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A Contribution to the Taxonomy of the Subfamily Issinae in America North of Mexico (Fulgoridae, Homoptera)

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PART II

ABSTRACT: This paper comprises the second part of a monograph dealing with the taxonomy of the subfamily Issinae (Fulgoridae, Homoptera) in America, north of Mexico. In Part I* only the genus *Dictyssa* was discussed. In this part a complete key to the genera, which number twenty-one in all, is given and the following twelve genera have been studied in detail: *Euthiscia*, *Hysteropterum*, *Dictyonia*, *Dictyssonina*, *Dictyonissus*, *Neacthus*, *Misodoma*, *Ulixes*, *Tylana*, *Traxus*, *Thionia* and *Picunna*. Of these twelve genera the following contain only one species, being either monotypic or at least having only one species that occurs north of Mexico: *Euthiscia*, *Dictyonia*, *Dictyssonina*, *Misodoma*, *Ulixes*, *Tylana*, and *Traxus*. In the discussions of the remaining five genera a key to the species in each genus is given. The genus *Thionia* contains seven species, *Picunna* two species, *Hysteropterum* seven species and one variety, *Dictyonissus* two species, and *Neacthus* thirteen. The total number of species studied is fifty-three. The following species are described as new: *Thionia omani*, *Picunna chinai*, *Hysteropterum fuscomuculosum*, *Dictyonissus nigrophilosus*, *Neacthus perlucidus*, *Neacthus sinchamatus*, *Neacthus similis*, *Neacthus jacinticusus*, *Neacthus curvaminis*, *Neacthus uniformis*, and *Neacthus diversus*. *Issomorphus maculatus* Melichar has been placed in the genus *Picunna*.

Some of the older species have been redescribed and comparative notes and drawings are given for all species except *Hysteropterum morum* Van Duz. The male genitalia are described and figured for all species except the following: *Ulixes scutatus* (not yet recorded from the United States), *Thionia omani* and *Thionia quinquata*.

The characters of most value for classification are the male genitalia, the shape and position on the body of the tegmina, the size of the hind wings, and the wing venation, including the fineness or abundance of reticulation.

* The University of Kansas Science Bulletin, Vol. XXIV, No. 17, 1936.

KEY TO THE GENERA

1. Tegmina entirely covering abdomen or greater portion of it, parchmentlike or vitreous, or a combination of both..... 2
 Tegmina short and usually extending only partially over abdomen, except in macropterous forms of some species which are always more or less hyaline, parchmentlike, thick or opaque.....(Tribe Caliscelini) 16
2. (1) Hind wings either absent, rudimentary or else very narrowed with vein Sc_1 present and vein Cu_1 branched or hind wings long, notched at apex, vein Sc_1 not present and vein Cu_1 not branched; posterior tibiae with 2 to 5 spines or, entirely unarmed..... 3
 Hind wings present, narrow, not notched at apex, anal area small or else rudimentary; posterior tibiae with 2 to 4 lateral spines; vein Sc_1 absent (Tribe Issini) 4
3. (2) Hind wings present, entire, with strongly marked notches at the joints of the folds, anal area large; vein Sc_1 absent; usually large insects varying from 5.5 to 8.1 mm.....(Tribe Thionini) 6
 Hind wings usually absent or rudimentary (a few species of *Neaethus* excepted); vein Sc_1 present (*Dictyssonina* excepted); small insects, usually under 5.5 mm.....(Tribe Hysteropterini) 7
4. (2) Frons deeply concave or perpendicular; clypeus strongly deflexed and horizontal *Traxus* Metcalf, p. 449
 Frons not concave; clypeus not so deeply inflexed or horizontal..... 5
5. (4) Tegmina rugulose with veins slightly elevated, finely reticulated; hind wings small and narrow.....*Ulixes* Stal, p. 451
 Tegmina not rugulose, with strongly elevated veins, larger reticulations; hind wings half the length of tegmina, not visible when latter is in repose, *Tylana* Stal, p. 454
6. (3) Cubital vein of tegmen simple and costal region vertical to the body; posterior tibiae with 2 spines.....*Thomna* Stal, p. 456
 Cubital vein of tegmen branched; posterior tibiae with usually 4 spines, *Pecumna* Stal, p. 471
7. (3) Tegmina more or less opaque or with vitreous spots and oblique bands..... 8
 Tegmina vitreous entirely except *Misodema* and some species of *Neaethus* parchmentlike 12
8. (7) Vertex not conically produced; posterior tibiae with one or more spines..... 9
 Vertex conically produced; posterior tibiae without spines; tegmina not extending beyond tip of clavus.....*Euthiscia* Van Duzee, p. 479
9. (8) Tegmina with vitreous patches or spots (*Dictyssa fusca* excepted) not necessarily narrowed at apices; posterior tibiae with 2 to 4 spines..... 10
 Tegmina uniformly opaque with no vitreous spots or bands, narrowed and rounded at apices; more or less thickly branched veins; posterior tibiae with 1 or 2 spines.....*Hysteroptecum* Amyot and Serville, p. 481
10. (9) Tegmina either as broad as long or approximately semicircular in shape, partly opaque, usually with an oblique hyaline band across clavus and corium or some sort of hyaline markings; costal margin decidedly rounding 11
 Tegmina oblong, costal margin nearly straight or if rounding with a distinct bulla present at base of each wing..... 14
11. (10) Tegmina semicircular in shape, not closely adpressed to body, veins of corium forming irregular cells, some of which usually (not always) are vitreous or light colored.....*Dictyssa* Mehehar *
 Tegmina practically as broad as long, held almost vertically, cells of corium exceptionally few and large and distinctly angular.....*Dictyonna* Uhler, p. 496

* Key to species and descriptions of this genus in Part I of this paper in Univ. of Kan. Sci. Bull., Vol. XXIV, p. 424, 1936.

united at base for a short distance only; apparently both veins M and Cu_1 are two-branched, although this is not always discernible, since all the longitudinal veins, posterior to the median depression, are lost in the uniform apical reticulation; vein Cu_2 follows the claval suture; veins 1st A and 2d A united at apex to form the characteristic Y-vein, although each are quite sinuate, pulled out of a straight course by the concavity of the tegmen.

Traxus fulvus Metcalf

(Plates XLIX-LII-LIII-LV-LVI)

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jr. of Elisha Mitchell Society XXXVIII, 1923.

Comparative notes. General color, grayish-tan with dark-brown flecks and spots. The species is easily recognized structurally by the subglobose, convex elytra with several prominent elevations located as follows: the acute angle formed by the lateral margins of the vertex and the frons where they meet above the eyes; on each lateral half of pronotum a carinalike ridge following the eye to the ventral side; on the mesonotum each lateral carina elevated on a prominent boss; and a transverse hump, beginning on the anterior half of the clavus and continuing across the corium to the costal margin, back of which is a transverse concavity extending across entire tegmen.

This species had been brought to the author's attention recently by one or two colleagues, who were of the opinion that it was synonymous with *Ulixes scutatus* Walker, a Mexican species, figured and discussed by Fowler in the *Biologia Centrali Americana*. The writer sent a specimen to Mr. W. E. China of the British Museum for comparison with the type. In a letter to the writer, Mr. China states: "This is nothing like Walker's species and does not belong to the genus *Ulixes*. Indeed, it belongs to quite a different subfamily, the Hysteropterinae. It appears likely to be a new genus. The structure of the frons and clypeus is very unusual."

Male genitalia. Resembling the genitalia of *Picumna* in general outline. The tenth abdominal segment (anal flap) seems distinctive because of its ovate outline. It is a flattened tube, narrowed considerably at base, then rounding out through middle and from thereon with its ventral margin extending caudad as a flat, roundly pointed flap. The eleventh segment scarcely shows beyond the dorsal margin of the tubular part of the tenth segment. It bears a much shorter and thicker ventral stylus than is found in other genera.

Harpagones (genital styli of authors) visible externally as two broad triangular plates which are about twice as long as width at base. Each harpago as viewed from a lateral, flattened view is a subquadrangular plate with its dorsal margin at about middle projected dorsad as an irregular flat extension terminating in a slender, cephalad, curving hook and also bearing on its cephalic margin a flat, recurved hook which bends caudad.

The aedeagus and theca are difficult to distinguish in this genus as in *Picumna* or *Tylana*. Together they appear as a bilaterally symmetrical, broad, tubular structure. From a lateral view the theca shows its apical margin, broadly notched through middle, due to its ventral region being greatly extended caudad as a slightly pointed lobe which bears on each side a rounded lip-like extension lying *in situ* just posterior to each aedeagal hook, and its dorsal region extended caudad into a bulbous knob. The apex of the aedeagus apparently does not show beyond the theca. However, two pairs of aedeagal hooks are conspicuous. One hook emerges from the thecal notch, extends ventrad a short distance, then abruptly bends cephalad and extends forward almost to the base of the aedeagus. The second hook on each side also emerges at the notch of the theca and is directed cephalad to a little beyond middle of aedeagus. This hook is heavily sclerotized and is forked at its middle into two sharply pointed, curved hooks, the dorsal one of which is slightly longer than the ventral one.

Notes on distribution. Metcalf lists the type specimens as all coming from Brownsville, Texas.

In the National Museum collection there is a pair which were taken at Brownsville, Texas, in June by Paul Oman. In the Snow Entomological collection at the University of Kansas is another pair taken by R. H. Beamer at Cameron county, Texas, in August. Apparently this is one of the rare species in this subfamily.

Location of types. Probably in the collection of Z. P. Metcalf, Raleigh, S. C.

THE GENUS *ULIXES* Stal, 1858

(Plates XLIX, LII, LIV)

Stal, Carolus. Bidrag till Rio Janeiro—Traktens, Hem.-Fauna, II, p. 67, 1858.

Fowler, W. W. Fulgoridae. Biologia Centrali Americana. Homoptera I, pp. 113-119, 1904.

Walker, F. Insects Saundersiana, Homop. p. 44, 1858 (Issus).

Comparative notes. Fowler characterizes this genus as follows: Wings small or rudimentary, not notched at apex; frons perpendicular, clypeus more or less inflexed; peculiar rough facies; strongly

raised venation; general shape convex or subglobular and tegmina as a rule strongly convex (*scutatus* excepted); spines on hind tibia two to four as given by Fowler in the *Biologia Centrali Americana*. There are four in *scutatus*. Fowler in his original description for *intermedius* states that there are four. The writer believes that four is the correct number for the genus.

One of the most distinctive characters which the present author notes is the short clavus, whose apex extends only slightly over one half the length of the tegmen. Another is that the costal border is not inflexed as in many other genera.

The general features of the wing venation as is found in *Ulixes scutatus* are: a separate Sc_1 vein lacking; veins Sc_2 and R united for a short distance at base, curving outwardly at this point so that these veins as they extend parallel with each other to the apex, are much nearer to the costal border than in most species; vein M forking into two branches about midway of the tegmen; vein Cu_1 apparently single-branched, its tip lost in the apical reticulation; vein Cu_2 following the anal suture; veins 1st A and 2d A united at tip to form the characteristic Y-vein.

KEY TO SPECIES

- 1a. Head shorter; tegmina more rounding at tip; frons perpendicular; clypeus strongly inflexed *Ulixes scutatus* Walker.
 1b. Head longer; tegmina obtuse at apex; frons and clypeus gradually rounded under head *Ulixes intermedius* Fowler.

Note. Only *scutatus* has been collected in this country to date. *Ulixes intermedius*, however, was collected by Dr. E. D. Ball in the Sierra Madre mountains, Mexico. His material was in the type series of Fowler's and was sent back to him by Fowler. Doctor Ball very kindly pointed out the differences of *intermedius*, which he has in his collection, with a solitary specimen of *scutatus*, which the writer sent to him for comparison. The differences which Doctor Ball noted are incorporated in the above key, which the present writer considered might be useful, inasmuch as Doctor Ball has mentioned that any Mexican material collected by him in these mountains is almost certain at some time to turn up in the southwest of our country.

The single female specimen of *scutatus* Walker, mentioned above, has been compared by the writer with a single male specimen sent to the writer for study from the British Museum collection. The latter specimen was compared by Mr. China with the type. The female specimen from the United States was identical to the male specimen in body form and coloring in every particular with the

following exceptions: the United States female specimen had the clypeus more distinctly retreating than did the other one (see drawing), and the female specimen, contrary to the general rule, was smaller by one millimeter than the male. Since the male was collected at Oajaca, Mexico, and the female at Yarnell, Ariz., this difference might be accounted for by difference in range and the structural difference by that of difference in sex.

Ulixes scutatus Walker

(Plates XLIX, LII, LIV)

Comparative notes. A large, broad species, the same or larger than *Tylana ustulata*, measuring 7 to 8 mm. long and 5 to 6 mm. wide across greatest width of tegmina. Greyish or greyish-brown in color. Vertex and thorax uniformly brown, flecked with yellow spots. Tegmina yellowish-tan, rather solidly flecked with brown. Underside of abdomen yellow, sparsely marked with irregular brown spots.

This species is readily distinguished from any other North American form by its broad, flaring tegmina, its short clavus, its inflexed clypeus and the lateral carinae on pronotum being much nearer to the posterior border of the sclerite than to the eye. In the inflexed clypeus and also in the short clavus it perhaps more nearly resembles *Traxus fulvus* than any other species. It is easily separated from this species, however, by lacking the mesonotal bosses, by having four spines on the hind tibiae instead of two and by the general shapes of the bodies.

Male genitalia. No specimen was available to the writer for dissection. Only one specimen was obtainable for study. This was a specimen from the British Museum, compared with the type by Mr. China and loaned to the writer for temporary use. A drawing of the external genitalia of this specimen is figured. Fortunately the harpagones are spread apart so that the aedeagal structure can be partially seen.

From this position it can be seen that the theca on the ventral side extends to almost the apex of the aedeagus and on the dorsal side extends slightly beyond, ending in a rather swollen knob. Arising from each lateral slit of the theca are two well-sclerotized aedeagal hooks, the more dorsal one extending lateral on the outside of the harpago and bending back cephalad so that its apex extends under the rim of the last complete abdominal segment, the ventral hook a long, bladeliike structure, bearing a short lateral hook near

base and tapering to a finely pointed apex, which does not quite reach the rim of the abdominal segment.

Notes on distribution. Fowler lists this species from Mexico and from San Geronimo, Guatemala. In the National Museum at Washington is one specimen collected by Mr. Paul Oman from Yarnell Heights, Ariz., in 1933. This one female specimen was compared with a male specimen from the British Museum collected at Oajaca, Mexico, which Mr. China compared with the Walker type and loaned to the writer for study.

Location of type. British Museum, England.

THE GENUS TYLANA Stal, 1862

Stal, Carolus. Rio Jan. Hemip. II, p. 67, 1862.

Comparative notes. Some of the outstanding characteristics of the genus are: head, including eyes, somewhat smaller than thorax, frons with three longitudinal carinae, not united at base, clypeus inflated; pronotum with a raised anterior margin which extends ventrad as a distinct carina which finally joins the posterior margin; scutellum tricarinate; tegmina obliquely truncate at apex, with a very long clavus which extends approximately three fourths the length of the tegmen, longitudinal veins very prominent and rugulose, cross veins prominent at apex of tegmen, making a prominent network; hind wings short, extending only halfway, not notched at apical edge, the anal lobes not very broad; femora of hind legs with two spines.

Tylana ustulata Uhler, 1876

(Plates XLIX, LII, LIII, LIV, LVI)

Uhler, P. R. List of the Hemiptera of the Region West of the Mississippi River, including Those Collected During the Hayden Explorations of 1873. Bul. U. S. Geol. Geog. Surv. I, p. 354, 1876.

Comparative notes. There is only one species in the genus in North America, north of Mexico. Therefore, the characteristics pointed out as distinctive for the genus also are specially valuable in separating this species from other members of the subfamily. General color pitch-brown to pitch-black, with lighter markings, the latter in most specimens making a light saddle across middle of tegmina. *Tylana ustulata* is one of the largest species in the entire subfamily, measuring 6 to 7 mm. in length from tip of head to apex of tegmen. Superficially it closely resembles, in color and size, *Picumna maculata* Melichar and *Picumna chinai* n. sp. From these

it can be distinguished by having the tegulae of the wings hidden under the pronotum and the base of the wing somewhat twisted so that the longitudinal veins appear to start immediately behind the pronotal margin; by having prominent cross veins at apex of clavus making a network; by having the lateral margins of the vertex elevated and meeting the lateral carinae of the frons in an acutely produced angle above the eyes; and by having the costal margin broadly expanded and bent under for half the length of the tegmen, at which point the costal margin is distinctly angulate, and by having short hind wings, not over half the length of the tegmina.

Wing venation. Due to the bent-under costal margin of the tegmen the subcostal vein does not show from a dorsal view of the insect, and although this costal area is rather broadly expanded no Sc_1 vein apparently is present. Another peculiarity is that the basal cell from which the longitudinal veins arise in other genera seems to be obliterated or pushed so far forward that the veins appear to start just back of the pronotal margin, and lastly an ambient vein is present, starting at apex of clavus and continuing around the apical margin to the costal margin, where it ends at the angle half-way down the length of the tegmen. All the veins run rather parallel. Sc_2 and R are united for only a very short distance, then each extends as a single vein to the apical region, where they are lost in the reticulation; M divides into two branches, each of which is also lost in the apical reticulation; Cu_1 is single branched; Cu_2 runs along the claval suture; 1st A and 2d A unite to form a prominent Y-vein in the clavus.

Male genitalia. The tenth abdominal segment forms the so-called anal segment or flap, whose apex lies closely against the harpagones. Basally it is a broad tube which has its ventral margin extended caudad as a broad flap. The lateral margin of the flap constricts at middle, then rounds out slightly and finally tapers to the truncate apex, which is slightly emarginate through middle. The eleventh segment shows beyond the dorsal margin of the tubular part of the tenth segment as a short ringlike segment, bearing a broad, pointed stylus.

Externally, the harpagones (genital styli of authors) appear on the ventral side of the body as two adjoining triangular plates, whose combined width at base is about equal to their length. Each harpago as viewed from a flattened lateral position (see drawing No. 4, plate LVI) is roughly quadrangular with its dorsocephalic angle obliquely cut off and its dorsocaudal angle greatly prolonged dorsad

into a broad, sharply pointed projection, at base of which is a short, broad, flaplike hook.

The aedeagus is bilaterally symmetrical, almost completely hidden by the theca. With the theca the aedeagus from a ventral view appears to be a broad, capsulelike tube bearing two long tapering sclerotized processes, whose apices extend beyond the base of the genital tube. These processes are aedeagal hooks which extend out from a notch in the theca at a point about one third of the way from the apex of the aedeagus, then broadly curve ventrad a short distance, after which they extend directly cephalad, to a point beyond base of the latter. The theca on the ventral side is truncate posteriorly. On the dorsal side it is somewhat more membranous, appears sunken lengthwise through the middle and has a spatulate, lobelike extension just posterior to the base of the aedeagal hook and is also expanded lobelike at apex.

Location of type material. United States National Museum, Washington, D. C.

Notes on distribution. Uhler in his original description states that this species inhabits Colorado and Arizona. Specimens are at hand for study from the following places in Arizona: Sabino canyon, Vail, Baboquivari mountains, Pima county, Miami and Tucson. Specimens from Miami, Ariz., were taken by Dr. R. H. Beamer on a tree-like form of *Equisetum*. One specimen was taken by R. H. Beamer from Rodeo, N. M., in August, 1935.

THE GENUS *THIONIA* Stal, 1859

Stal, Carolus. *Novae quaedam Fulgorinem formae species que insigniores.* Berl. Ent. Zeit. III, p. 313, 1859.

Fowler, W. W. *Fulgoridae.* *Biologia Centrali Americana, Homoptera I*, pp. 113-119, 1904.

Melichar, Leopold. *Monograph der Issiden (Homoptera) abh. K.K. Zool.—Bot. Ges. Wien III*, 1906.

Metcalf, Z. P. *The Fulgoridae of Eastern North America.* *Jn. of the Elisha Mitchell Society XXXVIII*, 1923.

Comparative notes. The genus includes species of large or medium size, varying from 5.5 mm. to 8.1 mm. The vertex is chevronlike in shape, depressed through middle and with sharply elevated margins. The frons is elongate with elevated margins and three carinae usually present (*simplex* excepted), the two lateral ones of which have their posterior ends curving to meet the median one. The costal area of the tegmen is not deflexed as in *Tylana*, nor horizontal as in *Picumna* and *Ulives*, but is in a vertical position, while the rest of the tegmen is more or less slopingly horizontal to the body.

