures. Length 7 mm.

Vertex curved on the anterior margin, slightly longer on middle than next the eye, ocelli on margin almost touching eyes. Pronotum with anterior margin strongly convex, side margins short, concave posteriorly. Elytra long considerably exceeding abdomen.

Color: Greenish testaceous, vertex with a broad, transverse, blackish band on disc between the eyes. Beneath pale greenish

tinged with testaceous; front marked with ten pale arcs, and two spots at base of clypeus brown. Pronotum testaceous, pale before and on the median line, either side of which is a brown cloud, and a smaller one occupies each latero-posterior angle. Triangular spots in basal angles of scutellum, and a median line with a spot either side, brown. Elytra fuscous-brown, nervures white. Wings smoky, iridescent, nervures brown.

Genitalia: Last ventral segment of the female thin, broadly and deeply cleft nearly to its base; the incisure at its apex armed with a small blunt tooth, the lateral lobes ovate. Male valve almost twice as long as preceding segment, rounded and slightly emarginate on either side; plates broad at base, suddenly constricted behind middle, then produced, tips slightly divergent. Pygofers large, fitting at apex to form an oval opening.

The species is typically southern, and was described from specimens collected in Mississippi. In addition to this state, it has been reported from Tennessee, Kansas, Florida and North and South Carolina. I have examined specimens from Tennessee and North Carolina.

***Chlorotettix rugicollis* Ball.**

(Figs. 5: a, b, c.)

Chlorotettix rugicollis Ball, Can. Ent., 35, p. 230 (1903); V. D., Buff. Soc. Nat. Sci., 9, p. 228 (1908); Barber, Bull. Amer. Mus. Nat. Hist., 33, p. 535 (1914); DeLong, Tenn. State Ent. Bull., 17, p. 87, (1916).

Resembling *spatulatus*, but with a broader vertex. Green with a red band on the margin of the vertex. Length 7 mm.

Vertex broadly obtusely rounding, but little longer on middle than next the eye, two and one-half times wider than long, evenly rounding to front. Elytra rather long, the veins large and distinct.

Color: Pale green, a transverse red band on margin of vertex and front, sometimes becoming pale orange and often extending over the eyes. The elytra of the male usually tinged with tawny brown.

Genitalia: Last ventral segment of female deeply, triangularly excavated, with a strap-shaped tooth similar to that in *spatulatus*. Male valve nearly as wide as the preceding segment, and about half as long; plates nearly flat, long, triangular, the margins sparsely haired.

This species was described from specimens collected in Florida, New Jersey and Texas. It has also been reported as occurring in Tennessee and South Carolina. Although extensive collecting has been done in several of the northern and western states it has not been found to occur in any of them, and probably is restricted to the south and east, but no doubt is more widely distributed than records would indicate.

***Chlorotettix vittatus* Osborn.**

(Figs. 6: a, b, c.)

Chlorotettix vittata Osb., Ohio Nat., 9, p. 465 (1909).

Greenish white with distinct fusco-hyaline lines on the elytra. Female length to tip of elytra, 7 mm., male 6.75 mm.

Head scarcely as broad as pronotum; vertex round in front, scarcely longer at the middle than next the eye; front narrowed apically; clypeus widened at apex, loræ elliptical, rather narrow, genæ with sinuate margin. Pronotum concave behind, elytra sub-hyaline, veins small and indistinct.

Color: Pale greenish white, elytra somewhat milky with two slender oblique lines on clavus parallel to claval suture and two on the corium brown. Scutellum with three rather broad longitudinal stripes which extend forward on the pronotum and can be seen through the subhyaline portion.

Genitalia: Last ventral segment of female rather short, hind margin shallowly emarginate with a median and rather broad, deeper emargination; pygofer rather long, bristled near the tip. Male valve rounded behind, plates short, greatly exceeded by pygofer, curved on outer borders, a few bristles near the margin.

The species was described from specimens (types and paratypes in Ohio State University collection) collected at Los Amates, Guatemala, which is the only record known.

***Chlorotettix suturalis* DeLong.**

(Figs. 7: a, b, c.)

Chlorotettix suturalis DeLong, Tenn. State Ent. Bull., 17, p. 85, (1916).

Resembling *tergatus* in size and shape, but paler, with vertex slightly longer, a fuscous stripe on elytral suture, and genitalia distinct. Length, 7.5 mm.

Vertex a little longer on middle than next the eye, bluntly angulate. Face gradually, somewhat convexly narrowed to clypeus which is broadest at apex. Pronotum with anterior margin strongly curved to half its length, side margins very short, posterior border emarginate. Elytra long, exceeding tip of abdomen.

Color: Pale green, vertex with a median brown line on posterior portion, ocelli margined with bright green, margin as seen from above with a darker blotch either side of apex, formed by the darker color of the front extending on to the vertex. Pronotum with disc and posterior portion darker, basal angles of scutellum dark brown. Elytra washed with fuscous, a dark fuscous stripe composed of three rather distinct lobes, extending along the suture. In fresh specimens the color is bright with a red tint, becoming dull in preserved material. Clypeus and tarsal segments marked with fuscous.

Genitalia: Last ventral segment of female twice as long as preceding, lateral angles rounded, posterior margin broadly, deeply notched, more than half way to base, the sides of which are dark brown. Male valve broad, almost transverse and truncated posteriorly, plates broad and long, convexly narrowed to rounded tips, exceeded by pygofers; a groove parallel to outer margin, extending from base two-thirds the length of each plate. Outer margins clothed with spines.

The type specimens (author's collection) of this species were collected in Tennessee from Canebrake (*Arundinaria tecta*) where they occur in great numbers, but the species was not collected from any other plant. Although having been reported only from this state, its distribution no doubt corresponds with the distribution of the food plant mentioned. Paratypes in Osborn collection.

***Chlorotettix occidentalis* n. sp.**

(Figs. 8: a, b.)

Resembling *stolatus*, rather long and narrow, but with the vertex shorter and genitalia distinct. Length, 7 mm.