The tegulae are inconspicuous, showing only at the extreme sides. The longitudinal veins are prominent; cross veins are lacking for the most part, but sometimes show as a faint network at apex of the tegmen. Hind wings present and as long as the tegmina. Posterior tibiae with only two spines.

Vein Sc in this genus is not branched, and, therefore, no costal vein (Sc_1) is present. Vein Sc_2 and R arise from a main vein trunk near the base of the wing as a single vein, but very shortly separate into two separate veins which run parallel to apex of the tegmen. Vein M divides near middle of the wing into two branches and branch M_{1+2} may or may not divide at apex. Cu_1 is simple, Cu_2 follows the anal suture. Veins 1st A and 2d A are united near the apex of clavus to form the characteristic Y-vein.

The general color for the genus varies from tan to brown, sometimes unicolorous, but usually variegated with darker patches or with small, dark-brown, round speckles or with both.

This genus resembles the genus *Picinnina* Stal very closely, but is easily distinguished by the bi-spinose hind tibia and vein Cu_1 being simple, while in the other genus the tibia is quadri-spinose and vein Cu_1 branched.

HISTORY OF THE GENUS

Stal described the genus in 1859 in *Novae Quaedam Fulgorinæ Formae Speciesque Insigniores*, Berl. Ent. Zeit. III. Van Duzee gives the logotype of the genus as *longipennis* (Spin.). In 1830 two species, namely *simplex* and *elliptica*, were described by Germar, who placed them in the genus *Issus*. In the same year Say described *bullata* as a *Flata*. In 1905 Fowler described a species in Mexico which he called *naso*. Recently a long series of this species has been taken in our southwestern states. In 1908 Van Duzee added the long-headed *producta* to the group and in 1923 Metcalf added *quinquata*. In this paper one new species is being added, *T. omani*.

This makes a total of seven species, which represent in collections the North American species of *Thionia*.

To this list may be added the two species of Melichar's (1906) *transversalis* and *ocellata*, which the writer believes are not found in this country, since the type locality was given merely as N. A. No specimens are present in the National Museum collection and no specimens have turned up in the numerous collections thus far studied.

KEY TO SPECIES

1. Vertex considerably broader than long..... 2
 Vertex longer than broad 4
2. (1) Anterior margin of vertex rounding, not produced anteriorly beyond eyes;
 tegmina narrow, not bullate, unicolorous..... *simplex* (Germar), p. 458
 Anterior margin of vertex slightly angulate; tegmina bullate and broad at
 base 3
3. (2) Vertex concave, lateral margins greatly elevated; tegmina not narrowed
 considerably beyond middle..... *elliptica* (Germar), p. 459
 Vertex not concave, lateral margins not elevated; tegmina greatly narrowed
 and reflexed at apex..... *omani* n. sp., p. 461
4. (1) Head triangularly produced a considerable distance beyond eyes..... 5
 Head produced only very slightly beyond eyes or not at all..... 6
5. (4) Head produced beyond eyes a distance more than or equal to the length of
 the eye; a larger species, measuring 6.8 mm. to 8.4 mm.... *naso* Fowler, p. 463
 Head produced beyond eyes a distance less than the length of the eye; a
 smaller species, measuring 5.5 mm. to 6.8 mm..... *producta* Van Duzee, p. 465
6. (4) All six margins of the chevronlike vertex equal in length so that its latero-
 anterior angle is posterior to the anterior margin of the eye; larger in-
 sects, measuring 8 mm. for females..... *quinquata* Metcalf, p. 167
 Lateral margin of vertex longer than the four posterior and anterior margins,
 thus bringing the lateroanterior angle even with or anterior to the anterior
 margin of the eye. Size, 6.4 mm. to 7.6 mm..... *bullata* Say, p. 468

Thionia simplex (Germar), 1830

(Plates L, LI, LII, LIII, LV, LVI)

Germar. Thon's Ent. Arch., II, p. 51. Issus.

Dozier, Herbert L. The Fulgoridae or Plant-Hoppers of Mississippi, Including Those of Possible Occurrence. Miss. Agri. Exp. Sta. A. & M. College, p. 105. 1928.

Comparative notes. This is the smallest species in the genus, measuring 6 mm. to 6.5 mm. in length. It is distinguished easily by color, being uniformly brownish-yellow without markings. Structurally it is readily distinguished by the squarish vertex which is broader than long; by the frons which is only slightly longer than wide, narrowed between the eyes and bearing only one median carina or sometimes with two lateral carinae just faintly indicated on either side.

Male genitalia. The tenth abdominal segment forms the so-called anal tube or flap. Basally it is a broad, flat tube that has its ventral margin greatly extended caudad into an elongate spatulate lobe or flap which is truncate at apex. The eleventh segment shows beyond the dorsal margin of the tubular part of the tenth segment as a short, ringlike segment bearing a very short, slender stylus.

Externally the harpagones (genital styli of authors) appear on the ventral side of the body as two broad triangular plates which closely adjoin along their mesal margins. As viewed from a flattened, lateral view each harpago is a broad, pear-shaped plate, narrowed at base, greatly broadened across apex, where the dorsal,

apical angle is extended dorsad in a slightly pointed, recurved process, at the base of which is a broad, flat posteriorly projecting flap. (See drawing 5, plate LVI.)

The aedeagal structure is similar to that of the genus *Picumna*, being a bilaterally symmetrical, broad, tubular organ in which the limits of the theca and aedeagus are hard to distinguish, since the theca is sclerotized considerably and almost completely covers the aedeagus. From a lateral view the theca can be seen to extend almost to apex of aedeagus. Its posterior margin is truncate on the ventral side, but has its dorsal angle extended caudad as two processes, the dorsal one of the two being an elongate, slightly recurved lobe, the ventral one a sharply pointed hook which bends somewhat ventrad. The apex of the aedeagus shows as a thick lobe between the processes of the theca and bears two long, narrow, pointed processes, which protrude, one on each side, from the lateral notches in the theca and bend directly cephalad, extending as far forward as the base of the aedeagus.

Location of type. Possibly in the Museum at Budapest.

Notes on distribution. This is a southern and eastern species. The type locality is given as Kentucky.

A large series of this species was available for study from the following localities: Alabama, Arkansas, Florida, Mississippi, North Carolina, South Carolina, and Virginia.

Dozier (1928) adds the following states in which it has been collected: New Jersey, Maryland, Washington, D. C., Ohio, Kentucky, Missouri, Texas and Tennessee.

Thionia elliptica (Germar), 1830

(Plates L, LI, LII, LIII, LV, LVI)

Germar. Thons. Ent. Arch. II, p. 51 (*Issus*).

Dozier, Herbert L. The Fulgoridae or Plant-Hoppers of Mississippi, Including Those of Possible Occurrence. Miss. Agric. Exp. Sta. A. & M. College, p. 105, 1928.

Comparative notes. This species measures 7 mm. to 7.5 mm. from apex of head to the tips of the tegmina. It is distinguished from other species in the genus by the greater proportional width of the tegmina, the deeply concave basal margin of the frons, by having only one longitudinal carina on the frons which extends down the median line and is sharply elevated and by the very deeply concave vertex with its greatly elevated anterior corners.

The general color is a yellowish or greenish-tan, speckled with brown. In addition, the clavus of each tegmen through its middle third bears a triangle of dark brown and has a dark apex.

Male genitalia. The tenth abdominal segment or anal flap is much broader than that of *simplex*, being about twice as wide as long. At base it is a broad, flat tube that has its ventral margin greatly extended caudad into an elongate spatulate lobe which is slightly emarginate at apex. The eleventh segment shows beyond the dorsal margin of the tubular part of the tenth segment as a short, ringlike segment, bearing a short, blunt stylus.

Externally the harpagones (genital styli of authors) appear on the ventral side of the body as two broad, triangular plates which closely adjoin along their mesal margins. As viewed from a flattened, lateral view each harpago is a broad, pear-shaped plate, narrowed at base, over again as wide across apex and with its dorso-apical angle extended dorsal into a long process, bearing a posteriorly bent external flap at its base. (See drawing 7, plate LVI.)

The aedeagal structure is a bilaterally symmetrical, broad, tubular organ with the aedeagus and theca about equally sclerotized and therefore difficult to distinguish. The theca covers the aedeagus as a cylinder for about half its length, then splits on each side into a dorsal flap which extends caudad, completely covering the aedeagus to the tip, and on its ventral side forms a rounded caudal projecting lobe just posterior to the aedeagal hook. On the ventral side the theca extends almost to the tip of the aedeagus, but has each latero-posterior corner extended still further caudad into a roundly pointed mesad curving projection. The aedeagus extends between the dorsal and ventral flaps of the theca and ends as a broad bilobed flap which shows between the curved ventral hooks of the theca. Attached somewhere near its base and extending externally between the flaps of the theca is a strongly sclerotized hook which abruptly bends cephalad and extends as far back as the base of the aedeagus. About two thirds of the way from the apex this aedeagal hook bears on its lateral margin a slender, slightly pointed hook.

Location of type. According to Melichar in the Museum in Budapest.

Notes on distribution. Dozier (1928) states that "this is a rare species, never collected anywhere in numbers." The type locality is Kentucky. In the Snow Entomological Museum is one specimen collected at Polk county, Arkansas, by Jack Beamer. In the National Museum collection are five specimens collected at Concan, Texas, by Mr. P. W. Oman.

VanDuzee's catalogue lists it in addition from New Jersey, Washington, D. C., North Carolina, Georgia, Kentucky and Missouri.

Thionia omani n. sp.

(Plates LI, LII)

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of tegmen, 7.2 mm. for the male. Length of tegmen, 6.2 mm.; width of tegmen through greatest width, 2.2 mm.

Color. General color golden-bronze. Vertex with the extreme outer margins dark brown, just inside of which is a narrow, light border, disk mottled brown with a light mesal spot anterior to center. Pronotum light brown, a yellow longitudinal stripe through middle of the depressed center and a dark-brown, small depressed spot on each side of this, each lateral half with about twelve light-yellow, uniformly sized pimples; mesonotum reddish-tan through middle, each lateral carina light yellow, laterad of which is a large brown spot, lighter at extreme sides and apex. Frons red-brown, extreme outside margins dark brown, median and lateral carina and many uniformly round spots and pimples, all light yellow. Clypeus reddish-tan, with basal or posterior margins and a broad median longitudinal band lighter tan. Eyes spotted in shades of brown. Venter of thorax yellow or reddish-tan. Sterna of abdominal segments dark brown through middle, light at the sides. Tegmina amber, translucent, infuscated in irregular spots or some small areas near apex light yellow; longitudinal and most of the cross veins deep tan, a few cross veins near apex light yellow.

Structural details. This is a broad-headed species with the apex of tegmina greatly narrowed and deflexed. Vertex broad, twice as wide as one lateral margin, its anterior margin triangularly produced at middle, its posterior margin triangularly emarginate, the basolateral corners of the frons distinctly showing from above. Pronotum roundly produced anteriorly and shallowly emarginate posteriorly, its total width approximately six times its total length, greatly reduced in length behind eyes, due to the great overlapping of the head and eye region over the pronotum, the latter at this point being much grooved to allow for the insertion of the eye; all margins of pronotum being slightly raised, the disk through middle depressed and in exact center a pair of round, depressed spots. Mesonotum deeply depressed through middle, a faint median carina present and the two lateral carinae prominent. Frons a little over one third longer than basal or posterior margin, which is concave, the lateral margins slightly diverging at base of apical third, after

which point they extend apically and mesad in the form of a prominent thick carina, the space between the two ends of these margins being in width about half that of the basal margin; a median carina present on the frons, but abruptly ended half way of the length, two conspicuous lateral carinae also present, which start basally at the median carina, bow outwardly and end before apex of frons; the central disk of the frons thickly speckled with round, light-yellow spots, each lateral disk also speckled in yellow, but these spots usually more pimple-like. Clypeus approximating the lateral margins of the frons in length. Tibiae and femora of legs deeply sulcate. Tegmina very broad at base, prominently bullate at approximate apex of their basal fourth, from which point they strongly taper to an angulate apex and from about the middle of the wing on are distinctly reflexed; longitudinal veins and a few cross veins prominent, wing venation characteristic of the genus. Hind wings characteristic of the genus, being long, with vannal area large, and with a distinct notch in the prevannal area.

Comparative notes. This species is not easily confused with any other North American species. It is separated from *naso*, *producta*, *quinquata*, and *bullata*, by its broad vertex. From *simplex* it is separated by its much larger size and deeper coloring, by the angulate margin of its vertex instead of the rounded one of *simplex* and by its distinctly bullate and reflexed tegmina. From *elliptica* it is distinguished by lacking the strongly concave vertex with elevated lateral margins as in that species and by having more bullate tegmina, at which point they are widest, beyond which point they are greatly narrowed and reflexed at apex, while in *elliptica* the greatest width of the tegmen is through the apical region, and the margins are not bent under.

This species probably is more closely related to *Thionia variegata* Stål. The writer is not familiar with this species, but judging from Fowler's illustration of this species and his description, *variegata* is unicolorous, brownish-testaceous and does not possess the greatly narrowed, reflexed tegmina of *omani*.

The single specimen was sent to Mr. China of the British Museum, who compared it with Fowler's species of *Thionia* and *Colpoptera* material. He found that it did not compare with these and believed it to be a new species of *Thionia* belonging to the *variegata* group of Stål.

Location of type. This species was described from one male holotype, taken in the Organ mountains, Dona Ana, New Mexico,

August, 1915. collector unknown. The type is in the National Museum Collection, Washington, D. C.

The species was named in honor of Mr. Paul Oman, of the National Museum, who was the first person to recognize this as being a possible new species and who has done much collecting in this group of insects, as well as given much assistance to the writer in compiling this paper.

Thionia naso Fowler, 1905

(Plates LI, LII, LIII, LV, LVI)

Fowler, W. W. Fulgoridae, Biologia Centrali Americana. Homoptera I, pp. 112-119, 1904.

AUTHOR'S DESCRIPTION

Size. Female, length of body from apex of head to tip of tegmen, 7.6 mm. to 8.4 mm.; length of tegmen, 5.6 mm.; width of tegmen, 2.4 mm. Male, length of body, 6.6 mm. to 7.2 mm.; length of tegmen, 4.8 mm.; width of tegmen, 2.3 mm.

Color. Resembling *producta* in general color pattern. Dull testaceous except most of ventral surface greenish-tan. Vertex with thin outer margins dark brown and on each lateral half a brownish longitudinal band which becomes darker at base, rest covered with dark-brown specks. Pronotum with a broad, median pale vitta, on either side of which it becomes darker; slender edges of the pronotum as well as some uniformly round, conspicuous dots, dark brown. Scutellum pale with three irregular brown spots on each lateral third. Frons yellowish-tan covered with prominent dark-brown spots; the basal angles and carinae, especially at base, black. Postclypeus for the most part dark brown with a conspicuous light vitta down center and a lesser one on each side. Genae, except at base and apex, ivory. Pleural flap of the pronotum with a light triangle on lower edge, which sends a slender wedge toward the eye. Tegmina considerably variegated and quite variable; the slender 2d A cell which extends along the entire claval margin, dark through middle; first anal cell conspicuously but irregularly clouded with dark; rest of tegmina with dark veins clouded with dark patches here and there; sternal regions light, marked with dark through middle and at the sides. Legs light, profusely covered by conspicuous dark-brown spots, some of which blend with others in places.

Structural characteristics. The vertex much longer than broad and greatly produced cephalad beyond the eyes; the basal portion nearly square, the apical portion extended forward in an acute angle to such an extent that one edge of the angle is equal to the lateral

edge of the basal region, making all five edges of the vertex approximately equal; sides carinate and an abbreviated carina on median line. Frons, elongate, slightly parallel through middle; basal and apical widths about equal; three longitudinal carinae present, converging at base and extending approximately four fifths of the length; posterior margin deeply emarginate for the reception of the clypeus. Clypeus elongate, strongly convex. Pronotum at middle about one half the length of the vertex, strongly advanced and obtusely angled between the eyes, truncated behind, eecarinate, with two impressed points on the disk. Mesonotum slightly longer than pronotum, its sides arcuated, a lateral carina faintly visible on either side. Tegmina slender, and costal margin angled as in *producta*, distinctly inflated at a point corresponding to apex of basal fourth. Venation characteristic of this genus, the longitudinal veins conspicuously elevated, cross veins few and indistinct.

Male genitalia. Since the general features of the male genitalia correspond to those in the species *producta* the reader is referred to the description of these structures under that heading in the discussion of that species.

Comparative notes. Since this species more closely resembles *T. producta*, the comparative notes given under this same heading in the description of that species will apply to *naso*. As is pointed out there, these two species can readily be distinguished externally. However, the matter is somewhat complicated when it comes to separating these two species by the male genitalia, for it is apparent that there is not much difference in these usually valuable characters. For this reason some writers might believe that it would be better to call one a variety than to leave them as two distinct species. The writer, however, has done the latter thing instead, mainly because of the idea that taxonomy in a large measure is a matter of convenience, and since the two are so easily separated by other characters it would seem less confusing to separate them into two species.

In the genitalia there are one or two minor differences (see drawings) which can be noted. The dorsoapical processes of the theca seem less pronounced in *omani* than in *producta*. Secondly, the apices of the aedeagal hooks in *producta* are always less sclerotized and seem more slender and tapering, so that at first glance they are easily not noticed. In *omani* these apices are more heavily sclerotized and seem somewhat bulbous at the end.

Location of types. Fowler described this species from one speci-

men collected by Dr. E. D. Ball at Jalapa, Mexico. Doctor Ball has this type now in his private collection. He has very kindly compared a male and female specimen with the type. These two specimens and about thirteen others have been taken at Concean, Texas, by Mr. Paul Oman of the United States Museum staff.

Notes on distribution. Doctor Ball wrote the following notation to the author after comparing the Concean, Texas, material with the type. "In reference to the species, it is typical *Thionia naso* Fowler as compared with the type and with material which I have from the Santa Rita, Huachuca and Chiricahua mountains."

Thionia producta Van Duzee, 1908

(Plates LI, LII, LIII, LV, LVI)

Van Duzee, E. P. Studies in North American Fulgoroidea. Proc. of the Academy of Natural Sciences of Phil. LX: 494, 1908.

Comparative notes. This species is easily distinguished from *simplex*, *elliptica*, *bullata*, and *quinquata* by the vertex, which is angulately produced cephalad for a considerable distance beyond the eyes. The basal portion is almost square, with the lateral margins parallel and slightly elevated as thin edges and the posterior margin shallowly and roundly emarginate. The apical portion of the vertex, starting at the eyes, is produced cephalad in an angle, a little less than a right angle and each edge of which is about half the length of the lateral margin. The frons in this species is elongate, being not quite twice as long as wide and bearing three longitudinal carinae which are united at base, but which extend only approximately one half to two thirds of its length. The tegmina are narrower than in *bullata* and have the costal margin more angled.

T. producta more closely resembles *T. naso* Fowler than any others in the genus. From this species it is separated externally by its smaller size and the shapes of the vertex and frons. In *naso* the vertex is similar to that of *producta* at base, but has the apical region angulately produced cephalad to such an extent that one edge of the angle is much longer than either of the lateral margins or the length of the eye, while in *producta* this line is shorter than a lateral line or the length of the eye. The frons in *naso* is proportionally more slender, being over twice as long as wide and its width at base where the vertex and frons meet in an angle is approximately equal to that across its extreme apical margin, while in *producta* the basal width at this same point is less than the width at apex.

Notes on variation. This species seems very variable in color. In the original description much black was noted on frons, vertex, pronotum, and a broad vitta on the tegmina following the inner margins of the scutellum. In many specimens this black is greatly reduced or lacking in many places.

Structurally a variation is noted in the extent that the vertex is produced cephalad. A series of specimens show the vertex longer than in the typical forms, but not nearly as long as in *naso*. The writer places these longer-headed forms with *producta*, although Doctor Ball stated in a notation concerning *naso* Fowler that he had material of this species from the Santa Rita mountains, Arizona.

Male genitalia. The anal flap (tenth abdominal segment) in this species is so elongate that its apex bends caudad, snugly covering the extreme apices of the genital styli on the dorsal surface. Its length is a little longer than three times its width. At base the tenth segment is a flattened tube with parallel lateral margins. Its ventral margin extends caudad as the parallel-sided flap, which is truncate and slightly tapering at apex and not quite twice as long as the basal part. The eleventh segment is visible beyond its dorsal margin as a narrow ringlike segment bearing a moderately long stylus.

The harpagones (genital styli) are visible externally as broad, triangular plates whose inner margins are closely adjoined. From a flattened lateral view each harpago is a broad, pear-shaped plate, narrowed considerably at base, where it is attached to the body by a slender stalk. Its apex is considerably widened and its dorso-posterior region bears a foot-shaped flap which extends first caudad, then suddenly bends dorsad, where it projects dorsad as a roundly pointed projection.

The aedeagal structure is similar to that of other species, especially that of *bullata*. It is bilaterally symmetrical. On the ventral side its posterior margin is truncate through the middle, but at the sides is deeply notched to allow the aedeagal hooks to appear externally as anteriorly projecting, well-sclerotized hooks. Laterad of the notches the theca projects caudad on either side as slender, somewhat pointed processes. From a lateral view it appears much longer, covering practically the entire aedeagus. Its extreme dorsal and apical region is modified into two projections, the anterior one being a rounding, cephalad-projecting lobe and the posterior one being a short, pointed, caudad-projecting hook. The aedeagus appears only at the extreme apex, where it appears as a broad, elongate lobe, emerging from between the flaps of the theca. It bears on each side

a long, narrow, well-sclerotized process which emerges from the notch of the theca, extends directly ventrad a short distance and then bends abruptly forward, reaching not quite to the base of the theca. Each aedeagal hook bears on its outer margin at approximately the base of the apical fourth a small external spine. *In situ* these hooks are crossed on the ventral side.

Notes on distribution. Van Duzee described this species from one pair taken at Rifle, Colo., in July. Mr. Van Duzee was kind enough to send to the writer a metatype male taken in the Huachuca mountains, Arizona, in August. Mr. Paul Oman has taken a series of fourteen at Concan, Texas, in June. In the Snow Entomological Museum at the University of Kansas is a large series taken in Arizona at the following places; Huachuca mountains, Santa Rita mountains, Yavapai, Prescott, Jerome, Miami, Coconino county, Chiricahua mountains and Oak Creek canyon; and in Utah from Cove Fort, Cedar City, Monroe and Salina. In 1936 Dr. R. H. Beamer collected a series from Leakey, Texas, on July 8.

Location of types. In the collection of Dr. E. P. Van Duzee, San Francisco, Cal.

Host plants. Collected by Dr. R. H. Beamer from cedar (1936).

Thionia quinquata Metcalf, 1923

(Plates LI, LII)

Metcalf, Z. P. A Key to The Fulgoridae of Eastern North America With Descriptions of New Species. *Jour. of the Elisha Mitchell Scientific Society* 38: p. 190, 1923.

Comparative notes. Metcalf in his original description states that this species may be recognized by the shape of the vertex and by coloration.

The general color is almost uniform light brown, which is almost uniformly covered with small, dark points, and the veins are also dark.

In size it ranks as one of the larger species in the genus, as the female measures at least 8 mm. in length from tip of head to apex of wings.

The vertex is more distinctly chevronlike in shape than in any other species in the genus due to the sharper angles, especially the anterior one, and the fact that the six sides of the chevron are practically equal; the lateroanterior angles of the vertex are posterior to the anterior margin of the eye and, therefore, more of the frons is visible from above than in such species as *bullata*. The frons is broad as in *bullata*, being not much longer than wide; it bears three distinctly elevated longitudinal carinae, which are united at base;

its basal margin is only slightly concave. The longitudinal veins of the tegmina are prominent and elevated; the cross veins are more conspicuous than in other species.

Note. The writer was in possession of only one specimen for study. This was a female, and therefore no data in regard to the male genitalia can be given.

Notes on distribution. Metcalf states that the type female was collected at Raleigh, N. C., in September. One specimen in the United States National Museum was taken at Thompson Mills, Ga., concerning which no data was given in regard to date or collector.

Thionia bullata (Say), 1830

(Plates LI, LII, LIII, LV, LVI)

Say, Thomas. Jr. Acad. Nat. Sci. Phila. VI, p. 240; Comp. Writing, II, p. 375. Flata.

Comparative notes. A common species which is rather variable in color and, therefore, not always easily identified. The usual pattern has a light vertex marked with a dark longitudinal band on each lateral half (sometimes, however, reduced to a spot), which usually continues, although sometimes irregularly, across pronotum and mesonotum; tegmina unicolorous light brown or tan with a darker indefinite band in the form of a Y which is interrupted through the middle.

Size from tip of head to apex of tegmina 6.4 mm. to 7.6 mm.

The structural characteristics by which it can best be distinguished are the shape of the frons, the vertex and the tegmina. The frons is only slightly longer than wide; its lateral margins are roundly and evenly emarginate, making the greatest width through apical third; it bears three distinctly elevated carinae which are united at base, and its basal margin is very slightly concave. This species resembles *quinquata* in many respects. It differs from it by its smaller size, shape of the vertex and tegmina. In the latter species the chevronlike shape of the vertex is more pronounced, due to the six sides of the chevron being approximately equal in length. In *bullata* the lateral margins are proportionally longer and this brings the lateroanterior angles in line with the anterior margin of the eyes or more commonly anterior to the eyes, while in *quinquata* this angle is posterior to the anterior line of the eyes. The tegmina of *quinquata* are distinctly inflated at base of apical fourth and only slightly so in *bullata*.

Male genitalia. Externally the male of this species can be distinguished very easily by the conspicuous spatulate projections from

the anal flap, which extend ventrad around the harpagones to such an extent that they almost converge at middle on the ventral side of the body. The tenth abdominal segment (anal flap) is conspicuously different from other members of the genus studied. At base it is a broad, flat tube, but apically it has its ventral and lateral margins projected caudad as a greatly expanded plate, whose latero-posterior corners are drawn out into long spatulate lobes (see above) and whose posterior margin through the middle is triangularly produced. The eleventh abdominal segment shows beyond the dorsal margin of the tubular part of the tenth segment as a short ringlike segment which bears an abbreviated stylus.

Externally the harpagones (genital styli of authors) appear on the ventral side of the body as two broad, triangular plates which closely adjoin along their mesal margins. As viewed from a flattened, lateral view, each harpago is a broad, pear-shaped plate, narrowed considerably at base where it is attached to the body by a slender stalk, but over twice as wide across the apex as at base and with a slender footlike flap extending first caudad, then suddenly bending dorsad as a roundly pointed flap.

The aedeagal structure is of the *simplex* type. It is bilaterally symmetrical. On the ventral side the theca covers the aedeagus for three fourths of its length; it has a truncate posterior margin and each lateral third is extended laterally as a rounded flaplike lobe which is just caudad to the aedeagal hook at a point where it emerges from the notch in the theca. From a side view the theca shows a modification in the dorsoapical region, namely, by having two projections, an anterior one which is a rounded lobe that extends cephalad over the aedeagal structure for about half its length, and a posterior one which extends caudad and slightly dorsad as a slender, gently curving hook. The aedeagus shows as a thick lobe between the processes of the theca and bears two long, narrow, pointed processes, which protrude, one on each side, from the lateral notches in the theca and bend directly cephalad, extending as far forward as the base of the aedeagus. Each of these aedeagal hooks bears on its outer margin, at approximately the base of the apical sixth, a small external spine.

Notes on distribution. Say, in the original description, states that it inhabits the United States.

Specimens were available for study from Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi and South Carolina. In addition to these states, Dozier (1928) gives the following: New

Jersey, New York, Ohio, Pennsylvania, and Ontario. He states that both nymphs and adults were taken on oak.

Van Duzee's catalogue adds North Carolina.

Location of type. Do not know.

Thionia occlata Melichar, 1906

Melichar, Leopold. Monograph des Issiden (Homoptera). Abk. k. k. Zoöl. Bot. Ges. Wien III, 1906.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. of Elisha Mitchell Society, Vol. 38: 158, 1923.

Comparative notes. The writer did not have any specimens of this species for study. Mr. Paul Oman says that there are no specimens in the National Museum, and that he is not familiar with the species.

Metcalf (1923), in his key to the species, distinguishes it by having vertex as long as broad, frons not arched, without a transverse yellow band, all reddish or yellowish-brown, vertex rounded anteriorly and tegmina with an ocellated spot near the apex.

The size of the species is given as $5\frac{1}{2}$ mm.

Location of types. In the Wien Museum, Austria.

Notes on distribution. Apparently described from one female, for which the locality is given as North America. The writer believes that this species probably does not occur in North America, north of Mexico.

Thionia transversalis Melichar, 1906

Melichar, Leopold. Monograph des Issiden (Homoptera). Abk. k. k. Zoöl. Bot. Ges. Wien III, 1906.

Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. of Elisha Mitchell Society, Vol. 38: 158, 1923.

Comparative notes. The writer did not have any specimens of this species for study. Mr. Paul Oman says that there are no specimens in the National Museum and that he is not familiar with the species.

Metcalf (1923), in his key to the species, distinguishes it by having vertex as long as broad, frons slightly arched and with bright yellow transverse band.

The size of the species is given as 8 mm.

Location of type. Melichar states that the type female is in the museum in Wien, Austria.

Notes on distribution. The species was evidently described from one female, for which specimen the type locality is given as North America. The present writer is of the opinion that this is not found in North America, north of Mexico.

THE GENUS *PICUMNA* Stal

Stal, Carolus. Hemiptera Mexicana—Enumeravit Speciesque Novas Descripsit. Stet. Ent. Zeit. XXV: p. 53.

Fowler, W. W. Fulgoridae. Biologia Centrali Americana. Homop. 1: 113-119, 1904.

Melichar, Leopold. Monograph der Issiden (Homoptera.) Abh. k. k. Zool. Bot. Ges. Wien III, 1906.

Comparative notes. In size varying from 6-7 mm. long. General color, brown, marked with testaceous and yellow.

Some of the distinctive characteristics of this genus are: the frons narrowed at base with one median carina distinctly visible and two lateral carinae faintly indicated or showing only at the extreme basal end; the clypeus keeled through the middle; vertex concave across disk; pronotum short with very abbreviated lateral areas, anteriorly curved and posteriorly straight; scutellum with three parallel longitudinal keels, the median one not always distinct; tegulae conspicuous; tegmina elongate, oval, weakly produced at sides and with thick longitudinal veins, the cross veins lacking or scarce, clavus long, extending to base of apical fourth of tegmen; hind wings long, deeply notched at margin; hind tibia with usually four lateral spines (rarely five) and a crown of spines at apex.

The wing venation in this genus shows the following characteristics: vein Sc is unbranched and, therefore, there is no expanded costal area; Sc₂ and R are united for only a short distance at base; M is always branched into two branches, usually about center of tegmen; vein Cu₁ is branched always posteriorly to the branching of M, but in various specimens varying in its distance from apex of tegmen; Cu₂ follows the anal suture; 1st A and 2d A uniting some distance from apex of clavus.

This genus resembles the genus *Thionia* rather closely, but is easily distinguished, as Stal points out, by its quadrispinose hind tibia and vein Cu₁ being branched; in *Thionia* the hind tibiae are bispinose and vein Cu₁ is simple.

KEY TO SPECIES

- 1a. Dark brown, mottled with yellow; costal margins of tegmina as viewed from above not parallel, somewhat expanded at base so that greatest width of tegmen is in line with apex of scutellum.....*Picumna chinai* n. sp., p. 473
- 1b. Dark brown, mottled with yellow; costal margins parallel or slightly rounding, not expanded at base, greatest width of tegmina through middle.

Picumna maculata (Melichar), p. 471

Picumna maculata (Melichar)

(Plates II, IV, V, VI, VIII)

Issomorphus maculatus Mel. Melichar, Leopold. Monograph der Issiden, Homoptera. Abh. k. k. Zool. Bot. Ges. Wien III, 1906.

Issomorphus maculataus Mel. Metcalf, Z. P. The Fulgoridae of Eastern North America. Jour. of the Elisha Mitchell Society XXXVIII, 1923.

Picumna ovatipennis Walker. Fowler, W. W. Biologia Centrali Americana. Homoptera 1: 113-119, 1904. Figures a variety, fig. 30, plate 12, which may be *maculata* Melichar.

Comparative notes. *Issomorphus maculatus* in this paper is placed under the genus *Picumna* because it has all the characteristics of this genus. In appearance it is very similar to other species in the genus. Melichar in his original description of the genus *Issomorphus* mentions the presence of five spines on the hind tibia which he says separates it easily from the European genus *Issus*, and which would also separate it from any North American genus. The present writer has been unable to locate five spines on any specimen, and believes that Melichar must have counted the large lateral spines which make up part of the apical crown or circle of spines.

This species in size and shape resembles very closely two Mexican species, *Picumna ovatipennis* Walker and *Picumna varians* Stal. In many collections the former name has been given to this species. It also resembles in color pattern and size *Picumna chinai* n. sp. For comparison of these species see the notes under this heading in the description of the latter.

A color variation occurs in this species, some specimens being much more mottled than others and some with uniform brown tegmina, except for a large yellow spot along the costal margin.

Male genitalia. The tenth abdominal segment (anal tube or flap) is a broad, flat tube at base that has its ventral margin extended caudad as a broad, spatulate truncate lobe which is wider across extreme apex. The eleventh segment shows beyond the dorsal margin of the tenth segment as a short, ringlike segment and bears a long, slender, pointed stylus.

Externally the harpagones (genital styli of authors) appear on the ventral side of the body as two triangular, pointed plates which are closely adjoined along their mesal margins. As viewed from a flattened lateral view each harpago is a broad pear-shaped plate, narrowed at base, greatly broadened out across apex with the dorsal, apical angle extended dorsad into an elongate process which is slightly pointed at its extreme apex and at base bears an external, liplike process.

The aedeagus and theca are difficult to distinguish. Together they appear as a bilaterally symmetrical, broad, tubular structure. From a lateral view the theca shows its apical margin broadly notched through middle, due to its ventral region being greatly extended caudad as a rounded lobe which bears on each side a rounded liplike process just posterior to each aedeagal hook, and its dorsal region extending caudad as three distinct processes, the one through middle being a broad semimembranous flap and the two on each side

being slender, sinuately curved, hooklike processes which are sharply pointed at apex. The apical region only of the aedeagus shows. This part consists of a broad, bilobed flap extending between the dorsal and ventral flaps of the theca, and two sclerotized hooks, one on each side, which protrude from the notches of the theca and immediately bend caudad for a short distance, then make a right-angled bend which causes them to extend cephalad over the aedeagus almost to its base. Each aedeagal hook, as viewed from the ventral side (drawing 3, plate LIV), is slender and cylindrical at base, then suddenly constricts to a narrow rod and then flattens out as a spatulate flap, bearing on its mesocephalic corner a slender, recurved hook.

Notes on distribution. Melichar lists Las Vegas, Hot Springs, New Mexico, as the habitat of this species. In the Snow Entomological Collection at the University of Kansas are many specimens taken by R. H. Beamer from the following places in Arizona: Coconino county, Yavapai county, Oak Creek canyon, Grand Canyon, Huachuca mountains, Santa Rita mountains, the Chiricahua National Monument, and Granite Dell. One specimen was collected by Mr. Beamer from Luna, N. Mex., in July.

Location of types. In the National Museum at Washington, D. C., are three syntypes of the species *Issomorphus maculatus* Melichar. Mr. Paul Oman has kindly made comparisons of these types and finds that two of them, although somewhat broken, fit the original description and figures made by Melichar for this species. One of these we are designating as the lectotype of the species. The data for this type is "Las Vegas, H. S., N. M., Aug. 13. Barber and Schwarz, collectors." According to Mr. Barber the H. S. means Hot Springs, which are at the base of the hills about six miles from the town of Las Vegas and in the edge of the pinon pine belt.

The third specimen of the group is the new species, *Picumna chinai*, which follows this description.

Host plants. Dr. R. H. Beamer collected a series of this species at Silver City, N. Mex., from pine (1936).

Picumna chinai n. sp.

(Plates L, LI, LII, LIV, LVI)

Picumna oratipennis Walk. Fowler, W. W. *Biologia Centrali Americana*. Homoptera I, pp. 113-119, 1904. (Probably is his figure 29, plate 12.)

Picumna oratipennis Walk. Metcalf, Z. P. *The Fulgoridae of Eastern North America*. Jour. of the Elisha Mitchell Society XXXVIII, 1923.

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of tegmen 5.2 mm. to 5.6 mm. Length of tegmen 4 mm. to 4.4 mm.; greatest width of

tegmen 1.6 to 1.8 mm. This species has the size and appearance of *maculata* (Mel.).

Color. This species has the typical mottled color pattern in blackish brown to cream that is characteristic of the genus. Vertex, pitch-brown except for a median light tan longitudinal stripe and a spot of same color in center of each lateral half. Eyes, light brown or tan. Pronotum, pitch-brown except a median yellow stripe and the lateral carinae somewhat lighter. Mesonotum, light tan, mottled with light brown and all margins and carinae lighter. Frons, light tan, traversed by irregular tracings of dark brown which usually becomes a solid patch across basal or posterior margin and roundish spots on apical lateral corners, carinae brown. Clypeus, yellow, dark brown at sides, each lateral half bearing 6 to 7 oblique brown bands. Underside of thorax yellow with conspicuous dark-brown spots on each sclerite. Coxae of forelegs, light yellow, with a conspicuous brown spot on anterior half; femora of legs striped longitudinally in yellow and brown; tibiae reddish-brown; tarsal segments light, shading to reddish-brown on margins and into black-tipped claws. Abdominal segments of male from underside light yellow, harpagones infuscated. Abdominal segments of female from underside light at sides and margins, darker through middle; ovipositor valves pitch-brown. Tegmina, pitch-brown, irregularly mottled and speckled with light, a large sclerhyaline light spot on costal margin approximately at middle, which is somewhat triangular in shape, with the apex of the triangle directed mesad.

Structural details. Vertex transverse, concave, lateral margins slightly diverging posteriorly, anterior margin evenly rounding, but not angulate as in *maculata*, posterior margin deeply triangularly emarginate. Pronotum short, broader than head, slightly sunken through middle, shorter behind eyes and the anterior part of each lateral arm greatly sunken to allow for the overlapping of the eye onto it, behind which it is elevated into a sharp carina. Mesonotum triangular, not much broader than long, only slightly sunken through middle, median carina only faintly indicated, a lateral carina on each side conspicuous. Tegulae very large. Frons elongate, its lateral margins diverging apically so that at apex it is not quite a third wider than across the basal margin; the basal margin deeply concave; a median carina and a lateral carina on each side starting at the same place, slightly below the basal margin, the two lateral ones outwardly bowing and then running parallel with median one. Clypeus almost as broad at base as the frons, its greatest length about equal to one lateral margin of the frons. Tegmina held hori-

zontally on body, their claval and costal margins subparallel, their greatest width just anterior to middle, where they are considerably flared as viewed from above.

Male genitalia. Anal flap (10th abdominal segment) forms a characteristic flattened tube at base, the ventral margin of which is then extended into an elongate, parallel-sided, truncate lobe. The eleventh segment shows slightly beyond the dorsal rim and bears a slender, fingerlike stylus, which is many times longer than wide.

The harpago is extremely broad in this species, being almost triangular in shape. It is a flat lobe, slightly inflated through middle and with its extreme dorsoposterior corner extended cephalad into a somewhat bluntly tapering projection. At the base of this projection is a flat, external ventrad-projecting flap.

The aedeagal structure is bilateral and of the same general shape of *maculata*, but broader. From a lateral view the theca shows its apical margin broadly notched through middle, due to its ventral region being greatly expanded caudad as a rounded lobe, which bears on each side a rounded liplike process just posterior to each aedeagal hook, and its dorsal region extending caudad as three distinct processes, the one through middle being a broad semimembranous flap and the two on each side being slender, twice angled hooks which end in a sharp apex. The apical region only of the aedeagus shows. This part consists of a broad, bilobed flap extending between the dorsal and ventral flaps of the theca and two sclerotized processes, one on each side, which protrude from the notches of the theca, immediately bend caudad, then make a right-angled bend, which causes them to lie over the aedeagus, where they reach to almost the base of the latter. Each aedeagal hook as viewed from the ventral side is slender and cylindrical at base, then suddenly becomes slightly constricted, after which it suddenly expands, becoming a spatulate lobe with its mesocephalic angle forming a small, recurved hook.