Vertex subangulate, almost one-third longer at middle than next the eyes, more than twice as wide as long; ocelli one-third the distance from the eyes to apex. Face longer than broad, clypeus broad, apex truncate, antennal pits unusually deep.

Pronotum narrower than head, more than half longer than vertex, twice as wide as long. Wings rather long and narrow, the two inner veins of the clavus joined by a cross nervure just posterior to the apex of the scutellum.

Color: Pale green, vertex and scutellum with a yellowish tint; wing nervures darker green. Face with several interrupted pale arcs.

Genitalia: Male valve shorter than last ventral segment, truncate posteriorly. Plates broad at base, gradually narrowing to acute tips, but not produced. Pygofer large, tumid, forming a keel where they meet posterior to the plates.

This species is described from a male specimen from Corvallis, Oregon, kindly sent to me by Prof. A. L. Lovett and treated thus because of its distinctive characters as compared to allied species. It is somewhat intermediate in form between *unicolor* (Fitch), and *stolatus* Ball, but differs from the former by its long, slender body, obtusely angled head and comparatively narrower pronotum, and from the latter by the shorter, more obtuse vertex and the male plates which are not produced in long finger-like points. Type in author's collection.

***Chlorotettix spatulatus* Osb. & Ball.**

(Figs. 9: a, b, c.)

Chlorotettix spatulata Osb. & Ball, Proc. Ia. Acad. Sci., 4, p. 225, (1896); Metcalf, Eli. Mitch. Sci. Soc., 31, p. 27, (1915); Barber, Bull. Amer. Mus. Nat. Hist., 33, p. 535, (1914); DeLong, Tenn. State Ent. Bull., 17, p. 86, (1916); Sand. & DeL., Anns. Ent. Soc. Amer., 10, p. 92, (1917).

Resembling *rugicollis* in form and size but without the red band on the vertex. Length, 7 mm., width, 1.75 mm.

Vertex with margins parallel, or slightly longer on the middle than next the eye, two and one-half times wider than long, anterior margin broadly rounding to the front, which narrows rapidly to the small clypeus. Genæ broad, rounding below; pronotum one-half longer than vertex, emarginate behind, side margins short. Elytra broader than in *lusorius*, venation weak.

Color: Usually a uniform green, elytra subhyaline, often tinged with yellow.

Genitalia: Last ventral segment of female very long on lateral margin, posterior margin produced, broadly notched, more than one-half the depth of the segment, apex of notch with a spatulate

process which is broadened toward the apex, and is two-thirds the length of the notch; lateral margin of the segment rounding to the acute lateral angles. Male valve appearing as a narrow margin to the ultimate segment; plates sloping, broad at base, slightly rounding, acutely pointed, exceeded by the pygofers.

The species has a wide distribution having been collected in Iowa (type) Colorado, Nebraska, Ohio, Wisconsin, Tennessee and Florida. There are specimens at hand from all the localities except the last one. Cotypes are in the collections of Dr. Herbert Osborn and Dr. E. D. Ball.

Chlorotettix unicolor (Fitch.)

(Figs. 10: a, b, c.)

- Bythoscopus unicolor* Fitch, Homop. N. Y. State Cab., p. 58, (1851); Lintner's 9th Rept., p. 398, (1893); Walker, Homop., 4, p. 1161, (1852).
Jassus unicolor Uhler, Bull. U. S. Geol. & Geog. Surv., 3, p. 511, (1878); Prov. Pet. Faune Ent. Can., 3, p. 286, (1890).
Grypotes unicolor Uhler, Stand. Nat. Hist., 2, p. 246, (1884); V. D., Can. Ent., 21, p. 9, (1889); V. D., Psyche, 5, p. 390, (1890); Osb., Proc. Ia. Acad. Sci., 1, pt. 2, p. 12, (1892).
Thamnotettix unicolor Harrington, Ottawa, Nat., 4, p. 32, (1892).
Athysanus unicolor Southwick, Science, 19, p. 288, (1890).
Chlorotettix unicolor V. D., Psyche, 6, p. 306, 308, (1892); Lintner's 9th Rept., p. 410, (1893); V. D., Trans. Amer. Ent. Soc., 21, p. 304, (1894); V. D., Bull. Buff. Soc. Nat. Sci., 5, p. 200, (1894); Gill & Bak. Hemip. Col., p. 103, (1895); Osb., Rept. Ohio Acad. Sci., 8, p. 68, (1900); V. D., Can. Ent. 44, p. 328, (1912); Osb., Maine Agr. Exper. Sta. Bull. 238, p. 144, (1915); Sand. & DeL., Anns. Ent. Soc. Amer., 10, p. 92, (1917).
Chlorotettix vanduzeei Bak., Can. Ent., 30, p. 219, (1898).

According to the original description of *unicolor*, it is, "Greenish yellow immaculate; elytra hyaline; length, 0.28. Taken on flowers and goldenrod."

A more detailed description will help in the recognition of this species. Resembles *spatulatus* in size and form, but female genitalia without a spatulate process. Length, 7.5 mm.

Vertex two and one-half times as broad as long, scarcely longer at the middle than next the eye, anterior margin broadly rounded. Front a little longer than broad, width at apex one-third that at antennæ. Checks narrow, but feebly angled below the eyes, forming a very narrow margin beyond the loræ. Clypeus about rectangular. Pronotum short and very broad, anterior margin feebly, broadly rounded, sides short. Elytra long.

Color: Almost uniform pale green, often washed with yellowish. Disc of pronotum, basal angles and a median notch on scutellum darker. Elytra hyaline, nervures often distinctly green in color.

Genitalia: Last ventral segment of the female long, with a rather broad, shallow notch, becoming narrowed and sharper at apex; the edge of the lobe on either side more or less sinuate. Male valve short and broad, almost truncated. Plates broad at base, outer margins concave on apical half, apices moderately produced, subacute, slightly divergent; a few spines on margin; pygofers large, greatly exceeding plates.