Comparative notes. In collections of the Issidae taken in North America, north of Mexico, there are two species of this group represented in fairly good numbers. These two species have been determined by authors as *Issomorphus maculatus* Melichar and *Picumna ovatipennis* Walker, and have been indiscriminately and interchangeably classified as such. In order to straighten out which was which the writer sent specimens from each species to Mr. China, of the British Museum, to compare with the type of *Picumna ovatipennis* Walker. Mr. China reported that neither of these United

States forms were *ovatipennis* Walker, and sent a homotype (compared by him) of the latter to the writer for study. This homotype is described in the following description and figures are given for it. Mr. China suggested that the ovate United States species was *Issomorphus maculatus* Melichar and the other one, with the broadened tegmina at base, a new species.

Following Mr. China's comparison the writer then asked Mr. Oman, of the United States Museum, to again check over the type specimens. Mr. Oman reported that two of the three type specimens of *Issomorphus maculatus* Melichar were the ovate species and one was the broad-winged one. Because the ovate one fits Melichar's figure better we have designated it as the lectotype, and since it undoubtedly is *Picumna* we have changed the name to *Picumna maculata* (Melichar). See preceding description. The broad-winged form is herein described as new, with the name *Picumna chinai*.

The species of the genus *Picumna* resemble each other most closely in coloration and size. In these two respects *P. maculata* (Mel.) and *P. chinai* n. sp. are almost indistinguishable. Yet, these two are easily separated by the shape of the tegmina. *P. chinai*, as viewed from above, is a broad, flat species, more the shape of *Ulixes scutatus*, due to the great expansion of the wings at the base which makes the tegmina broadest at a point in line with apex of scutellum. *P. maculata* (Melichar) has the characteristic shape of the genus, which is ovate, as viewed from above, with the greatest width of the tegmina through the middle. The frons is slightly more narrowed at base and the clypeus slightly broader in *chinai* than in *maculata*. The genitalia of these two species are similar and yet show distinctive differences, which can best be seen by studying the drawings.

The Mexican species, *Picumna ovatipennis* Walker, is easily distinguished from the North American species occurring in the United States, by the shape of the vertex and frons. Although Walker described the vertex as transverse in this species, it is subequal in length and width, which gives it a much longer appearance. In *P. maculata* (Mel.) and *P. chinai* n. sp. the vertex is at least one fourth wider than long and has the appearance of being quite broad and short. The frons of *P. ovatipennis* is greatly narrowed at base and the clypeus much shorter than either of the other two species.

The writer has not seen any of the other Mexican species which might be confused with any of the above three. Mr. China believes, as does the writer, that both Fowler and Melichar thoroughly muddled up the genus *Picumna*. He states that *P. varians* Stal, as de-

terminated by Fowler, seems to be closely allied to *ovatipennis* Walker. This idea is borne out by the fact that in Stal's description of *varians* he states that the vertex is equal in length and width.

Notes on distribution and types. The species was described from numerous examples taken at various points in Arizona. The species is named after Mr. China, of the British Museum, who has so kindly assisted the author in the identification of numerous species and who first suggested that this was a new species.

Holotype male and allotype female collected in the Santa Rita mountains of Arizona, on August 18, 1935, by R. H. Beamer. Paratypes from the following places: 14 females and 9 males from the Santa Rita mountains; 16 females and 11 males from the Huachuca mountains; 2 females and 2 males from the Chiricahua mountains; 2 females and 2 males from Patagonia; one female from St. Catalina mountains, and two males from the Dragoon mountains.

Holotype and allotype, and the majority of the paratypes in the Snow Entomological Collection at the University of Kansas.

Picumna ovatipennis (Walker)

(Plate L)

Walker, Francis. List of the specimens of Homopterous Insects in the Collection of the British Museum. Supplement, p. 88, 1858, as (*Issus*).

Size. Length of body, 4.8 mm. Length of tegmen, 4.5 mm.; width of tegmen, 1.9 mm.

Color. General color greenish-tan, marked with brown. Vertex yellow through middle, lateral margins greenish, apical third and a spot in each lateroposterior corner brown. Frons, yellow-green, marked with dark in the following places; basal angles dorsad of carinae dark brown, lateral carinae faintly indicated almost to apex as brown lines which fade out apically, disk at base between lateral arms of carinae reddish-brown, followed by an irregular transverse band of light, another dark band through middle followed by a light area at apex; in each lateral disk through middle is a vertical row of about six round, brown spots, the expanded apical corner is mottled in brown. Clypeus greenish-yellow with six oblique bands indicated on either side, apical half dark brown. Genae yellow except a brown crescent around base of each antenna. Antenna dark brown with lighter brown sense organs. Pronotum greenish-yellow with two brown spots in apex of triangle formed by the lateral carinae and a brown spot at each extreme lateral edge. Pleural parts below yellow margined, rest dark brown except a light streak through middle. Rest of thorax below yellowish-green, spotted

with brown, from above light brown. Abdominal segments, from above light brown, at sides considerably darker and extreme posterior margins light. From below abdominal segments brown through middle, mottled at sides, extreme posterior margins greenish-yellow. Ovipositor dusky brown. Legs, femora brown with a broad transverse light band through middle; tibiae speckled; tarsal segments reddish-brown, somewhat darker on apices, tarsal claws dark brown. Tegmina yellowish-hyaline marked with reddish-brown in the following places: a broad triangle through middle with its apex ending on claval suture at about middle of wing, an oval spot on extreme apical costal angle, another large rectangular area between this spot and apex of corium, smaller spots scattered over other parts of corium, clavus with a larger, irregular oblique band across middle, a smaller irregular band posterior to this and the extreme basal posterior area dark brown. Wings pale, transparent with thick brown veins.

Structural details. Vertex with length and width equal, considerably concave through disk, making it appear narrower than it is, its anterior margins roundly converging to a sharp pointed apex from above, thus allowing considerable of frons to show on either side. Width of eyes considerably greater than width of vertex. Pronotum considerably wider than head, distinctly triangulate anteriorly with its two lateral carinae converging to a sharp point as they touch the anterior margin. Mesonotum large, slightly over twice the length of the pronotum at middle, a transverse crease following along the anterior margin and ending on each side at the lateral carina, no median carina visible, the central disk somewhat depressed. Abdominal segments collapsed in the dried specimen. Anal flap (10th segment) long, the extended flaplike part about one third longer than the tubular part. Genital stylus of the eleventh segment, a long, slender, fingerlike projection. Tegulae conspicuous. Tegmina subparallel, margined with the costal margin only slightly rounding, apex uniformly rounding, and its greatest width, if any, in line with angle of the claval margin. Hind wings large, with its three areas at apex about equal in width.

Wing venation same as for the genus in general characteristics. In particular, M branches into two branches considerably anterior to middle, then each branch again divides in the apical region. Cu_1 branches only a slight distance posterior to middle; anal veins unite at about base of apical fourth of clavus.

Comparative notes. This Mexican species apparently has not been collected north of Mexico at the present time. Two or three

northern species have been wrongly determined as this species in collections and in the literature. For comparative characters to separate the several species see the notes under this heading in the description of *Picumna chinai* n. sp., just preceding.

Mr. China very kindly loaned the writer a female homotype compared by him with the type. Drawings of this specimen are found on plate L, figs. 1, 2, and 3. In studying this type specimen with Walker's description the present writer finds the following inconsistencies in the description: Walker states that the vertex is transverse, whereas, in the specimen it is subequal in length and width; that the abdomen is black—in this specimen it was testaceous brown; that the forewings are black and tawny towards the base—in this specimen they are tawny with brown markings; that the forewings have a tawny mark on the anterior border—this specimen had a large costal spot which also continued transversely across wing; that hind wings are grayish vitreous with black veins, while here they are pale yellow with light-brown veins.

Location of types. British Museum.

THE GENUS EUTHISCIA Van Duzee

Van Duzee, E. P. Expedition California Academy of Science to Gulf of California. Proc. Cal. Acad. of Sc. XII, p. 193, 1923.

Comparative notes. According to Van Duzee this genus has the aspect of *Mycterodus* and is closely allied to *Thiscia* Stal. Neither of these genera are North American. It differs from *Thiscia* by the very broad, smooth front, much simpler elytral venation and the rudimentary wings.

The genus is readily distinguished from other North American genera by spineless hind tibiae, the very large pronotum as compared to the scutellum and the broad, much abbreviated and somewhat bullate tegmina which enclose the body and meet below it.

Van Duzee described two species in the genus, of which one species, *Euthiscia tuberculata*, has been taken north of Mexico by Dr. E. D. Ball, at Tueson, Ariz.

Euthiscia tuberculata Van Duzee, 1923

(Plates I, IV, V, VI, VIII)

Van Duzee, E. P. Expedition California Academy of Science to Gulf of Mexico. Proc. Cal. Acad. of Sc. XII, p. 193, 1923.

Comparative notes. This species is readily distinguished externally by several characteristics. On the dorsum of the body are six tuberculate elevations, two on vertex, two on pronotum and two on the scutellum. The tegmina are unusual because of their shape and

brevity; being so abbreviated at apex that little of the tegmen extends caudad beyond tip of clavus and their greatest width is at a point considerably cephalad to their middle. As is typical for the genus the tegmina are held vertically, are somewhat bullate, and enclose the body by having their costal margins meet below.

The wing venation shows the following general characteristics: vein Sc divided, with vein Sc₁ (equal costal vein of Metcalf) only visible a short distance at base; veins Sc₂, R, M and Cu all apparently united at base for a short distance; veins Sc₂ and R branching from this main trunk as one vein, but soon dividing into separate veins; vein M four-branched; vein Cu₁ two-branched; vein Cu₂ running along claval suture as in other Homoptera; veins 1st A and 2d A by uniting at apex forming a Y-vein in clavus. All the veins of the tegmina breaking up into a reticulation at apex so that it is difficult to trace out the course of the longitudinal veins. Hind wings lacking.

Male genitalia. Anal flap (10th abdominal segment) almost three times as long as broad, narrowed at apex. Eleventh segment ring-like and with a conspicuous elongate stylus. Both of these segments almost hidden externally, due to the great compression of the abdominal segments and the dorsal extension of the apices of the harpagones.

The harpagones in this species are visible externally as two ventral subrectangular plates meeting at middle. They are proportionally smaller than in other species in the subfamily. Due to the great compression of the sterna of the abdominal segments they assume, also, a more vertical position with their apices extending considerably dorsad, thus crowding the anal flap and genital stylus backward until the latter touch the abdominal terga and are practically hidden by the harpagones.

The aedeagus is a broad tubular structure which is bilaterally symmetrical. Its apical half is divided into two broad spatulate lobes, each of which bears four irregular teeth on its laterocaudal margin and on its ventral side a cephalad-projecting, sharply pointed, elongate flap, which extends cephalad to a point midway the length of the aedeagus. A broad, three-pronged apodeme is attached to the base of the aedeagus. A rather complicated theca envelops the aedeagus. On the ventral side the theca, through the middle, covers the aedeagus for about two thirds of the length of the latter, but the extreme lateral angles project caudad much farther and somewhat dorsad as two sharply pointed processes. On the dorsal side the theca is more membranous, is depressed through the middle for

most of its length and at the apical end projects caudad between the apical flaps of the aedeagus as a broad, somewhat pointed process. (See drawing 9, plate LIV.)

Notes on distribution. The species was described from numerous examples from lower California. Holotype male taken at Los Angeles Bay and allotype female at Monserrate Island. Types are in the California Academy of Science Collection at San Francisco. Dr. E. D. Ball has since taken this species from a gray shrubby Verbena (*Lippia wrightii*) in Sabino canyon, near Tucson, Ariz.

THE GENUS HYSTEROPTERUM Amyot and Serville

Amyot and Serville. *Hemip.* p. 519, 1843.

Fowler, W. W. Fulgoridae. *Biologia Centrali Americana.* Homoptera I, pp. 113-119, 1904.

Distant, W. L. Fauna of British India, Family Fulgoridae. *Rhynchota* III, p. 333, 1906.

Melichar, Leopold. Monograph der Issiden (Homoptera). *Abh. k. k. Zool. Bot. Ges. Wien.* III, pt. 4, 1906.

Metcalf, Z. P. The Fulgoridae of Eastern North America. *Jour. of the Elisha Mitchell Society* XXXVIII, 1923.

Dozier, Herbert L. Fulgoridae. *Miss. Agric. Exp. Sta. Bull.* 14, 1928.

Comparative notes. The distinguishing characteristics of this genus are: Tegmina short, either subequal in length and width or not twice as long as wide, deflected in an oblique or vertical position to the body, not convex, narrowed and rounded at apex; costal margin narrow, bent at an angle to rest of wing and lying horizontally against venter; hind wings small and rudimentary; head not properly produced in front of eyes; frons centrally and laterally carinate; hind tibia either with one or two stout lateral spines; male genitalia bilaterally symmetrical.

The general features of the venation are: vein Sc_1 close to costal margin and from a dorsal view appearing to be the ventral margin of the tegmen; veins R and Sc_2 united a very short distance at base, each single vein parallel throughout rest of wing; vein M divided into two branches near middle of wing; vein Cu_1 simple; vein Cu_2 following the anal suture; veins 1st A and 2d A united near apex to form the characteristic Y-vein of the clavus. All the longitudinal veins break up into a close reticulation at apex of wing.

KEY TO SPECIES

1. Larger insects, measuring 6 to 7 mm. long; dark brown or blackish in coloring; reticulate elytra.....*morum* Van Duzee, p. 482
- smaller insects, measuring under 5 mm. in length; varying from speckled dark brown to light cream in coloring..... 2
2. (1) In lateral view dorsal line of tegmen straight; usually uniformly colored, marked with numerous dark spots in the cells of the tegmina (occasionally two-toned) 3

- Somewhat concave through middle; either contrastingly colored in fuscous and light or cream, spotted with dark in varying degrees..... 5
3. (2) In dorsal view frons protruding almost equal to length of vertex, lateral carinae against eyes scarcely elevated; disk of vertex less concave; anterior margin of pronotum rounded; lateral edge of tegmen cream colored *aurorum* Uhler, p. 483
- In dorsal view frons protruding not as much as half length of vertex, lateral carinae against eyes distinctly elevated; disk of vertex concave, anterior margin of pronotum angulate; tegmen without a cream band..... 4
4. (3) Vertex with lateral margins greatly elevated; its width only twice as great as length; hind tibia with one lateral spine..... *fuscumaculosum* n. sp., p. 485
- Vertex over twice as wide as long; lateral margins moderately elevated; hind tibiae with two lateral spines..... *punctiferum* Walker, p. 487
5. (2) Tegmen slender, almost twice as long as broad; strongly marked in contrasting light and dark patches; back concave, but no pyramidiform elevations of the tegmina..... *anum* Ball, p. 489
- Tegmen short and broad; more uniformly colored, varying from cream with few black spots to dark brown or gray with many dark spots; some form of pyramidiform elevations on clavus..... 6
6. (5) Slightly larger insects measuring 3.5 to 4 mm. in length; frons with a single median longitudinal disk narrower than either lateral disk; pronotum longer and with margins against eye elevated..... *bufo* Van Duzee, p. 491
- Slightly smaller insects, measuring 3 to 4 mm. in length; frons with a single median disk wider than a lateral disk; pronotum shorter and lateral margins not elevated against eye..... 7
7. (6) Vertex with anterior margin concave through middle, making its length at this point only one half the length of the lateral margin; angle of vertex and frons above eye sharp; and from above this angle in position anterior to front line of eye; claval elevations prominent..... *sepulchralis* Ball, p. 492
- Vertex with anterior margins broadly, sinuately convex, length at median line not much shorter than at lateral margin; angle of vertex and frons rounding; and from above this angle in position posterior to front line of eye; claval elevations, especially at apex, scarcely visible or lacking..... 8
8. (7) Pale creamy in color; elevations on clavus scarcely noticeable; size smaller, 3 mm. *cornutum* var. *cornutum* Melichar, p. 493
- Much darker, nearer like *sepulchralis* in color; claval elevations slightly longer and more distinct; size 3 to 3.5 mm. *cornutum* var. *utahnum* Ball, p. 495

Hysteropterum morum Van Duzee

Van Duzee, E. P. Expedition Cal. Acad. of Sci. to Gulf of California. Proc. Cal. Acad. of Science 12; p. 191, 1923.

Comparative notes. The author has not seen this species. Apparently it is a rare species for this country. Van Duzee described it from one female taken at the bay at the southern end of Tiburon Island, in the Gulf of California, and from one male taken on the Rinco mountains, in Arizona.

Van Duzee himself distinguishes it by saying that it is a large blackish species with much the aspect of *Picumna ovatipennis* Walker, but that it is distinct structurally. He gives the size as being from 6 to 7 mm. in length. In his description he also points out that it resembles *Hysteropterum fowleri* Fowler, a Mexican species, but is darker than that species with a more convex clypeus.

Mr. Paul Oman, in a note to the author, states that *H. morum* is close to *Thionia naso* Fowler, but has reticulate elytra and a shorter vertex than that species has.

Location of types. Female is No. 1805, Mus. Cal. Acad. Sci. Male is in collection of E. P. Van Duzee.

Hysteropterum auroreum (Uhler), 1876

(Plates LVII, LVIII, LIX)

Uhler, P. R. List of the Hemip. of the Region West of the Mississippi River, Including Those Collected During the Hayden Exploration of 1873. Bull. U. S. Geol. Geog. Surv. 1, p. 352, 1876.

Comparative notes. Superficially this species closely resembles *H. punctiferum*, both in color and size. The ground color in this species is a brighter yellow and the markings of dark on the tegmina, especially on the clavus, are more in the nature of blotches than dots as in *punctiferum*. The size of both species is 5 mm. Structurally *auroreum* differs from *punctiferum* by the following characteristics: in the former the frons, as viewed from above, shows beyond the vertex for almost half the length of the vertex, while in the latter it is scarcely visible; in *auroreum* only the median carina of the frons is conspicuous and the rest of the disk is smooth and even slightly convex, while in *punctiferum* three carinae are distinctly visible and the disks between are concave; in *auroreum* the basal margin of the frons is almost straight and the apical one deeply emarginate to receive the large clypeus, but in *punctiferum* the basal margin is convex, and the apical margin much less indented.

Male genitalia. The genitalia of this species very easily distinguish it from any allied species. The anal flap (10th abdominal segment) usually reaches only to the tips of the styli, so that from a ventral view it is not visible beyond them. From a flattened dorsal view the 10th segment appears much narrower through the basal, flattened tubular part; thence the expanded ventral margin broadens fanlike into a fanlike flap which extends caudad a distance which equals the length of the basal tube, after which its margins abruptly constrict to a rounded, narrower apex. The eleventh segment shows only as a narrow rim beyond the dorsal margin of the anal tube and bears an abbreviated stylus.

The harpagones (genital styli) are visible externally as sharply pointed triangular plates. From this external ventral view each harpago is twice as long as its width at base. From a flattened

lateral view each harpago is roughly pear-shaped. Its narrowed anterior end is the point at which it is attached to the body. Through the apical region it is broadened to over twice its width at base. The posterior dorsal angle is prolonged cephalad into a sharply pointed, slightly recurved hook. At the base of the expanded dorsal corner is a short, broad, triangular, external hook whose apex bends caudad.

The theca in this species closely ensheathes the aedeagus as a tubular sheath for about two thirds its length. At this point it splits on each side; the dorsal half then extends caudad to the full length of the aedeagus and becomes bulged out at the apical end into a bulbous flap, one on each side, lying above the aedeagus; the ventral part of the split theca extends below the aedeagus as a bluntly tapering single flap which ends in a point some distance anterior to the apex of the aedeagus. The aedeagus shows only between the split ends of the theca as a thickly tubular structure which bears at its extreme apex on each side a well-sclerotized triangular hook, only part of which is visible externally, and two conspicuous, long, well-sclerotized processes which emerge, one on each side, from the notches in the theca and extend anteriorly to the base of the aedeagal structure.

Female genitalia. In this species, as in others in the genus, the external female genitalia are of some taxonomic importance. The anal flap (10th abdominal segment) is large. It extends well beyond the tips of the ovipositor valves and in many cases folds ventrad around the valves, completely hiding their tips. From a flattened dorsal view it appears as a broad wedge-shaped flap with its lateral margins strongly, outwardly curved and with the tubular basal region about half as wide as the expanded apical flap. The eleventh segment is represented as a minute ringlike structure, only barely visible beyond the dorsal margins of the tube. It bears a small, pointed stylus.