The species has a distribution from coast to coast through the northern part of the United States and southern Canada. It has not been recorded for a southern state. Specimens at hand from Maine, New York, New Hampshire, Ohio, Wisconsin, Iowa, Oregon and Washington, seem to show very clearly the distribution. In addition to these states it has been reported for Colorado, California, and the southern border of Canada. I have examined specimens in the Osborn collection which were collected at Fitch's home and compared with the types of this species in the Fitch collection at Albany.

***Chlorotettix similis* n. sp.**

Size and form of *unicolor* and resembling it very closely in general appearance, but with head slightly longer at middle, and distinct genitalia. Length, 6.5–7.5 mm.

Vertex broadly rounded as in *unicolor* but distinctly longer at the middle than next the eye. Width between the eyes more than twice the length. Pronotum short and broad, more broadly curved anteriorly than the anterior margin of the vertex. Elytra as in *unicolor*.

Color: Uniform pale green, unmarked; elytra greenish, hyaline, nervures faint or indistinct.

Genitalia: Last ventral segment of female longer and narrower than in *unicolor*, more than twice as long as preceding segment, and convexly narrowed, posteriorly, from about the middle. The posterior margin is composed of two rather narrow, strongly rounded lobes, formed by the median notch, the sides of which are convexly rounded and, after meeting, often overlap along the median line of incision. This incision extends one-third of the way to the base. The whole surface of the segment is very rugose

and striated, the striæ running transversely on the anterior half and longitudinally on the posterior portion. Male plates similar to *unicolor* but not strongly narrowed nor produced, which gives them a shorter appearance.

Described from nine females and three males from Corvallis, Oregon, collected and sent to me by Mr. F. H. Lathrop. These were received too late to include genital drawings.

In the series at hand the genitalia of the females are very distinct from *unicolor* by the convexly rounded lobes which are much longer and narrower than the concavely rounded or sinuate lobes of that species.

Chlorotettix viridius Van Duzee.

(Figs. 11: a, b, c.)

Chlorotettix viridia V. D., Psyche, 6, p. 309 (1892); Weed, Can. Ent., 26, p. 278, (1892); V. D., Trans. Amer. Ent. Soc., 21, p. 304, (1894); Bull. Buff. Soc. Nat. Sci., 8, p. 71, (1907); Bull. Buff. Soc. Nat. Sci., 9, p. 228 (1908); Osb., Rept. N. Y. State Ent., 20, p. 539, (1892); Metcalf, Eli. Mitch. Sci. Soc., 31, p. 26, (1915); Barber, Bull. Amer. Mus. Nat. Hist. 33, p. 26, (1915); DeLong, Tenn. State Ent. Bull., 17, p. 86, (1916).

Athysanus viridia Southwick, Sci., 19, p. 288 (1892).

Form of *unicolor* and *tergatus*, but smaller, apple green in color. Length, 6-7 mm.

Vertex distinctly rounded on the anterior margin, slightly longer on the middle than next the eye. Front broad and convex, sutures curved outward a little below the antennæ, clypeus broad, almost rectangular; cheeks unusually broad, prominently angled below the eyes, margin beyond the loræ narrow. Pronotum with anterior margin broadly curved, posterior margin slightly sinuate.

Color: Apple green, connexivum and sometimes the edge of the dorsal segments washed with yellow; rostrum, base of antennæ, tarsi, spines of the posterior tibiæ and the ovipositor, soiled white or even fulvous. Elytra vitreous, slightly tinged with fulvous in the male, or green in the female, nervures greenish. Wings white, iridescent, nervures concolorous. Eyes dark.

Genitalia: Last ventral segment of the female broadly excavated from the prominent lateral angles almost to the base, the sides of this incisure interrupted at the middle by a short, obtuse, blackish tooth. Pygofer slightly exceeding the stout ovipositor. Male valve short and broad, shorter than the preceding segment, broadly rounded. Plates nearly rectangular, transverse, a little

longer than last ventral segment, apices slightly produced and divergent, outer margin clothed with a few short spines and soft hairs. Pygofers ligulate, about twice as long as the valve, whitish hyaline and thin in texture.

Specimens are at hand from Ohio, New York, New Jersey, Mississippi, Michigan, Virginia, Texas, Louisiana, North Carolina, South Carolina and Tennessee. It has also been reported for Kansas, Arkansas, Maryland, Alabama, Florida and Jamaica. The species seems to be quite widely distributed throughout the southern, and part of the middle western, states. Its northern limit is apparently attained in Michigan and New York.

***Chlorotettix curvidens* n. sp. Osborn.**

(Figs. 12: a, b, c.)

Light stramineous, a darker arc on the pronotum and the elytral veins whitish. Excavation of the female genital segment with prominent curved teeth on the borders. Length, ♀ 6.5 mm., ♂ 6.25 mm.

Head short, vertex rounding, faintly angulate in front, scarcely longer at middle than next the eye; front convex, narrowing sharply to the clypeus; pronotum with a strongly curved, impressed arc on anterior third behind which the surface is faintly striate. Elytra concolorous, the veins faintly lighter.

Genitalia: Female last ventral segment at border nearly twice as long as preceding the central part deeply excavated, an acute notch reaching nearly to the base of the segment and the inner border with a strong slightly curved tooth outside of which is a deep curved emargination, the border of which is black. Male valve triangular, obtusely angulate behind, plates elongate triangular, three times as long as width at base, tips acutely angular slightly acuminate and divergent. Finely ciliate and with about seven stronger spines on the border.

Described from a number of specimens collected at Santa Lucia, Gualan, and Los Amates Guatemala, and San Pedro, Honduras, by J. S. Hine in January and February, 1905. Types and paratype are in the Ohio State University collection.

This species is about the size of *vittatus* but slightly darker and lacks the brown stripes but is most positively separated by the very distinct toothed excavation of the female genital segment.

Chlorotettix lusorius Osb. & Ball.

(Figs. 13: a, b, c.)

Chlorotettix lusoria Osb. & Ball, Proc. Ia. Acad. Sci., 4, p. 226, (1899); Osb., Rept. N. Y. State Ent., 20, p. 529, (1904); Wirtner, Hemp. W. Pa., (Car. Mus.) 3, p. 225, (1904); Osb., Maine Agr. Exper. Sta. Bull., 238, p. 144, (1915).