The eighth abdominal segment is hidden under the seventh. The ninth segment is conspicuous. The seventh segment has its posterior margins concavely rounding and its anterior margin angulately produced cephalad.

Notes on distribution. In the original description Uhler states that this species inhabits Texas. The specimens available for study were all from Texas.

Location of types. In the United States National Museum at Washington, D. C.

Hysteropterum fuscomaculosum n. sp.

(Plates LVII, LVIII, LIX)

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of tegmen, 2.8 mm. to 4.3 mm., averaging around 3 mm. Length of tegmen, 2.4 mm. to 3.6 mm. Width of tegmen, 1.4 mm. to 2 mm.

Color. Same general color as *punctiferum* Walker. Body color amber yellow. Vertex with lateral and anterior margins etched in dark brown, a faint median dark-brown line, a dark spot in each lateral half against the anterior border. Eyes mottled brown. Disks of frons between carinae uniformly dark brown or somewhat mottled, lateral disks lighter, mottled with dark spots; carinae and part of lateral margins light. Clypeus brownish through middle, crossed with darker oblique bands, median carina and anterolateral corners light. Pronotum yellow, median light stripe, rest dotted with brown spots. Mesonotum with borders and apex light, rest fuscous-brown. Tegmina uniformly amber-yellow, conspicuously dotted with small round brown spots in the cells, the veins light. Prothorax and mesothorax tannish to brownish with margins always light. Metathorax yellow or green. Legs amber or light yellow, coxae and tibiae with longitudinal brown stripes or markings, femora crossed by two to three transverse brown bands. Abdominal segments green or yellow, with usually a median brown spot against anterior margin and two transverse rows of uniformly round dots across disks of each segment, or else a cluster of round spots through middle.

Structural characteristics. Shape of *punctiferum* Walker, but with head and thorax proportionally narrower in comparison with greatest width across the combined tegmina. Vertex somewhat wedge-shaped with greatest width across its anterior margin, its width at this point exactly twice greater than the length at lateral margins, its posterior margin elevated. Frons narrowed at base, its basal margin moderately convex, a distinct median carina present and two slightly arching lateral carinae, each median disk twice as wide at basal end as either lateral one, but about equal in size with each lateral one at extreme apical end, apical margin deeply emarginate to receive clypeus. Clypeus moderately inflated with a distinct median carina present.

Pronotum in length at middle subequal to a lateral margin of vertex, greatly reduced in length behind eyes. Mesonotum slightly longer through middle than the pronotum, a transverse crease par-

allel with and close to anterior margin, a diverging oblique carina on each lateral disk. Tegmina not quite twice as long as its greatest width, which is at a point halfway of complete length of the insect, slightly more inflated at this point than in *aciculatum*; anal margin straight, posterior margin obliquely sloping from apex of clavus, costal cell and part of Sc_1 inflexed against venter. Wing venation characteristic of the genus, the longitudinal veins thick, little reticulation at apex.

Male genitalia. Genital segment (10th abdominal) short and not visible from a ventral view. It is a flattened, tubelike segment at base and has its ventral posterior margin extended into a bluntly tapered flap, which is about one third longer than the basal part. The eleventh segment shows beyond the dorsal posterior margin of the tube as a small, ringlike segment, which bears an inconspicuous, short, fingerlike stylus.

The harpagones (genital styli) are visible externally as sharply pointed, triangular plates which meet along their inner margins. From a flattened lateral view each harpago is roughly pear-shaped, very much narrowed at its anterior end, where it is attached to the body. The posterior margin is greatly widened and has its dorsal corner elongated dorsad into a slender anteriorly recurved hook. At the base of this dorsal extension is a narrow, liplike, external hook, whose free margin is directed ventrad.

The internal genitalia are bilaterally symmetrical. The theca extends for a short distance from base as a tubular sheath for the aedeagus, then on each side it splits longitudinally. The dorsal part continues caudad as a flap, which through the middle third extends downward on either side as a phlange in front of the aedeagal hook, but apically splits at the middorsal line, thus terminating on each side in two lobes, the dorsal one of the two being a long slender spatulate process which reaches to the apex of the aedeagus, the ventral one a short, bluntly pointed hook. The ventral part of the theca extends caudad as a single broad, slightly tapering plate which very nearly extends to the apex of the aedeagus. From a lateral view the apex of the aedeagus shows between the dorsal and ventral lobes of the theca and a slight portion of it shows dorsad of the theca. It shows also a well-sclerotized basal hook which emerges from the notch in the theca and is sinuately curved cephalad.

Female genitalia. Externally the genital plates and ovipositor valves are of taxonomic importance. Very little of the valves show externally, being partly covered by the seventh abdominal segment,

which is triangularly produced through the middle. The seventh segment in this species differs considerably in shape from that of *aciculatum* (see drawings). The genital segment (10th abdominal) is elongate and extends a considerable distance beyond the apices of the valves. The tubular basal part is short, but the extended ventral flap is much longer than in other species and has its lateral and apical margins deeply reflexed, so that through the apical region the flap is half of the basal width. The eleventh segment shows beyond the dorsal posterior rim of anal segment as a narrow, ringlike segment which bears a short stylus.

The eighth and ninth abdominal segments are invisible. The posterior margin of the seventh is triangularly produced caudad, so that the segment is much longer through the middle than at the sides.

Comparative notes. This species more closely resembles *H. punctiferum* than any other species in the genus. For comparison of these two species see the notes under this heading in the discussion of *H. punctiferum* Walker.

Location of types. Holotype male, allotype female, collected August 2, 1930, at Likely, Fla., by R. H. Beamer. Twenty-nine paratypes from Likely, Fla., July, 1934, and August, 1930, collected by R. H. Beamer, and eleven paratypes from Fort Pierce, Fla., August 30, two from Lighthouse, Fla., August 2, 1930, and one from Estero, Fla., July 21, 1934, by the same collector. These types are in the Francis Huntington Snow Entomological Collection at the University of Kansas.

Hysteropterum punctiferum Walker, 1851

(Plates LVII, LVIII, LIX)

Walker, Francis. List Homop. II, p. 376, 1851.

Uhler, P. R. List of the Hemiptera of the Region West of the Mississippi River, Including Those Collected During the Hayden Exploration of 1873. Bull. U. S. Geol. Geog. Surv. I, p. 353, 1876. Described as *H. aciculatum* n. sp.

Melichar, Leopold. Monograph der Issiden (Homoptera) Abh. k. k. Zool.-Bot. Ges. Wien, III, pt. 4, 1906.

Comparative notes. Walker's description of this species is not very clear. Uhler, on the other hand, gives a very comprehensive and easily followed description. The writer was in some doubt as to whether they were synonymous. Mr. China of the British Museum, however, made an accurate comparison of some recently collected specimens and found them to be identical with the type specimen of Walker's *punctiferum* collected at St. John's Bluff, Fla.

H. punctiferum Walk. is distinguished as follows: short, robust, minutely punctate with fuscous; its length, 5 mm. It resembles

H. auroreum Uhler somewhat, but differs by having the frons showing only a very little beyond the vertex as viewed from above; by the frons being distinctly tricarinate and with its basal margin convex and the apical margin shallowly indented to receive the clypeus. This species is more closely allied to *H. fuscomaculosum* than any other. They both have the same amber color, minutely punctate on tegmina with brown flecks. They differ structurally, however, in the shape of the vertex, size, spines on the tibiae and in the genitalia. In *punctiferum* the vertex is well over twice as wide as its length through middle and its lateral margins are not elevated, while in *fuscomaculosum* its width is only twice its length and the margins are elevated against the eyes. The length of *punctiferum* is 4 to 5 mm.; for *fuscomaculosum* 3 mm. The head and thorax of *punctiferum* are proportionately wider than in *fuscomaculosum*. *Punctiferum* has a bispinose hind tibia and the other is unispinose. The females of the two species show differences in the shape of the apical abdominal segments. In *fuscomaculosum* the seventh abdominal segment is triangularly produced through middle and the ovipositor valves are partially hidden. In *punctiferum* the seventh abdominal segment is broadly produced through middle and parts of the ninth abdominal segment, as well as the valves, are exposed. The anal flap (10th abdominal segment) is much narrower at the apex, due to the deeply reflexed apical and lateral margins.

Male genitalia. The tenth abdominal segment (anal flap) is more visible externally than in *H. unum*, but as in that species it is not as conspicuous as in the female. It is a flattened tube at base, whose ventral, apical margin is expanded into a large flattened flap. The lateral margins of the flap are bulged out through the middle, then are abruptly constricted to form a narrowly rounded apex. The eleventh segment shows beyond the dorsal edge of the anal tube as a narrow rim and bears a short, pointed stylus.

The harpagones (genital styli) are visible externally as sharply pointed triangular plates. From this external ventral view each harpago is about twice as long as broad. From a flattened lateral view each one is roughly pear-shaped, narrowed at its anterior end where it is attached to the body, very much broadened across its posterior margin, where the dorsal posterior angle is projected dorsad as a slenderly recurved hook. At the base of this dorsal extension is a narrow, liplike, external flap, whose free margin is directed ventrad.

The theca and aedeagus of this species are difficult to separate, since the theca fits snugly around the aedeagus as a tubular sheath

with flaplike extensions. The entire structure is bilaterally symmetrical. From a side view most of the aedeagus is hidden. The theca extends for a short distance from base as a tubular sheath for the aedeagus, then on each side it splits longitudinally. The dorsal part continues caudad as a flap, which through the middle extends downward on either side as a phlange in front of the aedeagal hook, while the extreme apical third is greatly narrowed, and splits longitudinally on the dorsal side to form two elongate, spatulate flaps, whose dorsal margins are serrate. Ventrally the theca extends caudad as a single broad, slightly tapering plate which does not completely reach the apex of the aedeagus. The aedeagus shows slightly at the apex as a truncate lobe between the dorsal and ventral flaps of the theca. It also shows a semicircular, well-sclerotized hook which emerges from the notch in the theca near its base, bends directly cephalad a short distance and then curves caudad and ventrad, forming a semicircle.

Female genitalia. The anal flap of the female is more conspicuous than that of the male. It extends beyond the tip of the ovipositor valves to a greater degree than in *H. unum*. (See plate LIX, drawing 16.) From a flattened dorsal view it is broader at base, where it is a flattened tube. Beyond this tubular base the ventral margin is expanded into a roundly tapering spatulate flap bearing numerous long, stiff hairs. The eleventh segment is inconspicuous and ringlike, showing only to a slight extent beyond the dorsal edge of the anal tube proper. It bears a very short, buttonlike stylus.

The seventh abdominal segment is longer than in most species. It has a sinuate posterior margin which is convex through middle. The lateral parts of the ninth segment are visible; the eighth is hidden under the seventh.

Notes on distribution. Type locality is St. John's Bluff, E. Florida. Uhler states that it inhabits Orange Spring, Fla., and Texas. In addition to many Florida specimens the writer had available for study specimens from Okefenokee Swamp, Georgia.

Location of type. British Museum of Natural History.

Hysteropterum unum Ball

(Plates LVII, LVIII, LIX)

Ball, E. D. New Genera and Species of Issidae (Fulgoroidea). Proc. Biol. Soc. Wash. XXIII, p. 43, 1910.

Comparative notes. This species is a strikingly marked species. The vertex is light with a pair of brown V-shaped marks in the posterior angles. The front is dark except for the lighter carinae,

margins and a few irregular spots. The elytra show contrasting light and dark patches somewhat as follows: at base the clavus is either entirely dark or bears an irregular brown capital L, posterior of which the entire apex is creamy white, forming, when combined with other tegmen, a conspicuous diamond-shaped marking in the middle of the combined tegmina; an oblique, arcuated dark-brown band takes up most of the corium; many of the lighter cells with dark specks in them.

Structurally the species is characterized by the vertex, which is not produced beyond eyes, but is two and one-half times wider than long; the frons is tricarinate and has its basic margin deeply convex; the clypeus is not deeply dovetailed into the frons and bears a strong median carina; back concave through middle; elytra longer than in most species, being not quite twice as long as broad.

Male genitalia. The anal flap (10th abdominal segment) is much less conspicuous than that of the female. At base the tube is somewhat constricted, then enlarges through middle, from whence it again narrows to a truncate rounded apex. The eleventh abdominal segment is ringlike, showing only slightly beyond the dorsal posterior edge of the tenth segment, and bears a short, pointed apical stylus.

The harpagones (genital styli) are visible externally as broad, triangular lobes that meet at middle in a straight line. From this ventral view each harpago is about one third longer than its width at base. From a flattened lateral view (see plate LIX, drawing 13) each harpago is a somewhat pear-shaped plate, which is attached at its anterior end only where it is narrowed considerably. It is very much broadened across its apex and has its dorsal, apical corner prolonged cephalad into a slightly cephalad-curving spatulate lobe, at the base of which is an external, raised, liplike flap.

The aedeagal structure is unique for the genus. It is bilaterally symmetrical. The theca forms a close-fitting tubular sheath extending practically the entire length of the aedeagus. On each side the apical half of the theca bears a longitudinal slit, from which arise the aedeagal hooks. The anterior aedeagal hook arises from the base of the slit and extends anteriorly as a forked process, the dorsal arm of which is shorter than the ventral one. The posterior hook of the aedeagus arises from the extreme apex of the aedeagus as a broad spatulate flap which extends dorsad and somewhat anteriorly. (See plate LVIII, drawing 13.)

Female genitalia. The anal flap of the female is large and very conspicuous. It is held vertical to the body so that it very nearly

meets the ovipositor valves on the ventral side of the body. From a flattened dorsal view it shows its lateral margins evenly rounding to a broad, rounded apex. The eleventh abdominal segment is not visible as a rule externally. The stylus of this last segment is long and slender.

The seventh abdominal segment is the last visible abdominal segment. It is characterized by having a sinuate posterior margin which is slightly concave through middle.

Notes on distribution. This species was described by Dr. E. D. Ball from a single male taken near Pueblo, Colo. Specimens were available for study from Socorro county, Carlsbad, Alamogordo, and Rodeo, New Mexico, and from Marfa and Brewster county, Texas.

Location of types. Collection of Dr. E. D. Ball, Tucson, Ariz.

Hysteropterum bufo Van Duzee, 1923

(Plates LVII, LVIII)

Van Duzee, E. P. Expedition to the Gulf of California. Proc. Cal. Acad. of Science 12: p. 92, 1923.

Ball, E. D. Some New Issidae, With Notes on Others. Bull. Brook. Ent. Soc. XXX (2): 37, 1935.

Comparative notes. This species measures 3.5 to 4 mm. in length. The following color description is given in the original description: "Color, most variable, grayish testaceous and fuscous, sometimes nearly black or varied with green on head and pronotum, usually with a paler area at apex of front; elytra pale or brown with fuscous veins and dots in the areoles." Structurally, according to Doctor Van Duzee, it is allied to *cornutum*, but is distinguished by its narrower front and longer pronotum. The writer finds that it is readily separated from both *cornutum* and *sepulchralis*, which it closely resembles, by the following characteristics: it is larger than either of these species, being usually around 4 mm. long; the angle formed by the union of the vertex and frons is more acute and prominent; the pronotum is longer and has its margins against the eye elevated; the elevations on the clavus are more conspicuous; and the longitudinal carinae on the frons are closer to the median one so that on each side the median disk is distinctly narrower than the lateral one.

Genitalia. No male specimens were available for study.

The anal segment of the female very closely resembles that of *H. sepulchralis*. The seventh abdominal segment is of the same shape as *cornutum* and *sepulchralis*.

Notes on distribution. The type specimens were collected in the

Gulf of Mexico region on *Lycium*. Dr. E. D. Ball (1935) gives the first North American record for this species. He took a single female at High Tanks (Tinajas Altas) in Arizona, near the Mexican border. Doctor Ball sent the writer a female to study from Kino Bay, Mexico.

Location of type. Holotype male and allotype female in the Museum California Academy of Science.

Hysteropterum sepulchralis Ball, 1935

(Plates LVII, LVIII, LIX)

Ball, E. D. Some New Issidae With Notes on Others. Bull. Brook. Ent. Soc. XXX (2) p. 37, 1935.

Comparative notes. This species resembles two species rather closely, namely, *H. bufo* Van Duzee and *H. cornutum* var *utahnum* Ball. From *bufo* Doctor Ball points out that it can be distinguished as follows: "Smaller, darker, with less elevated lateral carinae of vertex and the median tablet of the front broader. Dark brown or gray. Length, 3-4 mm." The pronotum of *bufo* is also much longer.

To distinguish this species from the species *cornutum* see the discussion under this heading in the description of that species.

Male genitalia. The anal segment (10th abdominal segment) is similar to that of *cornutum*, although in some specimens it is a trifle shorter and does not reach to the tip of the genital styli. From a flattened dorsal view the anal segment is an elongate lobe, the basal half of which comprises a flat tube, while the apical half is an extension from the ventral margin of this tube in the form of a roundly pointed flap. The eleventh segment is an inconspicuous ring-like segment which shows only slightly beyond the dorsal posterior margin of the tube and bears a short, slender fingerlike stylus.

The harpagones (genital styli of authors) are visible externally from the ventral view as two triangular plates which meet along the middle. From a flattened lateral view each harpago is roughly pear-shaped. The narrowed anterior end is the point at which it is attached to the body. Across its apex it is broadened to many times its width at base. Its dorsal posterior angle is prolonged cephalad into a curved, handlelike process. At the base of this expanded dorsal corner is located a broad, bluntly rounded external hook whose apex is directed caudad.

The internal genital structure is of the same general pattern as that of *cornutum*, but differs in certain details which can best be seen by comparing the figures on plate LVIII. The paired dorsal

apical lobes of the theca are longer than the aedeagus in *scpulchralis* and their apices are directed caudad instead of dorsad as in *cornutum*. The single ventral apical plate of the theca extends almost to the apex of the aedeagus in this species and the theca does not split at the sides until it reaches a point midway of its length. The well-sclerotized lateral hooks of the aedeagus in this species emerge from the notch in the theca and are somewhat S-shaped as in *cornutum*. However, the shape of the S is different in the two forms; in *scpulchralis* the base of the hook is slender, not deeply bent, thus making the apical loop of the figure the largest, while in *cornutum* the base of the S is the largest part of the figure, due to its broad curvature at this point.

Female genitalia. The anal segment (10th abdominal segment) is a long slender flaplike structure which lies in a vertical plane to the body, so that its apex touches the venter of the eighth abdominal segment and thus almost completely hides the valves of the ovipositor. This segment is longer in this species than in *cornutum*. It is slightly broader through the tubular basal end than across the flaplike apical region. The apex of the flap is roundly pointed and bears long stout hairs.

The seventh segment has a straight posterior margin as in *cornutum*.

Notes on distribution. The type specimens were collected by Dr. E. D. Ball at Bisbee, Ariz. Paratypes were also taken at Naco and Tombstone, Ariz. All of the type material, according to Doctor Ball, were collected on *Flourensia cernua* (tar-bush).

The writer had available for study a long series from the Mustang mountains in Arizona, one specimen from the Huachuca mountains, Arizona, and a few from each of the following places in New Mexico: Organ, Rodeo, and Santa Fé.

Hysteropterum cornutum var. *cornutum* Melichar, 1906

(Plates LVII, LVIII, LIX)

Melichar, Leopold. Monograph der Issiden (Homoptera). Abb. k. k. Zoöl.-Bot. Ges. Wien. 111, pt. 4, 1906.

Comparative notes. Typical specimens of *H. cornutum* are rather easily recognized because of its small size, since its length from apex of head to the tip of tegmina is 3 mm.; and by its pale, uniform creamy-yellow color of body and wings with very few dark spots or markings. Certain specimens, however, may have brown dots in the cells of the tegmina and when they do show this color variation then they approach rather closely the var. *utahnum* Ball.

Structurally *cornutum* is allied to *H. sepulchralis* Ball and *H. bufo* Van Duzee. It is separated from *bufo* by its smaller size, its pale color, by having the single median longitudinal disk of the frons wider or as wide as either lateral disk, the lateral margins of pronotum not elevated against eye and the body not concave across back as in that species.