Form and general appearance of *tergatus*, but with a sharper vertex and more general reddish cast. Length, 7-8 mm.; width, 2 mm.

Vertex slightly convex, one-half longer on the middle than next the eye, twice wider than long, margins broadly rounded, but with a distinct, slightly produced tip; front one-third longer than wide, three times wider at ocelli than on clypeus. Pronotum long, sides long, strongly rounding anteriorly, posterior margin nearly truncate. Elytra long, greatly exceeding abdomen, without appendix, first anti-apical cell long, parallel margined.

Color: Similar to *necopinus*; vertex olive brown, with a faint crescentiform band before the eyes; pronotum fulvous brown, scutellum with a quadrate light area on the disc, including two dark spots; elytra subhyaline with a distinct reddish tinge, nervures light, below tawny yellow.

Genitalia: Last ventral segment of the female long, emarginate behind, with a strong, angularly pointed, dark margined, median tooth half as long as the acutely rounding lateral angles. Male valve short and broad, less than half the length of the preceding segment; plates strong, flat, one-half longer than breadth at base, outer margins thickened, sparsely hairy, points strongly divergent, usually a fuscous line on either side arising from a spot at the base.

Type specimens (in Osborn collection) are from Ames, Iowa. Besides these I have examined specimens from Ohio, New York, New Jersey and Wisconsin. The species has also been reported for Pennsylvania, New Hampshire, Colorado and Utah.

Chlorotettix lobatus n. sp. Osborn.

(Figs. 14: a, b.)

Pallid straw color, elytra hyaline, head slightly angulate with narrow transverse line, the female segment with a deep notch, rounded near the base, leaving a broad, rounded lobe at each side. Length, ♀ 6 mm.

Head scarcely wider than pronotum, vertex subangulate, about one-third longer at middle than next the eye, front tumid, convex in lateral view: pronotum strongly arched in front, the impressed line very near its margin and very faint, striæ very faint and irregular.

Color: Light straw, the vertex with a narrow transverse slightly curved line, the median impressed line posteriorly, and two dots near hind border brown.

Genitalia: Female ventral segment with a deep notch rounded nearly to the base, the lateral part of the segment forming a broad lobe nearly twice the length of the preceding segment.

Described from a single female specimen collected at Gualan, Guatemala, by Prof. J. S. Hine, Jan. 14, 1905. Type in the Ohio State University collection.

***Chlorotettix scutellatus* n. sp. Osborn.**

(Figs. 15: a, b.)

Dull straw color, head obtusely angulate, vertex with a diffuse dusky transverse band, scutellum with an elongate dark spot each side extending under the border of the pronotum. Length, ♀ 6.3 mm.

Head distinctly wider than the prothorax; vertex obtusely angulate, nearly one-half longer at middle than next the eye; front slightly tumid. Pronotum with a faint arc near the anterior border behind which the surface is distinctly but irregularly striate.

Color: Dull straw with a dusky transverse band on the vertex, some faint dusky spots on the front of the pronotum, two blackish spots on the scutellum extending forward and showing through the semi-transparent border of the pronotum; elytra uniform in color with pronotum, and scutellum with faint dusky spots bordering the suture, veins whitish; wing veins dusky.

Genitalia: Female last ventral segment deeply excavated in a triangular notch reaching two-thirds the way to the base, the hind border sinuate produced (see figure), pygofer long, widened near base with coarse bristles on the central part and finer hairs at the tip.

Described from a single female specimen collected by the author at Brownsville, Texas, in February, 1910. Type in Osborn collection.

Chlorotettix vividus Crumb.

(Figs. 16: a, b, c.)

Chlorotettix vividus Crumb, Anns. Ent. Soc. Amer., 8, p. 197, (1915); DeLong, Tenn. State Ent. Bull., 17, p. 88, (1916).

Small, dull green species slightly larger than *minimus* in size. Length, 5.5-6 mm.

Vertex convex, distinctly angled, one and one-half times as broad as long, almost twice as long on middle as next the eye; the margin thick excepting at the slightly conical apex, venation indistinct.

Color: Almost uniform brownish green, darker especially on head, pronotum and scutellum; elytra subhyaline, pale green with a brownish tinge, more distinct apically.

Genitalia: Last ventral segment of female twice the length of preceding, posterior margin broadly, triangularly notched half way to base, with an apical notch; lateral angles rounded. Male valve broad, longer than last ventral segment, convexly sinuated, slightly notched at apex; plates rather long, gradually narrowed three-fourths their length, then produced with edges almost parallel. Pygofer equalling plates, densely clothed with spines apically.

The species was described from Tennessee, and has been taken in Kansas, Ohio and South Carolina. It occurs in Tennessee in abundance, and will probably be reported for other states when thorough collecting is done. Type in collection of Mr. S. E. Crumb.

Chlorotettix delta Ball.

Chlorotettix delta Ball. Ent. News, 27, p. 205, 1916.

♂ Size and general appearance of *tethys* but with a much larger head. Pale green with a slight tawny cast towards the tips of the wings. Length, 4.5 mm.

Vertex right angled, the margins straight, apex with the front sharply conical, length very slightly less than the basal width, nearly equalling the pronotum. Elytra long and narrow as in *lusoria*, giving a trim, wedge-shaped appearance to the insect. Venation distinct, regular, the nervures slightly raised.

Color: Pale green, eyes dark, the usual indented arcuated line on the pronotum. Apex of vertex and tips of elytra with traces of tawny.

Genitalia: Male valve short, obtusely rounding. Plates narrow appressed, equilaterally triangular, their apices produced as minute slightly separated finger-like processes as long as the plates and equalling the rather broad and foliaceous pygofer.

This species was described from a single male specimen collected in Arizona and is the only specimen that has been reported. According to the original description this species is easily recognized by the conically pointed head and distinct genitalia.

***Chlorotettix borealis* Sanders & DeLong.**

(Figs. 17: a, b, c.)

Chlorotettix borealis Sand. & DeL., Anns. Ent. Soc. Amer., 10, p. 92, (1917).

Resembling *C. vividus* in shape, but slightly smaller and with distinct genitalia. Length, 5 mm. Much smaller than any other known northern species.

Vertex obtusely angled, slightly more than one-half longer on the middle than next the eye, twice as broad as long. Anterior margin of pronotum strongly convex; posterior margin slightly concave; lateral angles broadly rounded. Elytra smoky hyaline.

Color: Resembling *C. vividus* in color, more of a grass green than found in most species of the genus. Last ventral segment of the female with a dark median stripe from the apex of the incision to the base of the segment. Ovipositor dark. Tibia and tarsi of front legs brownish.

Genitalia: Female last ventral segment twice as long as preceding, lateral angles well rounded. A rather broad median notch extending half way to the base; sides convexly angled posteriorly. Male valve twice as wide as long, triangular, with rounded apex. Plates rather long, convexly rounded to rather blunt tips. Hairs mostly on margin and dorsal surface.

A pair were swept from grass in a clearing at Trout Lake, Wisconsin, September 7, 1916. The species was described from these specimens and no other records have been reported. Type in the author's collection.

Chlorotettix minimus Baker.

(Figs. 18: a, b.)

Chlorotettix minima Bak., Can. Ent., 30, p. 220 (1898); V. D., Bull. Buff. Soc. Nat. Sci., 8, p. 71 (1907); V. D., Bull. Buff. Soc. Nat. Sci., 9, p. 228 (1908); Barber, Amer. Mus. Nat. Hist., 33, p. 535 (1914).

One of the small species of the genus with a very bluntly angulate vertex and distinct genitalia. Length, 5 mm.

Vertex obtusely angulate, slightly but distinctly longer at the middle than next the eye. Pronotum rather short and broad, twice as broad as long. Face longer than broad.

Color: Dirty greenish yellow without definite markings. Face paler, nervures of elytra rather indistinct.

Genitalia: Last ventral segment of female almost twice as long as the preceding; posterior border with a deep, very narrow median notch extending more than half-way to the base, either side of which it is broadly roundly emarginate to the strongly produced lateral angles, which are acutely pointed and inflexed, enclosing a three-lobed plate in the concavity. Pygofers rather robust, set with a number of brown hairs. Male valve shorter than preceding segment and scarcely angled at middle. Plates rounded basally at sides, beyond middle becoming suddenly narrow and parallel sided for rest of length.

Both the character of the lateral angles and the depth of the median notch may vary somewhat.

The species was described from several specimens taken at Chapada, Brazil, and has since been collected in Florida, Hayti, Jamaica and Trinidad. Type in Baker collection, U. S. National Museum.

Although this species was cited in the original description as resembling *C. unicolor*, the vertex is decidedly subangulate, but only slightly longer at the middle than next the eye. Because of this appearance it has been included with the species having the angulate type of head.

Specimens from Florida and Jamaica which were kindly sent to me by Mr. VanDuzee have been used in preparing this description.

Chlorotettix galbanatus Van Duzee.

(Figs. 19: a, b, c.)

Chlorotettix galbanatus V. D., Psyche, 6, p. 310, (1892); Trans. Amer. Ent. Soc., 21, p. 304, (1894); Osb. & Ball, Proc. Ia. Acad. Sci., 4, p. 232, (1896); Osb., Rept. Ohio Acad. Sci., 8, p. 68, (1900); Rept. N. Y. Sta. Ent., 20, p. 538, (1904); V. D. Bull. Buff. Soc. Nat. Sci., 9, p. 228, (1908); Wirtner, Hemp. W. Pa., (Car. Mus.), 3, p. 225, (1904); Metcalf, Eli. Mitch. Sci. Soc., 31, p. 26, (1910); Barber, Am. Mus. Nat. Hist., 33, p. 535, (1914); Osb., Maine Agr. Exper. Sta., 238, p. 143, (1915); DeLong, Tenn. State Ent. Bull., 17, p. 88, (1916); Sand. & DeL., Anns. Ent. Soc. Amer., 10, p. 92, (1917).

Athysanus galbanatus Southwick, Sci., 19, p. 288, (1892).

Yellowish green in color, size of viridius, but with a more angulate vertex. Length, 6 to 6.5 mm.

Vertex slightly wider than pronotum, obtusely angled, one and one-half times as long on middle as next the eye. Front rather long and narrow, cheeks obtusely angled below the eyes, the edge straight from the angle to the tip of the clypeus forming a narrow margin beyond the loræ. Clypeus broad, slightly widened apically. Anterior margin of pronotum strongly convex, slightly concave posteriorly.

Color: Pale yellowish green, almost uniform. Elytra hyaline, slightly iridescent, costa green; tergum usually embrowned, margins yellowish. Wings light, nervures slender, pale brown. Eyes and tips of tarsi black.

Genitalia: Last ventral segment of the female long, with a rather broad lingulate incisure reaching nearly to the base and forming a broadly rounded lobe on either side, the inner angles of which may be either rounded or more angulate. Pygofers slightly exceeded by ovipositor, apex clothed with stout bristles. Male valve a little longer than preceding segment, obtusely angled; plates long, evenly, convexly rounded from the base to the apex, outer margin thickly clothed with fine hairs.

This species is one of the commonest and most widely distributed of any belonging to the genus. Specimens are at hand from New York, Pennsylvania, Ohio, Wisconsin, North Dakota, Montana, Iowa, North Carolina, South Carolina, Tennessee and Louisiana. It has been collected in Maine and Maryland, in most of the gulf states and is distributed throughout the southwest, extending into Mexico. In many states it occurs in great abundance. Specimens in the Osborn collection were compared with types in the Iowa State College collection.

Chlorotettix vacunus Crumb.

(Figs. 20: a, b, c.)

Chlorotettix vacuna Crumb, Anns. Ent. Soc. Amer., 8, p. 196, (1915); DeLong, Tenn. State Ent. Bull., 17, p. 88, (1916).