It is distinguished less easily from *sepulchralis*. The following structural differences can be noted: in *sepulchralis* the anterior margin of the vertex is concave through the middle, so that the length of the vertex at middle is one half the length of the lateral margin, while in *cornutum* this margin sinuately curves cephalad, so that the length of the vertex at middle is not much less than at the sides; the angle above the eye formed by the union of the vertex and frons is acute and prominent in *sepulchralis*, but is rounding and inconspicuous in *cornutum*; and lastly the claval elevations are more prominent in *sepulchralis* than in *cornutum*, where they are usually scarcely noticeable or even lacking entirely.

Male genitalia. The tenth abdominal segment (anal flap) reaches to the tips of the genital styli and in some cases slightly beyond, so that the tip of it is visible beyond the apices of the styli from a ventral view. From the flattened dorsal view the anal segment is an elongate lobe, the basal half of which comprises a flat tube, while the apical half is an extension from the ventral margin of this tube in the form of a roundly pointed flap. A small, ringlike segment, extending beyond the dorsal margin of the tube, represents the eleventh segment. This segment bears a slender, pointed stylus.

The harpagones (genital styli of authors) are visible externally from the ventral view as two triangular plates which meet along the middle. From this view each harpago appears to be about one-third longer than its width at base. From a flattened lateral view each harpago is roughly pear-shaped. Its narrowed anterior end is the point at which it is attached to the body. Through the apical region it is broadened to over twice its width at base. The posterior dorsal angle is prolonged cephalad into a blunt spatulate lobe. At the base of this expanded dorsal corner is a broad, liplike external hook.

The internal genital structure is a bilaterally symmetrical tubular organ composed of a sclerotized aedeagus surrounded almost completely by the theca. The theca surrounds the aedeagus at base as a tubular sheath for about one third its length, then on each side it splits longitudinally. The dorsal apical two thirds is again

divided so that on each side it extends above the aedeagus as a long slender lobe that reaches to the tip of the aedeagus and terminates in a blunt recurved hook. The ventral part of the split theca extends along the lateral and ventral sides of the aedeagus as a bluntly tapering single flap, which does not quite reach to the apex of the aedeagus. From the notch at the point where the theca splits, a well-sclerotized aedeagal hook emerges, and extends anteriorly and ventrad in the form of a figure S and finally tapers to a finely pointed apex.

Female genitalia. In this species the anal segment is proportionally very long and the valves of the ovipositor appear shorter, so that the result is that the latter are usually almost hidden from a ventral view by the overlapping anal flap (10th abdominal segment). From a flattened dorsal view the flap is parallel-sided and terminates in an evenly rounded apex. The eleventh segment is visible only as a small ringlike segment, only slightly showing beyond the dorsal, posterior margin of the tenth segment. It bears an inconspicuous short pointed stylus.

The eighth and ninth segments are invisible. The seventh segment has an almost straight posterior border.

Notes on distribution. The type specimens were collected at Los Angeles, Cal., in July, by Coquilett. Specimens were at hand for study from the following localities: Lamar, Colo.; Carson City, Nev.; Emery county, Utah; St. George, Utah, all collected by David Fox on *Artemisia tridentata*; Hollister, Idaho, by David Fox on *Artemisia* sp.; and Cajon Pass, California.

Van Duzee (1908) stated that this species was taken by him in abundance in Colorado and Utah.

Hysteropterum cornutum var. *utahnum* Ball, 1935

Ball, E. D. Some New Issidae with Notes on Others. Bull. Brook. Ent. Soc. XXX: 38, 1935.

Comparative notes. This variety is much darker than the typical form; in this respect it resembles more nearly *H. bufo* or *H. sepulchralis*. Doctor Ball describes the color as follows: "Color gray with dark dots and spots throughout, especially marked on the nervures and sometimes forming a double row of dots across the antepical cells as in *sepulchralis*."

Notes on distribution and host plants. Doctor Ball collected the type series near the Grand Canyon in August, on *Artemisia cana* Pursh (black sage). The writer had available for study a large

series of several hundred specimens from the Grand Canyon, Santa Rita mountains, Flagstaff, Hereford, Coconino county, Yavapai county, and Oak Creek canyon, in Arizona; from Las Cruces, Blue Springs, and Datil, in New Mexico; from Dolores and Durango, in Colorado; and from Emery and Cove Fort, Utah.

THE GENUS *Dictyonia* Uhler, 1889

Uhler, P. R. New Genera and Species of American Homoptera. Trans. of Md. Acad. of Science, p. 40, 1880.

Comparative notes. This genus resembles *Dictyssa* closely. Yet it differs from that genus by having the tegmina practically as wide as long, exceptionally few and large cells in the wing, the head deeply sunken so that the eyes almost touch the base of the tegmina, and the terga of the abdominal segments so compressed that a conspicuous, elevated and somewhat swollen ridge is formed down the middle of the abdomen.

Like the genus *Dictyssa* it has bispinose hind tibiae and small or rudimentary hind wings.

The genus also superficially resembles the genus *Neaethus* Stal, but it differs from the latter in the reduced number of the cells and their exaggerated proportions on the central area of the tegmina.

Dictyonia obscura Uhler, 1889

(Plates LXVI, LXVII)

Uhler, P. R. New Genera and Species of American Homoptera. Trans. of the Maryland Acad. of Science, p. 40, 1889.

Comparative notes. This genus is monotypic and therefore the distinctive characteristics listed above for the genus are also used in identifying the single species *obscura*. Specifically *Dictyonia obscura* resembles *Dictyssa acerolata* Melichar and *Dictyssa quadravitrea* n. sp. more than other species in the subfamily. Frequently in collections it has been determined as the former. In addition to the generic differences it is easily distinguished from *D. acerolata* by the angular shape and large size of the cells of the tegmina, the widely expanded costal margin and the presence of the broad, cream-colored band down the middle of the frons. It is distinguished externally from *D. quadravitrea* by the extreme broadness of its tegmina, the wide expanded costal margin and again by the cream-colored band on the frons.

Wing venation. In general the wing venation is of the same pattern as that of the genus *Dictyssa*. Vein Sc_1 extends along the costal margin as a distinct vein for two thirds the length of the tegmen.

Veins Sc_2 and R are united for a short distance after leaving the central trunk, then R extends as a single straight vein and Sc_2 as an angled vein toward the apex. Vein M divides near apex into two short branches. Vein Cu_1 runs so close to claval suture that an unusually large hyaline cell occurs between it and vein M; Cu_1 branches into two branches which are not widely separated from the claval suture. Vein Cu_2 extends along the claval suture (Muir). Veins 1st A and 2d A are united at apex to form the Y-vein of the clavus.

Male genitalia. The tenth abdominal segment (anal flap) is an elongate flattened tube with its greatest width at middle, where it is about one half its length, from whence it tapers to a truncate, or sometimes slightly emarginate, apex. The eleventh segment is much reduced, scarcely visible in the anal tube, except for the presence of its elongate stylus, which shows as a slender projection beyond the dorsal margin of the anal flap.

The harpagones (genital styli) are visible externally from the ventral aspect as two adjoining, tapering plates. From a flattened, lateral view (see plate LXVII, drawing 8) each harpago appears as a subquadrangular plate with its dorsal posterior corner projected dorsad as a sharply pointed extension, at the base of which externally is located a flat, recurved hooklike structure.

Like many other genera the aedeagus is asymmetrical. On the left side it appears as a slender, tubular, somewhat pointed structure which is less sclerotized at tip than at base. Attached near its base and extending beyond the theca to a point not quite midway of aedeagus are two parallel, equal-sized heavily sclerotized processes. On the right side the aedeagus bears no sclerotized processes. The tubular membranous theca surrounds the basal third of aedeagus. On the ventral side it is truncate posteriorly, thus allowing the aedeagal hooks to show beyond it. On the dorsal side it extends caudad as a finely tapering projection, whose tip reaches to a point just beyond middle of aedeagus and somewhat caudad to the tips of the aedeagal hooks.

Female genitalia. The anal flap (10th abdominal segment) of the female is similar to that of the male. The external valves of the ovipositor have their greatest width through the middle, at which point they are approximately half as long as wide.

Location of types. Uhler type is lost, according to Mr. Paul Oman, of the National Museum, Washington, D. C.

Notes on distribution. Uhler states that this species had been col-

lected only from central California and around San Francisco. Apparently he described the species from two specimens, or at least only a few. Doctor Ball has sent the writer specimens from Yosemite and Vesalia, Cal. In the Snow Entomological collection at the University of Kansas is a large series collected from Giant Forest, Cal., in June, 1929, and Three Rivers, Cal., in June, 1932, by Dr. R. H. Beamer, and one specimen from Republic, Wash., by John Nottingham, in August, 1931. In the National Museum Collection is a large series, collected by Paul Oman at Three Rivers, Cal., in June, 1935, and a smaller series from Mariposa, Cal.

THE GENUS *DICTYONISSUS* Uhler, 1876

Uhler, P. R. List of Hemiptera of the Region West of the Mississippi River, Including Those Collected During the Hayden Explorations of 1873. Bull. U. S. Geol. Surv. 1, p. 354, 1876.

Comparative notes. The main distinguishing characteristics of the genus are: the collarlike pronotum, which in front is acutely, triangularly narrowed and carried forward almost to the front line of the eyes and is deeply emarginated behind; the long mesonotum, which through middle is as long as combined vertex and pronotum; long, narrow tegmina with costal area not expanded, the veins thick and conspicuous, making a network of large, round areoles, so that the course of the main longitudinal veins cannot be traced; and the conspicuous, erect hairs on body and tegmina. Tibiae of hind legs with 3 spines. Hind wings reduced to mere scales.

KEY TO THE SPECIES

- 1a. Tegmina and body sparsely covered with pitch black, long, stiff hairs; anterior margin of vertex distinctly angulate at middle.....*D. nigropilosus* n. sp., p. 499
- 1b. Tegmina and body sparsely covered with light hairs; anterior margin of vertex evenly rounding*D. griphus* Uhler, p. 493

Dictyonissus griphus Uhler, 1876

(Plates LXVI, LXVII)

Comparative notes. For comparison with *D. nigropilosus*, which it closely resembles, see the notes under this heading in the description of that species.

Either species of *Dictyonissus* might possibly be confused with *Misodema reticulata*, especially if one has never seen the latter, since both genera are described as having coarse veins making a network in the tegmen, and the same type of vertex. The two genera are easily separated, however, by the following characteristics: *Dictyonissus* has a pale green body, pale green tegmina with hyaline

areoles and long, erect hairs on the veins of the tegmina and the body; *Misodema* has a fuscous body coloring, and the tegmina are opaque and hairless.

Male genitalia. Anal flap (10th abdominal segment) about twice as long as wide, parallel-margined for two thirds its length, then tapering suddenly at the apex. The eleventh segment and its stylus short and inconspicuous.

The harpagones as viewed externally on the ventral side are two long, slender processes. From a flattened lateral view the dorso-caudal angles of each is found to be prolonged dorsad into a sharply pointed, slightly recurved apex, and at the base of this extension is found an external ventrad-curving, sharply pointed flap.

The aedeagus in this species is partially bilaterally symmetrical. It is tubular in shape and only partially exposed beyond the theca. On the apical three fourths it bears a sclerotized phlange which tapers to a narrow ridge toward the apex and which is serrate along the dorsal margin. The theca appears as a tube covering the aedeagus for approximately one half the length of the latter, then on each side it suddenly projects caudad as a narrow, elongate flap which extends to about the base of the apical third of the aedeagus.

Female genitalia. Anal flap (10th segment) broadest through middle, suddenly tapering to a roundly pointed apex. The eleventh segment scarcely visible, its stylus moderately long. The external valves of the ovipositor broadest through middle third.

Notes on distribution. Uhler states that it inhabits Texas. The type specimen was collected at Waco by Belfrage. In 1929 a large series was collected in Kerr county, Karnes county, and Menard county in Texas by R. H. Beamer. Several specimens were taken in 1932 at Monterey, Nuevoleon, Mexico, by L. D. Tuthill.

Dictyonissus nigropilosus n. sp.

(Plates LXVI, LXVII)

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of tegmen, 3.3 mm. to 3.8 mm. Length of tegmen, 2.7 mm. to 3.2 mm.; width of tegmen, 1.6 mm. Much smaller than *griphus*.

Color. Same general light green to testaceous color as in *D. griphus*, but with pitch black hairs over body and tegmina instead of light ones. Body uniform light green or greenish-tan. Anterior margin of vertex darkish. A bronze caste over disk of mesonotum. Eyes brown to black. Frons without the black dots found in *griphus*,

but base of black hairs also sometimes black. Venter of body green. Legs also green except for a bronze caste on tarsus, and tip of tarsal claws black. Tegmina greenish or greenish-tan, translucent, and very thick green veins.

Structural details. Vertex greatly protruding beyond eyes, its total width equal to its total length, the anterior margin distinctly angulately produced through middle, the posterior margin deeply roundingly emarginate, lateral angles parallel. Frons greatly elongate, narrowed at base, its lateral margins outwardly curving so that its greatest width is at base of apical third; a distinct median carina present for about two thirds its length, the entire disk together with the carina at base considerably elevated, leaving a shallow groove just mesad of each lateral margin, which is also elevated. Clypeus short, about two thirds the length of one lateral margin of the frons. Femora of legs slightly sulcate, tibiae greatly so. Pronotum collarlike as for the genus, but each lateral arm more rounded and elevated into a knob than in *D. griphus*. Mesonotum conspicuously humped at anterior end, two distinct lateral carinae present and a median longitudinal groove plainly visible. Costal margin of tegmen only slightly rounding, costal cell area broad, more broadly extended at anterior end than in *griphus*; longitudinal veins only distinguishable for a short distance at base, after which they are lost in the reticulation.

Male genitalia. Anal flap (10th abdominal segment) tubular at base for half the length, from which point the ventral margin extends posteriorly into a bilobed, somewhat pointed flap. Beyond the dorsal margin the ringlike eleventh segment is only slightly visible and bears a long fingerlike stylus.

Each harpago from a flattened lateral view is roughly boot-shaped, broadest at its extreme apical end, where the dorsal corner extends into a sharply pointed triangular projection. A flat, caudad-bending external hook is located midway of this projection.

The aedeagus is a semisclerotized tubular process which extends about halfway beyond the theca. On the right side it bears a narrow phlange which is saw-toothed on the dorsal margin. Just posterior to the end of the phlange is a recurved, well sclerotized hook. On the left side a similar phlange with a serrate dorsal edge is also present and another well-sclerotized hook, the apex of which only, shows beyond the edge of the theca as a sharply pointed bladlike process. The theca envelopes the aedeagus for half its length and has its caudal margin on both sides deeply notched through middle.

Comparative notes. There are only two species in the genus. They resemble each other closely in color, size and general features. They are easily distinguished by the presence of pitch-black hairs on body and tegmina in *nigropilosus*, together with the angulate vertex and the very narrow frons without any black markings. *D. griphus* has golden or light hairs, the anterior margin of vertex distinctly rounding and more produced beyond eyes and a broader frons with a row of black spots indicated in each lateral disk. *D. griphus* usually is a trifle larger than *nigropilosus*, its measurements being 3.5 mm. to 3.8 mm. from apex of head to tip of tegmen.

Location of types. Described from 3 males and 1 female. Holotype male and allotype female and two male paratypes taken at George West, Texas, July 1, 1936, collected by R. H. Beamer.

These types are in the Snow Entomological Collection, University of Kansas.

THE GENUS NEAETHUS Stal

Stal, Carolus. Rio Jan. Hemip. II, p. 67, 1862.

Description of the genus. This genus is similar to *Dictyssa* and *Dictyonia*. They are small insects with hemispherical, translucent or semitransparent tegmina and thick veins. The apical margin of each tegmen is strongly rounded and the costal margin expanded. Vertex is short through middle, much wider than long, not produced greatly beyond eyes. Pronotum extremely narrow at sides, where it is shortened to almost a point; its anterior margin deeply emarginate into region of the vertex; its posterior margin shallowly concave. Mesonotum is triangular with or without a median carinae and an arcuated groove just back of anterior margin. Frons is held vertically to body, is usually more or less parallel-margined, truncate posteriorly, and deeply emarginate anteriorly for the insertion of the postclypeus. Clypeus is triangular, not keeled on margins. Tegmina held vertically and lying adpressed to body, translucent or semi-opaque, always with heavy, conspicuous veins and many cross veins forming small angular cells. Wing venation, based on Muir, Tillyard and Snodgrass, is similar to *Dictyssa*, showing the following general characteristics: vein Sc divided, Sc_1 (equal costal vein of Metcalf) running along costal border for about one third the length of the tegmen, veins Sc_2 and R united at base and their apices sometimes completely lost in reticulation, in other cases each branches again near tip; vein M always two branched, the branches of each of these either apically not traceable in the reticulation or frequently branched several times, making a 4-, 5- or even 7-branched vein; vein

Cu₁ divided into two branches, Cu_{1a} and Cu_{1b}; vein Cu₂ forming the claval suture; 1st A and 2d A present. Hind wings are of three types: as long as the tegmina, very much abbreviated, but with a longitudinal fold indicated, or reduced to a mere scale. Two spines are present on the hind tibiae.

HISTORY OF THE GENUS

The genus was erected by Stal in 1862. Previously he had described *vitripennis* (Of. Vet. Akad. Forh. XI, p. 247) in 1854 as a *Hysteropterum*. This species is now regarded as the haplotype of the genus *Neacthus*. In 1906 Melichar described four other species, namely, *fencstratus*, *grossus*, *nigronevrosus* and *maculatus*. In 1921 Van Duzee added *fragosus* to the group. In the present paper seven new species are being added to the list of North American species, making a total of thirteen.

On the whole the species in this genus are not easily recognized by external characteristics. The most closely allied species groups perhaps are the *nigronevrosus-fencstratus* group and the *diversus-uniformis-curvaminus* group. The first one has widely different genitalia. The latter group have somewhat similar genitalia. The general reader may have difficulty in identifying all of these species by external characteristics. Close study of the genitalia show differences that are constant and it is upon these differences, since in some instances long series of slides were made from several localities, that the species have been erected. The home of the genus seems to be California and the Southwest, where many of them have been taken from oaks. Mr. Paul Oman, of the National Museum, and Dr. R. H. Beamer have stated that they have taken them from different varieties of oak trees even in the same mountain range. Apparently this genus is one of the highly variable groups which has split up into many species corresponding to different species or varieties of the host-plant group.

KEY TO SPECIES

- | | | |
|--------|--|-----------------------------------|
| 1. | Hind wings as long as or only slightly shorter than front wings..... | 2 |
| | Hind wings rudimentary, less than one fourth length of front wings..... | 4 |
| 2. (1) | Tegmina translucent and held vertically against body; pronotum greatly narrower than head..... | <i>perluceus</i> n. sp., p. 503 |
| | Tegmina more or less opaque and held somewhat horizontally; pronotum only slightly narrower than head..... | 3 |
| 3. (2) | Larger insects, 5 to 6 mm. long; lateral margins of vertex longer than width across eye; narrow costal cell..... | <i>fragosus</i> Van Duzee, p. 506 |
| | Smaller insects under 4.6 mm.; vertex concave, short, on lateral margin equal to or less than width across eye; broad costal cell..... | <i>grossus</i> Mel., p. 507 |

4. (1) Tegmina translucent, with a black band extending from clavus to costal margin and a brown spot at apex of clavus; pronotum deeply notched behind eye *maculatus* Mel., p. 510
Tegmina without such bands or spots; pronotum not so deeply notched..... 5
5. (4) Translucent tegmina with light veins..... 6
Tegmina more opaque, with either very thick, light or darker to black, thin veins 7
6. (5) Lateral arm of pronotum back of eye longer, anterior margin of pronotum notched; postclypeus length equal to one lateral margin of frons; costal cell wide and distinctly reflexed; vein Cu branching considerably anterior to middle *vitripennis* Stal., p. 512
Lateral part of pronotum short, not knobbed or deeply notched behind eye; postclypeus shorter; costal cell narrower and not reflexed; vein Cu branched at about middle..... *sinchamatus* n. sp., p. 515
7. (5) Larger insects, usually 4.4 mm. or over; vein Sc₁ straight and long, extending for at least one third length of wing; hind wings rudimentary but folded once longitudinally 8
Smaller insects, under 4.4 mm. (occasionally females larger); vein Sc₁ distinctly curved and short, not extending one third of wing length; hind wings reduced to mere scales with no longitudinal folds..... 9
8. (7) Head produced beyond anterior margin of eye; frons narrow, one lateral margin greater than its basal margin; anal flap of male two-pronged
similis n. sp., p. 517
Head scarcely produced beyond eye; frons broad, length and width about equal; anal flap of male rounded..... *jacintiensus* n. sp., p. 519
9. (7) Veins either all dark or at least cross veins dark or darkish; vein Cu₁ not uniting before apex or lost in reticulation..... 10
Veins light throughout; vein Cu₁ uniting in some way before apex..... 11
10. (9) Veins of female usually all black (longitudinal veins of male and some females lighter); vein Sc₁ greatly arched, short, not more than about one fourth length of tegmen; apical cells long and parallel..... *nigrouervosus* Mel., p. 522
Longitudinal veins light; vein Sc₁ short, but straight; a cluster of small cells at apex of corium..... *fenestratus* Mel., p. 525
11. (9) Veins thin, costal cell wide, vein Sc₁ distinctly inwardly arched so that costal cells are wider than long; elongate cells at apex as in *nigrouervosus*,
curvaminis n. sp., p. 528
Veins thick, costal cell narrower, with the small cells in this area either longer than wide or square; an irregular reticulation of small cells at apex..... 12
12. (11) More cross veins in costal cell area, numbering usually 7 or 8; clypeus longer, its length equal to one lateral margin of frons..... *uniformis* n. sp., p. 530
Fewer cross veins in costal cell area, numbering only 4 or 5; clypeus shorter, its length only equal to basal or posterior margin of frons..... *diversus* n. sp., p. 532

Neacthus perlucidus n. sp.