Size and general appearance of *balli*, vertex slightly shorter and genitalia distinct. Length 6-6.5 mm.

Vertex bluntly angulate, one-half broader than long, one-third longer on the middle than next the eye, margin thick.

Color: Vertex, anterior margin of pronotum, and the scutellum yellowish, tinged with green; pronotum brownish, clytra subhyaline, brownish, front tinged with orange, venter green.

Genitalia: Last ventral segment of female two and one-half times as long as preceding, lateral angles prominent, roundly angled, posterior margin broadly, somewhat convexly excavated three-fourths the way to base, the apical half of the excavation straight margined; the posterior half membranous and rugose. Male valve as long as last ventral segment, quite narrow and subangulate; plates broad, three times the length of valve, the outer margin convexly narrowing to subacute tips.

This species also has been found, as yet, only in Tennessee, from which state it was described. Both Mr. Crumb and the author have collected a good series of this species. Type in collection of Mr. S. E. Crumb.

Chlorotettix distinctus n. sp.

(Figs. 21: a, b.)

Size and general form of *vacunus* (Crumb) but with genitalia distinct. Length, 6 mm.

Vertex bluntly angulate, almost one-half longer on the middle than next the eye; face broad, longer than wide, clypeus widened at the apex. Pronotum rather short, convexly rounded in front, lateral angles short, humeral angles broadly rounded, posterior margin truncated. Elytra hyaline, nervures indistinct.

Color: Pale yellowish green, resembling *galbanatus*; vertex, pronotum and scutellum with a decided green tint, clytra distinctly yellowish. Beneath pale, tips of tarsi dark.

Genitalia: Last ventral segment of female three times the length of preceding; posterior margin deeply and rather broadly

notched two-thirds the way to base, sides of apical half straight, then concavely rounded to form a roundingly angled lobe either side. Plates exposed in the opening of the notch. Pygofers clothed with many hairs on apical half.

Described from a single female collected at Clarksville, Tennessee, June 30, 1915, which is in good condition and so distinct from any of the other species of the genus that it seems best to treat it as new. Type in author's collection.

Chlorotettix balli Osborn.

(Figs. 22: a, b, c.)

Chlorotettix balli Osborn, Ia. Acad. Sci., 5, p. 246, (1897); Osborn, Ia. Acad. Sci., 5, p. 235, (1897); Osborn, Rept. N. Y. Sta. Ent., 20, p. 539, (1904); DeLong, Tenn. State Ent. Bul., 17, p. 87, (1916).

Resembling *spatulatus* in genital characters, last ventral segment of female with spatulate process, but with a much longer vertex. Length 7-7.25 mm.

Vertex one-half longer on the middle than next the eyes, sub-angulate; front narrowing in almost straight lines to the clypeus which is broader and shorter than in *spatulatus*, base and tip slightly convex, sides parallel. Pronotum strongly emarginate behind. Elytra hyaline, the veins indistinct.

Color: Yellowish green, head and pronotum usually darker green, the tip of vertex, margin of venter, and tergum in most specimens suffused with ochraceous.

Genitalia: Last ventral segment of female long, with a deep notch extending almost to the base and including a spatulate process. The notch is deeper and wider than in *spatulatus*, and more open at the base of the process. The process is not enlarged at the apex, and reaches only half way to the tips of the sub-acute lateral margins of the segment. Male valve large, longer than in *spatulatus*, obtusely angled. Plates narrowing more rapidly behind the middle, tips upturned, scarcely acute; a row of bristles along the outer margin; pygofers long, exceeding plates, pointed at tip.

Specimens are at hand from Ohio, Iowa and Tennessee. The species has also been reported from New York. The type specimens in the collection of Dr. Herbert Osborn have been examined.

Chlorotettix iridescens DeLong.

(Figs. 23: a, b.)

Chlorotettix iridescens DeLong, Tenn. State Ent. Bull., 17, p. 86, (1916).

Resembling *lusorius* in general appearance, but with vertex shorter, greenish brown, iridescent. Length, 7 mm.

Vertex one-third longer on the middle than next the eye, more than twice wider than long. Front rather long, broad between eyes, margins gradually, convexly narrowing to the basal third of the clypeus, then widened somewhat abruptly to a broadened apex. Pronotum twice as long as vertex, broadly, shallowly emarginate posteriorly.

Color: General color resembling *lusorius* with a red tinge. Brownish, slightly tinged with green, vertex more yellowish, ocelli green, eyes black; front dirty yellow, shading to brown above. Elytra brownish, subhyaline, highly iridescent, nervures pale.

Genitalia: Last ventral segment of the female twice as long as preceding, broadly, deeply excavated to base, the sides of which are concave, becoming slightly convex near the apex of the notch, and forming long, rather sharply rounded lateral angles. Base of ovipositor and plates exposed at base of notch. Pygofers almost as long as ovipositor, posterior half clothed with brown hairs, a large tuft at tips either side of ovipositor.

Only recorded for Tennessee from which state it was described by the author from a single female specimen. Another specimen agreeing exactly with the type was collected from hickory during the summer of 1917 by Mr. Paul Wyatt at Clarksville, Tennessee. Type in the author's collection.

Chlorotettix tunicatus Ball.

(Figs. 24: a, b, c.)

Chlorotettix tunicata Ball, Can. Ent., 32, p. 340, (1900); V. D., Bull. Buff. Soc. Nat. Sci., 9, p. 228 (1908); Barber, Bull. Amer. Mus. Nat. Hist., 33, p. 535 (1914); DeLong, Tenn. State Ent. Bull., 17, p. 87, (1916).

Form and general appearance of *balli*, vertex as in *galbanatus*. Length, 7 mm.; width, 1.25 mm.

Vertex half longer on middle than against the eye, twice wider than long, disc convex, front and vertex evenly rounded except at apex, which is slightly conical.

Color: Pale yellowish green, elytra greenish subhyaline. In old specimens there is often a distinct yellow tint.

Genitalia: Last ventral segment of female half longer than preceding, lateral angles rounding, posterior border roundly emarginate, one-third the depth of the segment, sometimes slightly notched in the middle, either side of which there is a brown cloud. Male valve broad, slightly longer than the ultimate segment, obtusely angulate; plates broad at base, roundly narrowing to a very obtuse, almost truncate, apex, together the shape of a blunt pointed spoon, convex below with a marginal fringe of coarse spines.

Easily separated from any of the other species of the genus by the male plates. The specimens from which the species was described were collected in Kansas. Records show it has been taken in Florida, Tennessee, Arkansas, Louisiana, North Carolina, Texas and Missouri. The species is no doubt rather widely distributed throughout the south and middle west. Type in collection of Dr. E. D. Ball.

Chlorotettix stolatus Ball.

(Figs. 25: a, b.)

Chlorotettix stolata Ball, Can. Ent., 32, p. 341, (1900).

Form and general appearance of *lusorius* slightly narrower and without the mark on the vertex. Length, 7-8 mm.; width, 1.5 mm. Male slightly smaller.

Vertex nearly flat on disc, rounding anteriorly, one-third longer on middle than against eye, twice wider than long, front convex, line between vertex and front distinct, ocelli prominent, transparent, distant from eyes; elytra long and very narrow, venation as in *lusorius*, indistinct.

Color: Vertex pale yellow, sometimes with a greenish cast, pronotum olive, the disc with a fulvous cast; elytra hyaline green, with an iridescent fulvous tinge.

Genitalia: Last ventral segment of the female very long, truncate posteriorly or very slightly emarginate, the center with a brown mark. Male valve as long as the last ventral segment, the apex rounding, the margin notched at the middle, plates rather narrow at base, rapidly roundly narrowing to before the middle, then extending as long attenuate finger-like points.

The genitalia of both male and female are very much like those of *unicolor*, while in shape of head and general appearance it is closely allied to *lusorius* and *nudatus*.

The species was described from specimens collected in Mountain Valley, Colorado, and has not been recorded for other localities. The only specimen I have seen, and which I have had at hand in the preparation of this paper, is the type from Dr. Ball's collection.

***Chlorotettix nudatus* Ball.**

(Figs. 26: a, b, c.)

Chlorotettix nudata Ball, Can. Ent., 32, p. 340 (1900); DeLong, Tenn. State Ent., Bull., 17, p. 84, (1916).

Resembling *stolatus* in form and color; the vertex is more angled and the fulvous reflection less prominent. Length, 7.5 mm., width nearly 2 mm.

Vertex twice longer on middle than against eye, slightly conically pointed, front shaped as in *lusorius*, loræ long and narrow. Elytra long, slightly flaring in the middle, appressed behind.

Color: Pale green, an orange cast on face and vertex, a slightly brownish or fulvous cast on pronotum and elytra; elytra subhyaline, the nervures indistinct.

Genitalia: Last ventral segment of the female short, about as long as the preceding segment; posterior margin distinctly darker margined and divided into four lobes by a narrow slit in the middle and a pair of broad, shallow notches a little more than half way towards the sides; the margin thin, the plates visible at the base of the pygofer. Male valve narrow, roundly angulate, as long as the preceding segment; plates broad at base, three times the length of the valve, gradually narrowing to the acute, slightly produced tips.

The species has only been reported for Iowa and Tennessee, and was described from specimens collected in the former state. It is probable the species has a wider distribution than these records would seem to indicate. Type in collection of Dr. Ball.

Chlorotettix emarginatus Baker.

Chlorotettix emarginata Bak., Can. Ent., 30, p. 219, (1898).

The original description as given by Baker is as follows:

"Length 6.25-6.5 mm. Vertex blunter than in *unicolor*; color the same. Valve in male triangular and about the length of preceding segment. Plates about equaling pygofer, rounded at tips, but little wider towards the base, where each plate is suddenly depressed, giving the whole the appearance, as view from below, of being strongly constricted. Last ventral segment of female with lateral angles strongly produced backwards on either side of a broad, deep, rectangular emargination, the bottom of which is sinuate. Ovipositor equaling pygofer. Ocelli approximating eyes."

The species was described from the specimens collected at Vera Cruz, Mexico. This is the only published record of this species.

Resembles *unicolor*, Fh., but is slightly larger and differs widely in the form of the genitalia, both male and female. Type in Baker collection, U. S. National Museum.

Chlorotettix breviceps Baker.