(Plates LX, LXI, LXII, LXIII)

ORIGINAL DESCRIPTION

Size. Length of body to tip of tegmen, 4.4 mm. to 4.6 mm. Length of tegmen, 3.6 mm.; width of tegmen, 2.6 mm. This is a medium-sized species for this genus.

Color. Uniform straw-yellow, with few darker markings. Body uniformly a darker or straw-yellow, except margins of all segments and sclerites light cream, also a faint cream line down middle of

vertex, pronotum and mesonotum and middle abdominal segments from below with a greenish caste. Tegmina translucent straw-yellow or light amber; veins same color except a few dark cross veins on inner border of clavus and again at apex. Hind wings pale yellow, translucent. Eyes brownish. Clavola (flagellum) of antenna brownish-black. Legs all yellow except for black tips of the spines.

Structural details. Vertex subrectangular, slightly concave, much shorter through middle than at sides, its width at the anterior margin twice the length of one lateral margin, the lateral margins outwardly convex. Greatest width of eyes half the width of vertex. Frons depressed lengthwise through middle, lateral margins elevated, and slightly outwardly convex so that greatest width of frons is through its anterior fourth, median carina present but disappearing before reaching clypeus. Postclypeus with posterior margin angularly produced into frons for a distance equal to about one fifth the length of the latter.

Pronotum much narrower than head, its anterior margin roundly produced for greater distance into vertex than in *vitripennis*, its posterior margin shallowly emarginate; its extreme lateral part behind eye greatly abbreviated to about one sixth its length through middle and not deeply notched as in *maculatus*. Mesonotum with only a very faint median carina present, a deep transverse groove following anterior margin, but stopping at either side before reaching lateral margin, where each lateral corner is bullate. Tegmina approximately one third longer than wide, their greatest width approximately through middle, hemispherical in outline, due to both the apical and costal borders being evenly rounding; longitudinal and cross veins heavy, and forming large, irregular, angulate cells; costal cell area very broadly expanded; vein Sc_1 running as a stiff, straight vein from base to costal margin, making the cells in middle of the expanded border much larger than either the anterior or posterior ones; vein M only four-branched; vein Cu branched at about middle and veins Cu_{1a} and Cu_{1b} united before apex again and the combined vein shortly uniting with vein M_{3+4} . Hind wings as long as tegmina.

Male genitalia. Anal flap (10th abdominal segment) in flattened view approximately twice as long as wide with its lateral margins subparallel and its posterior margin roundly emarginate. Eleventh segment ringlike, only slightly showing beyond rim of tenth segment and bearing the usual fingerlike stylus.

The harpago (genital stylus) from a flattened lateral view ap-

pearing subquadrangular, broadest at its middle, due to slight bulging at this point of the ventral margin, the dorsal posterior corner extended dorsad into a sharply pointed process, at base of which is a ventrad-curved small external hook.

The aedeagus as viewed from the left side is a partially sclerotized tube bearing three sclerotized pointed flaps located as follows: a short curved one attached approximately at apex on anterior fourth and which is gently curved dorsad, a long, flat, sharply pointed one attached somewhat near base of aedeagus so that only its distal half shows beyond the theca, and the third attached near the middle and extending to near the apical curve of the aedeagus. The apical ninth of the aedeagus is recurved and is bulbous at base, then narrows to a sharply pointed apex. On the right side the aedeagus shows only one sclerotized hook or flap whose apex reaches approximately to base of apical third. The semisclerotized theca covers the aedeagus at base. On the left side it appears as a bluntly pointed sheathlike flap. On the right side it extends about one half the length of the aedeagus. Posteriorly it is truncate on the dorsal side and on the ventral side extends posteriorly as an elongate, slightly dorsad-curving hook.

Comparative notes. This species has probably always been identified as *N. vitripennis* Stal. because of its close resemblance in size, coloring and translucent tegmina. For the same reason it would be confused with *sinchamatus* n. sp. It is readily separated from these two species by the presence of long hind wings. For further details of comparison, see the notes under this heading in the descriptions of these species.

The presence of long hind wings places it near *fragosus* Van Duzee and *grossus* Melichar. It is easily distinguished from these two by the transparency of the tegmina and the lack of maculation or dark veins which are found on them. Other characters which distinguish these three species are as follows: *perlucidus* has a much narrower thorax than either of the other two; *perlucidus* and *fragosus* have the pronotum deeply produced anteriorly into the vertex, while *grossus* is only shallowly produced; in *perlucidus* the expanded costal border is very broad, and vein Sc_1 is very straight, thus making the cells in the middle of the costal area larger than at either end; in *grossus* Sc_1 curves outwardly, following the costal border, and thus the transverse cells are practically the same width; in *fragosus* the costal area is expanded only half as much as in *grossus* and *perlucidus*; *grossus* is conspicuously gibbous between

Sc₁ and R just in front of middle, which condition is only faintly indicated in *fragosus*, entirely lacking in *perlucidus*; finally the position in which the tegmina are held against the body varies in the three, in *fragosus* being held more horizontal, in *perlucidus* almost vertical and in *grossus* halfway between the other two.

Notes on distribution. Collected at Three Rivers, Cal., on July 8, 1932.

Location of types. Holotype male, collected at Three Rivers, Cal., July 8, 1932, and three paratype males same place, by Dr. R. H. Beamer. These types are in the Snow Entomological Collection at the University of Kansas.

Ncacthus fragosus Van Duzee, 1921

(Plates LX, LXI, LXII, LXIII)

Van Duzee, E. P. Characters of Some New Species of North American Hemipterous Insects with one New Genus. Proc. Cal. Acad. of Sci. XI (10) pp. 111-134, 1921.

Comparative notes. One of the largest species in the genus, measuring 4.5 to 6 mm. from apex of head to tip of tegmen. Readily distinguished by the semiopaque, long and narrow tegmina with a narrow, expanded costal border; vein M 5-branched; veins Cu_{1a} and Cu_{1b} united before apex; and the presence of hind wings which are nearly as long as the tegmina.

Van Duzee gives a description of the coloration as follows: "Yellowish or greenish testaceous, in male usually becoming brownish on vertex and face, with a paler area on apex of front; veins of elytra sometimes distinctly infuscated, especially in the male."

This species closely resembles *N. grossus* Melichar. It also is placed near *N. perlucidus* n. sp., because of the long hind wings. For detailed comparison of these three species see the notes under this heading in the description of *N. perlucidus*.

Male genitalia. Anal flap (10th abdominal segment) comparatively broad, its lateral margins outwardly curving to about their middle, then converging to a narrowed truncate apex, the flaplike extension from the basal margin not quite half the length of the entire segment. Eleventh abdominal segment ringlike with a short fingerlike stylus.

Harpago as viewed from a flattened lateral view roughly subquadrangular, its ventral margin rounding outwardly, its dorsal margin shallowly convex through middle, but at apical third extending dorsad a short distance, then making an obtuse angle and running posteriorly. The extreme dorsoposterior corner extended posteriorly as a short, blunt projection, of which both the ventral

and posterior corners are finely pointed and somewhat recurved. At the base of this posterior projection is a slender, recurved external hook. The aedeagus is somewhat more complex in this species than in others of the genus. Its basal half is covered by the theca. The apical portion that is visible beyond the theca is curved into a semicircle, is somewhat membranous so as to appear slightly wrinkled on the dorsal side and tapers to a broadly rounded apex. From a left view two well-sclerotized processes are visible; one a broad, flat projection attached at middle of aedeagus and extending caudad to about base of apical sixth, where it ends in a finely pointed apex; the other a stout, hornlike process attached nearer to base of aedeagus and only partially visible beyond the posterior apex of the theca. This hook is broad at base, but gently tapers to a pointed apex. It runs parallel with the aedeagus for a short distance, then, just after its emergence from the theca, it abruptly bends dorsad toward the aedeagus and partially overlaps the rim of the latter on the right side. This ventral hook is visible from either side of the aedeagus. On the right side there is present a similar dorsal flat projection as is seen on the left. The theca is practically the same on either side. It appears basally over the aedeagus as a membranous tube. At its dorsoposterior corner it extends posteriorly as a rounded elongate flap which ends in a small short dorsal spine.

Notes on distribution. The type locality is the summit of Mt. Wilson, Pasadena, Cal. A series of twenty-five specimens have been collected by Dr. R. H. Beamer from the following places in California: Anza, Idyllwild, Three Rivers, and San Jacinto mountains, in July and August.

Location of types. Museum of the California Academy of Science.

Neacthus grossus Melichar, 1906

(Plates LX, LXI, LXII, LXV)

Melichar, Leopold. Monograph der Issiden (Homoptera). Abh. k. k. Zool.-Bot. Ges. Wien, III, pt. 4, 1906.

Size. Length of body to tip of tegmen, 4 mm. to 4.6 mm. Length of tegmen, 3.37 mm. to 3.8 mm.; width of tegmen, 2.08 mm. This is one of the median-sized species in the genus.

Color. General color yellow, mottled with blackish-brown. Eyes yellow, spotted with red or all reddish-brown. Vertex dark tan with a cream-colored carina down middle, lateral margins also cream, enlarging to a spot at posterior corner. Pronotum tan with a cream-colored median carina and a cream spot at each corner behind eyes. Mesonotum brown except for two yellow spots on each side, one of

which lies anteriorly against the anterior margin and the other in line with it but on the posterior border, apex also cream. Frons reddish-brown, thin outer margins dark brown with a narrow white band bordering them on the inside and a large spot in center which is cream. Postclypeus reddish-brown, anteclypeus yellow, a dark longitudinal abbreviated stripe on each side running across both sclerites. Venter of body light yellow through middle, becoming darker at the sides and fifth and sixth abdominal segments washed in brown through middle and at extreme sides. Ventral ovipositor valves red-brown with their inner margins forming a dark-brown line. Legs brownish through middle, lighter at apices of segments, claws on tarsus black-tipped. Tegmina ground color semiopaque creamish-yellow, longitudinal veins yellow, cross veins varying from light brown to dark brown, usually the dark brown ones forming an irregularly spotted band, starting on clavus in line with apex of mesonotum and extending vertically across corium to costal border or sometimes forming more of an elongate vertical spot rather than a band, many dark veinlets again indicated in irregular patches in posterior half.

Structural details. Vertex subrectangular, broad, being at least four times wider across anterior margin than at middle, lateral margins diverging posteriorly, each margin twice as long as length through middle, anterior margin almost straight, only slightly produced anteriorly, not much greater than anterior margin of eye. Frons depressed through middle, its lateral margins distinctly elevated and diverging anteriorly so that greatest width is through its anterior fifth, a median carina distinctly indicated for two thirds its length. Pronotum scarcely narrower than head, roundly and comparatively shallowly produced anteriorly and narrower at this point than in *maculatus*. Mesonotum one third wider than long, each lateral fourth slightly bullate, a deep crescent-shaped groove following the anterior margin, but stopping just mesad of each lateral bulla; a very faint median carina present. Tegmina approximately one third longer than wide, their greatest width in line with apical sixth of clavus, distinctly bullate between veins Sc_1 and R at basal third of wing, costal cell area widely expanded. Longitudinal veins more elevated than cross veins, but of less diameter than many of the latter, the cross veins forming an irregular network of small veinlets. Vein Sc_1 rather gently curving, following outline of costal border, so that the cells in the expanded costal region are practically the same size and the transverse veins in this

region usually forked at end. Vein M_{3+4} often 3-branched, making a 5-branched media; all the branches of M and Cu_1 posteriorly arched and running close together, but not united before apex as in some species. Hind wings as long as tegmina.

Male genitalia. Anal flap (10th abdominal segment) in flattened view not quite twice as long as wide; its lateral margins subparallel and its posterior margin roundly produced. Eleventh segment ringlike, only slightly visible beyond rim of 10th segment and bearing the usual fingerlike stylus.

The harpago (genital stylus) from a flattened lateral view appearing as a subquadrangular flat plate about twice as long as wide, its ventral margin outwardly rounding, the dorsal margin slightly convex through middle and its posterior angle prolonged cephalad as a short pointed hooklike process, another triangular external hook attached at base of dorsal process and with its apex directed ventrad.

The aedeagus, as viewed from the left side, is a partially sclerotized tube bearing two sclerotized external processes, the more distal one attached to middle and extending caudad as an elongate narrow flap, which narrows to a bluntly rounding point reaching to about the base of the distal eighth of the aedeagus; the second process at base covered by the theca, but attached somewhat near the apex of basal fourth of aedeagus and showing beyond the theca as a well-sclerotized hook, which is broad at base, gently narrows to a slenderly pointed apex and reaches not quite to middle of aedeagus. On the right side the aedeagus shows only one flap-like extension which rises obliquely from the sides of the aedeagus, beginning at base of apical third and whose pointed apex reaches to base of apical sixth of aedeagus. The theca covers the base of aedeagus as a tube, extending on the left side about one third of the length of aedeagus, and ends posteriorly with a truncate margin. On the right side the dorsal margin of the theca is extended caudad as a sinuately margined flap which at its apex suddenly bends ventrad in the form of a pointed hook.

Comparative notes. This species more closely resembles *N. fragosus* Melichar than any other one. It is separated easily from the latter by having a distinct bulla at the base of each tegmen and by the more widely expanded costal border. For more details of comparison see notes under this heading in the description of *N. perlucidus*.

Notes on distribution. Type locality is given as Los Angeles, Cal.

In the Snow Entomological Collection are specimens from the Santa Rita mountains, Ariz., and the following places in California: Mint Canyon, Monrovia Canyon and Lockwood.

Location of type. Types are in the National Museum in Washington, D. C.

var. *pallida* Melichar

Melichar states that dark speckling or bands on the tegmina are sometimes lacking so that they appear pale yellowish. He calls this type variety *pallida*. Out of twenty-seven specimens studied the writer found eight which would fall under this classification.

Neaethus maculatus Melichar, 1906

(Plates LX, LXI, LXII, LXV)

Melichar, Leopold. Monograph der Issiden (Homoptera). Abh. k. k. Zoöl.-Bot. Ges. Wien, III, pt. 4, 1906.

Size. Length of body from apex of head to tip of tegmen is 4 mm. to 4.4 mm. Length of tegmen, 3.6 mm. to 4 mm.; greatest width of tegmen, 2.132 to 2.532 mm.

Color. General color light tan with transparent tegmina crossed by two oblique brownish-fuscous bands. Eyes light brown, banded or spotted in red. Vertex usually uniform yellow, sometimes spotted with light brown, especially females. Pronotum yellow tan with dark, paired, round pits in middle, sometimes numerous dark dots at sides. Frons and clypeus light yellow, a dark brown longitudinal streak on each side just laterad of the median carina and another irregular dark longitudinal streak more laterad to this, followed by a border of brown dots, then a longitudinal pale band, finally bordered by the very thin, dark lateral edge. Clypeus usually with a light median carina and sides washed in brown or with numerous oblique brown stripes on each side. Venter of body either uniform light yellow or frequently washed in fuscous, especially across bases of segments or at sides along the margins. Tegmina translucent greyish-tan with conspicuous dark veins, a prominent dark-brown oblique band before middle, beginning on base of clavus and extending slightly posteriorly across corium to a point on costal margin where vein Sc_1 ends; another interrupted band beginning at apex of clavus extending half across corium where it is lacking for width of one cell, then starts again somewhat more posteriorly and ends on apical margin. The latter part of this band or spot is frequently entirely lacking. Legs uniform yellow or sometimes washed in fuscous or with longitudinal carinae fuscous; claws black tipped.

Structural details. Vertex not much produced beyond eyes, concave through middle, anterior margin straight, at this margin $4\frac{1}{2}$ times wider than length along middorsal line, lateral margins converging slightly anteriorly. Pronotum much narrower than head, anterior margin broadly rounding, deeply notched behind eye and greatly overlapping vertex through middle; two round paired pits in center of disk. Mesonotum one third longer than wide, three carinae present, each lateral fourth bullate, a deep crescent-shaped groove following the anterior margin but stopping just mesad of each lateral bulla. Frons with basal or posterior margin straight, a median carina present for practically the entire length, lateral margins distinctly parallel and greatly elevated. Clypeus with a median carina present and deeply inserted into frons. Tegmina roughly twice as wide as long, superficially wedge-shaped with greatest width just anterior to apex of clavus; veins distinct, very few cross veins, so that the cells of wing are angular and easily counted; vein Sc_1 a wide distance from costal margin, so that this species has an especially widely expanded costal area, the transverse veins in the region numbering 8 or 9. Venation characteristic for the genus with veins Sc_2 , R, M_{1+2} and M_{3+4} each branching once, making a 4-branched media, Cu_{1a} and Cu_{1b} fused before apex and the single vein following apical border until it runs into vein M_{3+4} , thus setting off a narrow phlange. Hind wings very short or rudimentary, folded once longitudinally. (Melichar stated that they are lacking.)

Male genitalia. Anal flap (10th abdominal segment) more elongate than in many species, its length being $2\frac{1}{2}$ times its greatest width, which is across the flap part of the segment just posterior to the rim of the segment, due to the lateral margins bulging slightly at this point; the apical margin of the flap deeply, roundly notched. Eleventh segment with an elongate fingerlike stylus as in drawing.

The harpago, as viewed from a flattened position on a microscope slide, is peculiar in shape in that its length is not much greater than its width across its apex where its posterior dorsal corner is broadly extended dorsad. At this dorsal posterior corner is located a small external, sharply pointed hook.

The aedeagal structure has a more complex theca than in most species. The aedeagus itself is extremely slender, showing only at apical end beyond the theca, where it appears as a slender, goose-necked structure which bends out from the theca and then back in almost a complete circle, thus bringing the extreme apex under the

theca again. On the left side two sclerotized processes show, one a long, flat, bladelike structure attached approximately at middle and ending just cephalad of apex of thecal flap, the other a short, sharply pointed hook which is only barely visible beyond posterior margin of theca. On the right side only the tip end of an aedeagal hook shows beyond the theca. The theca is a long semisclerotized tube extending half way over the aedeagus. On the left side it ends truncately at the middle, except at the dorsal corner, where it is extended caudad for some distance as a flap whose edges partially fold together. On the right side the theca continues caudad as a broad lobe which ends truncately at base of apical fourth of aedeagus.

Comparative notes. *N. maculatus* is readily distinguished from all other species by the color of the tegmen, which is translucent, with one anterior oblique dark band and a partial posterior one, and the color of the frons, which has two lateral dark longitudinal streaks on each side of the median carina.

It more closely resembles *N. perlucidus* n. sp. and *N. vitripennis* Stal. From the former it differs by the presence of rudimentary hind wings instead of long ones, by having a deep notch in pronotum just behind eye, by a more wedge-shaped tegmen than a hemispherical one as in *perlucidus* and by having the combined distal part of Cu_{1a} and Cu_{1b} long, following the apical margin and thus setting off a narrow phlange.

For comparison with *N. vitripennis* Stal. see notes under this heading in the description of that species.

Notes on distribution. Type locality is given as St. Cruz and Sonoma, California. A few specimens have been collected by R. H. Beamer in July, from the following places in California: Maria county, Leona Heights, Niles, Upper Lake, Mt. Diablo, and Boulder Creek.