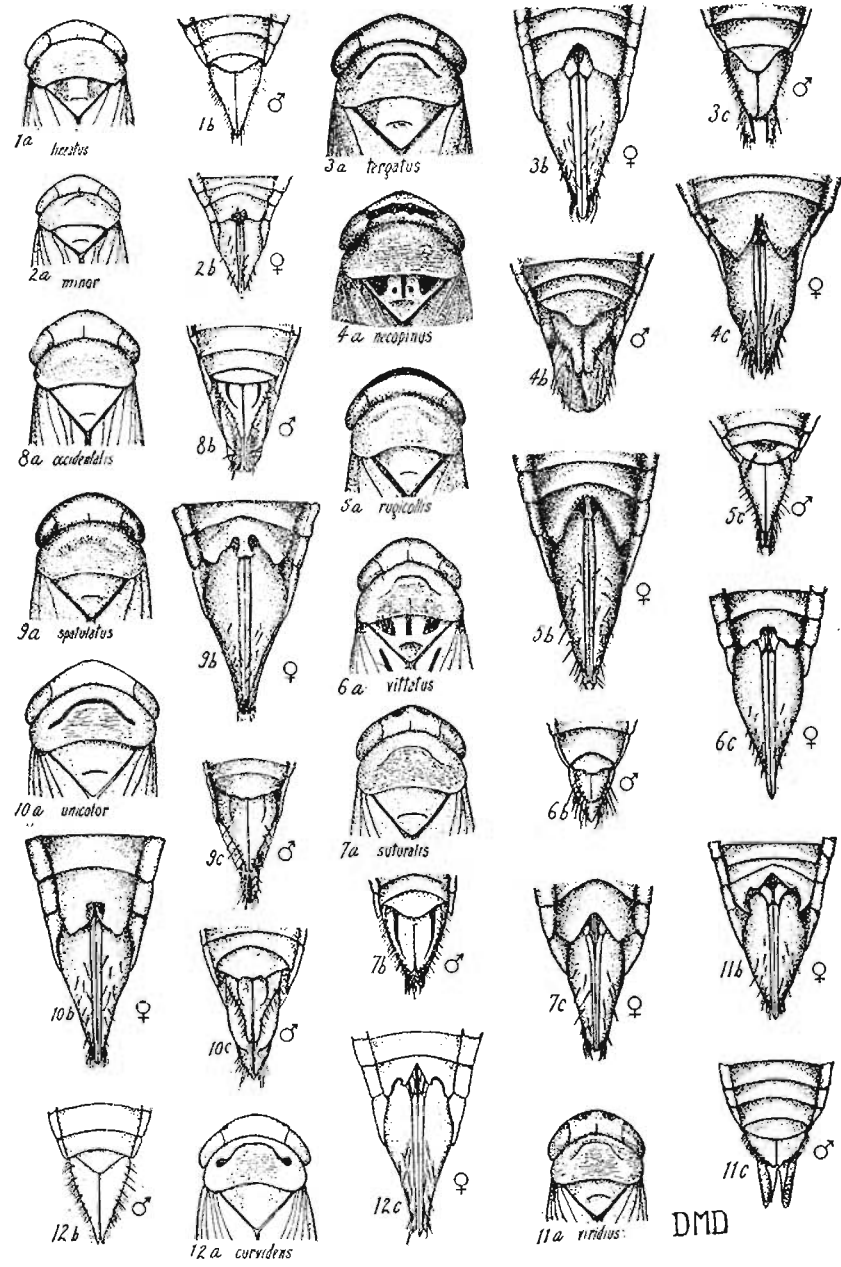
Chlorotettix breviceps Bak., Can. Ent., 30, p. 220, (1898).

According to the original description the species is nearest *viridius*, but the vertex is shorter, the ocelli smaller, further from the eyes and the color different. This insect has somewhat the aspect of an *Idiocerus*.

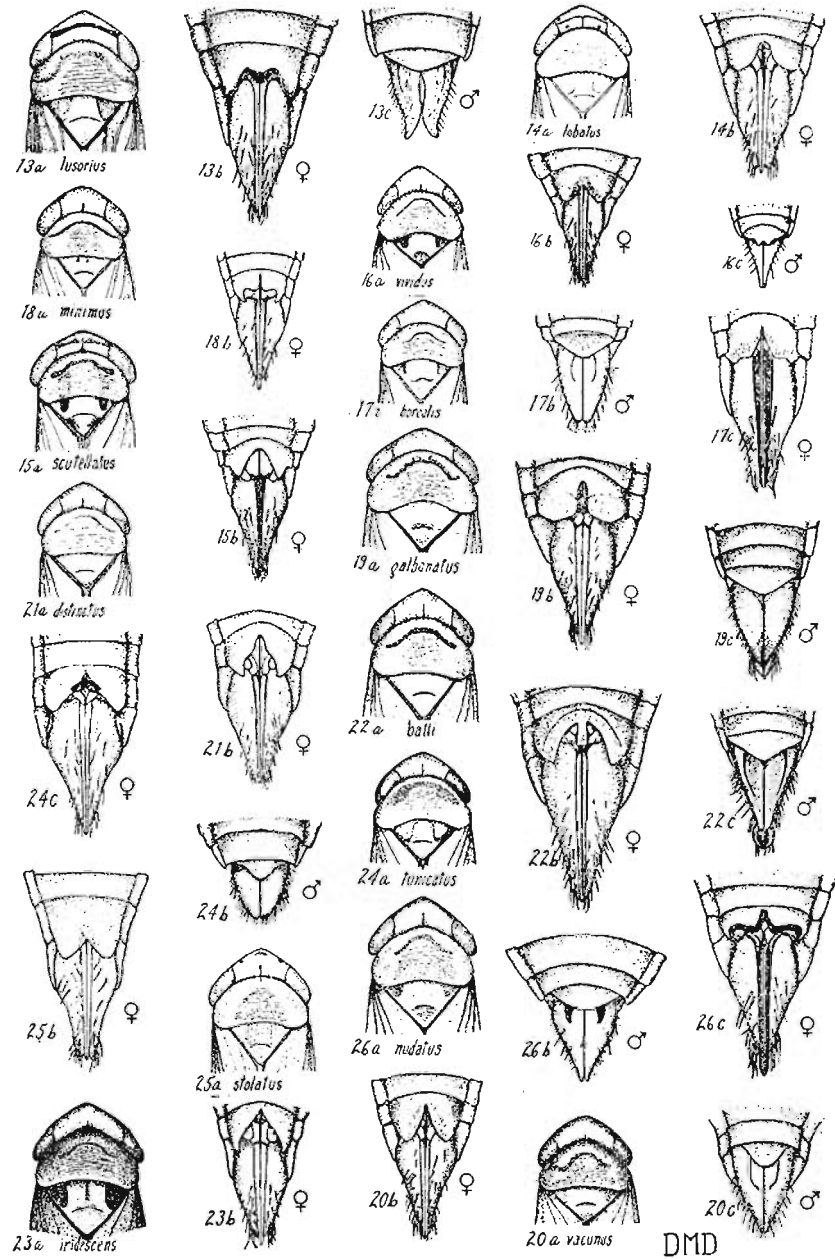
"Length, 6.25 mm. Vertex not longer at middle than at eyes. Ocelli black, scarcely further than their width from the eyes. Color throughout pale brownish; two longitudinal whitish lines on scutel. Last ventral segment twice the length of preceding, hind margin very broadly, slightly notched. Ovipositor about equaling pygofer."

The species was described from two females taken at Chapada, Brazil. This is the only known record for the species and it has never been reported for North America. Type in Baker collection, U. S. National Museum.

PLATE I.



D. M. DeLong



DMD