Location of types. In the United States National Museum at Washington, D. C.

Neaethus vitripennis Stal. 1854

(Plates LX. LXI. LXII. LXIII)

Stal. Carolus. Of. Vet. Aked. Forh., XI, p. 247. (Hysteropterum.)

Size. Length from apex of head to tip of tegmen is 4.4 mm. to 5.2 mm. Length of tegmen, 4 mm. to 4.4 mm.; width of tegmen, 2.08 mm. to 4 mm.

Color. Entirely golden yellow. Tegmina transparent and all yellow. Eyes brown. Claws on tarsus black-tipped.

Structural details. Vertex broad and extremely short through

middle where it is slightly more than one fifth of the anterior margin, moderately produced beyond eyes, anterior margin slightly rounded. Frons with lateral margins subparallel, outwardly rounding somewhat so that greatest width is across apical fifth, lateral margins greatly elevated, median carina present down entire length. Postclypeus comparatively much longer than in *N. maculatus* or *N. perlucidus*. In this species its greatest length is equal to one lateral margin of the frons. Pronotum much narrower than the head, deeply notched behind eyes as in *N. maculatus*, but with a thicker lateral arm than in *perlucidus*, its anterior margin roundly produced as an even hemisphere, its posterior margin shallowly convex. Mesonotum through middle twice longer than pronotum, a median longitudinal carina indicated and a short, lateral one, on each side just mesad of each lateral bulla; a deep groove indicated just posterior to the anterior margin. Tegmina less semicircular in outline with the costal margin more parallel to the claval margin than in *perlucidus*; cells of wing large, angular and a good many less cross veins than in other species; vein Sc_1 straight and widely separated from the costal margin making a widely expanded costal area, traversed by 8 to 9 veinlets and with the cells thus set off wider through middle than at either end; vein M four-branched; vein Cu branching considerably before middle and veins Cu_{1a} and Cu_{1b} thus separated by a longer cell than in *maculatus* and others, but united at apex and running as a combined vein just inside of apical margin for a considerable distance before joining vein M_4 and with the latter vein setting off a narrow phlange for half the width of the apical margin. Hind wings rudimentary, folded once longitudinally.

Male genitalia. Anal flap (10th abdominal segment) a large, broad, flaplike structure, tubular at base and with its ventral, posterior margin extended posteriorly, but to much less degree than in *maculatus*, as a flaplike extension which is deeply and broadly emarginate, so that it gives the structure a two-pronged effect. Eleventh segment a small but distinct tube with a conspicuous fingerlike stylus.

Each harpago, as viewed from a flattened view, is a subquadrangular plate with its posterior dorsal corner extended dorsad into a triangular, sharply pointed projection, and bears a small, ventrad-pointing external hook located half way on the dorsal extension.

The aedeagal structure is complex. The aedeagus proper is an elongate, tubular, well-sclerotized structure, which extends beyond

the theca in goose-necked fashion and finally tapers to a sharply pointed apex which is bent back toward itself. From a left view it shows four well-sclerotized hooks located as follows: one short, sharply pointed one, located approximately at base of apical fourth; another located approximately at middle of aedeagus and which makes a semicircular curve ventrad after emerging from the thecal rim; a third and very small, sharply pointed lateral hook, located just posterior to middle; and a fourth long, stiletto-type flap located just above the lateral posterior hook. On the right side no new hooks show, only the apices of the dorsal and ventral left hooks showing beyond the thecal margin. The theca on the left side completely covers the aedeagus only at base, then along dorsal side only extends caudad as a broad lobe to base of apical third of aedeagus, where it is notched and forms two pointed prongs. On the right side the theca covers the aedeagus all but its apical third or fourth.

Comparative notes. This species closely resembles the following species: *N. maculatus* Meliehar and *N. perlucidus* n. sp., in size, translucency, in texture, the large angulate cells and the widely expanded costal area. These three species are separated from each other in the following ways: pronotum deeply notched behind eyes in *vitripennis* and *maculatus*, but not so deeply in *perlucidus*; tegmina held vertically to body in *vitripennis* and *perlucidus*, but much more porrect in *maculatus*; hind wings long in *perlucidus*, rudimentary in other two; clypeus much longer proportionally to frons in *vitripennis* than in *perlucidus* or *maculatus*; costal margin and claval margin subparallel in *vitripennis* and *maculatus*, but distinctly outwardly rounding in *perlucidus*. Veins Cu_{1a} and Cu_{1b} united for only a short distance at apex in *perlucidus*, with no narrowed phlange set off along posterior border, while in *vitripennis* they are combined for a longer distance and together with vein M_1 sets off a phlange for about one half the width of the apical margin and in *maculatus* for about one third the width of the tegmen.

Vitripennis Stal may very easily be confused with *sinchamatus*, which in many respects it more closely resembles than any of the above. For comparison, see the notes under this heading in the description of that species.

It also closely resembles superficially *N. similis* n. sp. For comparison of this species see notes under this heading in the description of that species.

Notes on distribution. In the National Museum at Washington, D. C., are examples from Tamalpais and San Francisco, Cal. The type locality is San Francisco.

Neaethus sinchamatus n. sp.

(Plates LX, LXI, LXII, LXIII)

ORIGINAL DESCRIPTION

Size. Length from tip of head to apex of tegmen, 4.6 mm. to 4.8 mm. Length of each tegmen, 3.9 mm. to 4 mm.; width of each tegmen, 2.4 mm.

Color. Like *vitripennis* and *perlucidus* in being a uniform pale golden yellow. Eyes grayish-brown. Veins at apex of clavus tinted dark brown. Clavola of antenna blackish-brown. Tarsal segments reddish-brown. Tip of claws on legs black.

Structural details. Shape of head and pronotum similar to *perlucidus* n. sp. Vertex twice wider than length at sides, its anterior margin slightly angulate at middle, not produced beyond anterior margin of eye, lateral margins parallel. Greatest width of eyes half width of vertex. Frons and clypeus equal in length. Lateral margins of frons elevated and diverging from posterior margin so that greatest width is at base of apical fifth, a distinct median carina present and disk concave on either side. Pronotum much narrower than head, its anterior margin roundly produced into vertex, but not notched behind eyes, the lateral arm set off at this point much shorter in length than in some species. Mesonotum one third wider than length at middle, only a faint median carina indicated, each lateral third bullate, a deep crescent-shaped groove following and very close to posterior line of pronotum. Tegmen not semihemispherical or parallel margined, but with greatest width in line with apex of clavus. Veins of tegmen heavy, cross veins few and forming large angulate cells. Vein Sc_1 much closer to margin than in related species, thus setting off a much narrower expanded costal cell than in other species which is not recurved and traversed by only six or seven cross veins; vein M only four-branched; vein Cu_1 branching just before middle of tegmen, then veins Cu_{1a} and Cu_{1b} again uniting at apex and extending as a short ventrad-curving vein to meet M_4 . Hind wings rudimentary, folded once longitudinally.

Male genitalia. Anal flap (10th abdominal segment) much shorter than in *vitripennis* Stal. Its expanded ventral apical margin not any longer than the tubular basal part, the extreme apex very shallowly emarginate. Eleventh segment only slightly visible and bearing a short stylus.

Each harpago, as viewed from a flattened view, is a subquadrangular plate with its posterior or distal end extended dorsad as a projection which is slightly bulbous at base where it bears an ex-

ternal, ventrad-directed pointed hook and then ends in a spatulate lobe.

The aedeagus on the left side appears as a semimembranous tubular organ bearing several well-sclerotized processes located as follows: one attached at extreme base, gently curved in a semicircle, and ending in a point just beyond middle; a second long, flat process attached at middle is parallel-margined for three fourths of its own length and has its apical bent end ending in a fine point not far distant from apex of aedeagus; a third very short spine attached just anterior to middle. On the right side no additional hooks of the aedeagus are visible. The theca is unusual in that it covers only the extreme base of the aedeagus on the left side, but on the right side is extended into a long spatulate lobe which covers all of the aedeagus except the extreme apex. See drawings.

Comparative notes. This species more closely resembles *vitripennis* Stal and *perlucidus* n. sp. than any others because of its same coloring, size, etc. It is separated from *perlucidus* by having rudimentary hind wings, while *perlucidus* has long ones; by having the anterior margin of vertex not produced beyond eyes, by having more wedge-shaped tegmina which are wider in line with apex of clavus, while in the former they are hemispherical, and finally by having a very narrow costal cell area which is not bent back as in *perlucidus*.

From *vitripennis* Stal it is distinguished by not having the vertex so produced anteriorly or not nearly as wide, by not having the anterior margin of pronotum notched as in that species, and by having the costal cell area much narrower, not bent back and with fewer cross veins in it. In addition, male specimens can easily be separated by the external appearance of the anal flap, which is much larger and two-pronged in *vitripennis*, but is only shallowly emarginate in *sinchamatus*.

Location of types and type locality. Described from fourteen specimens. Holotype, male, and allotype female taken at Apline, Cal., August 9, 1929, by Dr. R. H. Beamer. Three paratype males from same locality. One paratype female from Campo, Cal., August 10, 1935; one paratype male and seven paratype females from San Diego county, California, August 7, 1929, collected by Dr. R. H. Beamer. The types are in the Snow Entomological Collection, University of Kansas.

Neaethus similis n. sp.

(Plates LX, LXI, LXII, LXV)

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of tegmen, 3.9 mm. to 4.9 mm. Length of tegmen, 3.2 mm. to 4.6 mm.; greatest width of tegmen, 3.2 mm. to 4.6 mm.

Color. General color similar to *N. fenestratus*. Body reddish-tan. Vertex and pronotum margined in dark brown, a faint light streak indicated on median line; two round, reddish-brown depressed spots in middle of pronotum. Mesonotum yellowish-tan through middle, darker at sides. Eyes yellowish-tan, banded with red bands. Frons uniformly dark tan, disk on either side of median carina sometimes darkened, margins dark brown. Body dark or golden-tan, the edges of some of the segments dark brown, and in females the median border of the ovipositor valves blackish-brown; males more uniformly colored. Legs reddish-tan, sometimes washed in darker brown on carinae or the ends of segments; tips of the claws black. Tegmina amber, translucent, sometimes somewhat milky, but not as much so as in *N. jacintiensus*. Veins uniformly dark brown in females; in male longitudinal ones sometimes lighter.

Structural details. Head not much wider than pronotum. Vertex not as broad as in *jacintiensus* but narrower than *N. vitripennis*, being about four and one half times wider across anterior margin than at median line, and being produced beyond eye for at least one fourth length of lateral margin of vertex, the lateral margins of the latter considerably diverging posteriorly. Frons long, narrow, parallel-margined with greatly elevated lateral edges. Postclypeus comparatively short, about one fifth shorter than one lateral margin of the frons. Pronotum not notched behind the eye, as in *vitripennis*, its anterior margin considerably elevated and roundly produced as an even hemisphere, its posterior margin shallowly convex, the lateral arms at side, behind eyes, about equal in length to one fourth pronotum along median line; two round pits in center of the disk. Mesonotum one third wider than length through middle, a deep groove along anterior border forming an arcuated line just posterior to margin of the pronotum; somewhat shallowly depressed through middle, leaving an elevated shoulder on each lateral fourth; a median carina sometimes faintly indicated. Shape of tegmen not as hemispherical as in many species, its greatest width in line with apex of clavus. Veins not as heavy as in *jacintiensus*. Cross veins fewer and parallel, thus making many parallel-sided cells, not so

much smaller at apex than elsewhere. Vein Sc_1 straight or only slightly curved outwardly, setting off a wide costal plange, which is distinctly inflexed and is traversed by seven to nine cross veins, making practically all the cells at either end smaller than through middle. Veins Sc_2 and R usually with two branches, sometimes three; vein M pectinate, usually with six branches; vein Cu_1 branched near base, as in *vitripennis*, and is united at apex, where it bends ventrad to meet a branch of M, which results in a narrow plange being set off for about one third of the apical margin. Hind wings rudimentary, folded once longitudinally.

Male genitalia. Anal flap (10th abdominal segment) of the male makes the species easily recognized, since its posterior margin is deeply emarginate, which gives it the appearance of being pronged. The tubular part is slender and has its outer margins somewhat bulging, so that its greatest distance is through middle. The eleventh segment shows as a ringlike lobe beyond the dorsal posterior margin of the tenth and bears a more triangular-shaped stylus than in many species.

The harpago, as viewed from a flattened lateral view, is a boot-shaped plate which is narrowed at the apex, then greatly bulged on the ventral side through the middle, after which it narrows again to a blunt, truncate apex, and at the base of this short projection bears an external ventrad-curving, slender hook.

The aedeagal structure in this species is complex, especially as regards the theca, which covers the aedeagus for most of its length. The apical portion of the aedeagus, which shows beyond the theca, is membranous and therefore wrinkled on its inner margin. On the left side the theca appears as a membranous tube with its opening about halfway from base of aedeagus. At this point the tips of two well-sclerotized hooks of the aedeagus show beyond the emarginate outer margin of the tube, the dorsal one a flat, sharply pointed process, attached somewhat near base, and the ventral one a shorter bifurcate process. The inner margin of the thecal tube extends caudad as a flat membranous lobe, whose posterior margin is slightly triangularly produced and beyond which the apex of a third flat, sharply pointed aedeagal process shows, which is attached near middle of aedeagus. On the right side the theca shows as a longer membranous tube with an opening near the apex and beyond which shows a sharply pointed, sclerotized hook of the aedeagus. From a microscope slide it is difficult to understand the twisting of the theca. Apparently the usual dorsal flap is split dorsad and the

lateral lobe has twisted around the aedeagus from a point midway on the aedeagus so that it makes it appear to have two openings.

Comparative notes. *Neaethus similis* n. sp. is very similar in superficial appearance to *vitripennis* and *jacintiensus* n. sp. It has, however, one of the most distinctive types of genitalia in the genus. These three species can be separated externally by the following characteristics: the anterior margin of the vertex is produced beyond eye for about one fourth the length of its lateral margin in *similis*, while in the other two is scarcely produced at all and the width across this margin is less in *similis*, being only about four and one half times the length on median line, while in *vitripennis* it is five times, and in *jacintiensus* five and one half. *Similis* has a longer and narrower frons and is about one fifth shorter at lateral margins than greatest length of clypeus; *jacintiensus* has the frons about equal in length and width, while *vitripennis* has a longer clypeus proportionally, its length being equal to one lateral margin of the frons.

The anterior margin of the pronotum is notched behind the eyes in *vitripennis*, but not in the other two. The tegmina show a few variations, the costal cell area is reflexed distinctly in *similis* and *vitripennis* but not in *jacintiensus*; vein M tends to branch more in *jacintiensus*, showing usually as many as seven branches, while *similis* frequently has six, and *vitripennis* only four. The anal flap of the male is pronged in *similis* and *vitripennis* and rounded in *jacintiensus*.

Location of types. Described from holotype male collected at Leona Heights, Cal., August 15, 1933; allotype female, Mt. Diablo, Cal., August 21, 1935; one paratype female, Mt. Diablo, Cal., and four paratype males from Mt. Diablo, Cal., collected by Dr. R. H. Beamer; one paratype female and seven males from Mt. Diablo, Cal., collected by P. Oman. These types are in the Snow Entomological Museum, University of Kansas, and the U. S. National Museum at Washington, D. C.

Neaethus jacintiensus n. sp.

(Plates LX, LXI, LXII, LXV)

ORIGINAL DESCRIPTION

Size. Length from tip of head to apex of tegmen is 4.3 mm. to 5.6 mm. Length of tegmen is 3.8 mm. to 4.8 mm.; width of tegmen is 2.4 mm. to 3.1 mm.

This is one of the largest species in the genus, approximating *N. fragosus* in size.

Color. General color light yellow washed in varying shades of

fuscous so that some specimens appear much darker than others. Vertex light brown to fuscous with broad, light-yellow margin and a median longitudinal band light. Eyes mottled brown. Prothorax light brown to dark except at margins and a median longitudinal line. Mesonotum light brown to reddish across the depressed middle portion, lateral bullae dark brown, the anterior margin and apex light yellow. Frons and clypeus uniform, in the lighter specimens being light-tan or yellow, with the clypeus slightly lighter; in the darker specimens being reddish-brown with the margins light yellow. The underside of body light yellow with touches of light green, especially on the third and fourth segments, or most of segments having the central parts of sclerites reddish-brown with margins light yellow and the abdomen dark brown on the third to sixth segments. Legs light yellow or reddish-brown, tips of claws black. Tegmina milky translucent with either dark-brown veins entirely or some of the longitudinal veins lighter.

Structural characteristics. Head not much wider than pronotum. Vertex broad, its width across anterior margin about five and one half times its length at middle, the anterolateral corners not any produced beyond the eyes, but the anterior margin slightly angulately produced at middle, the lateral margins distinctly diverging posteriorly. Pronotum four times wider than length at middle, gradually narrowed behind eye to a slender arm, but not at all notched. Mesonotum broadly triangular, much more than one third broader than long, depressed through middle with a median carina lacking or only slightly indicated. Length and width of frons equal, its lateral margins outwardly rounding and slightly elevated, a median carina present for three fourths its length, on each side of which the disk is depressed as far as the elevated lateral margins. Clypeus not as inflated as in some species, about one fifth shorter than greatest lateral margin of frons. Tegmen with greatest width about two thirds its length and at a point in line with apex of clavus and not in middle of wing as in *nigronevrosus* or *fenestratus*; veins thick, many cross veins present, thus making many angulate cells, the cells at the apex short. Vein Sc_1 straight and long, extending to a point which is at least one third length of tegmen, the cells in the costal area uniform, rectangular cells. Veins Sc_2 and R usually each only two-branched; vein M pectinate with as many as seven branches as in *nigronevrosus*; vein Cu branched nearer base than in other similar species, united again close to apex. Hind wings rudimentary, folded once longitudinally.

Male genitalia. Anal flap (10th abdominal segment) a broad, flat tube at base with its lateral basal margins parallel-sided, its ventral posterior margin extended as a short, broad flap with rounded apex. From a mounted specimen the eleventh segment is exposed as a ring-like segment, showing beyond the dorsal rim of the tube, and bears a fingerlike stylus which is as long as the apex of the flap.

From a flattened view each harpago appears as a flat, somewhat inflated lobe, which is broadest at about middle, where its ventral margin is outwardly rounded. At the posterior dorsal angle the harpago is expanded into a truncate flattened process which is abruptly bent ventrad and posteriorly on the inside, and on the outside bears a sharply pointed but short hook whose apex is directed directly ventrad.

The aedeagus, as viewed from the left side, appears as a slender, semicircularly curved tube, bearing two well-sclerotized processes, the basal one being much shorter, attached at base under the theca and ending about midway of aedeagus, only its apical part showing beyond theca as a curved hook, which is broader at base, then tapers to a sharp apex which gently curves ventrad. The other aedeagal process arises midway on aedeagus as a broad, knifelike structure, and gradually tapers to a fine point, which stops approximately at base of apical ninth of the aedeagus. On the right side the aedeagus is mostly covered by the theca. It shows a flat, bladelike process attached near base and ending at about the base of the apical third. The theca on the left side covers the aedeagus for about one fourth its length, and its posterior margin on this side is deeply emarginate. On the right side the theca extends tubelike to not quite the middle of the aedeagus, then has a dorsal flaplike extension which reaches almost to the tip of the aedeagus and is sharply pointed.

Comparative notes. *N. jacintiensus* is closely allied to *N. nigronervosus* Mel. and *N. fenestratus* Mel. It is separated from these species by several characteristics. It is much larger than either of the other two. The vertex is proportionally much wider and the length at middle much shorter; the posterior lateral margins distinctly diverge. The pronotum also is proportionally wider for its length. The mesonotum lacks a median carina which the other two usually have indicated. The tegmen in this species is not hemispherical and has its greatest width in line with apex of clavus instead of at middle. The cells of the tegmen near apex are short, not long and parallel-sided, as in *nigronervosus*, nor clustered at apex, as in *fenestratus*. The venation resembles that of *nigronervosus*

more than it does *fenestratus*, as M tends to be pectinate with many distinct branches.

N. jacintiensus n. sp. also resembles *N. similis* n. sp. For comparison of these two species see notes under this heading in the description of that species.

Notes on distribution. A large series of this species was taken in San Jacinto mountains, California, by Dr. R. H. Beamer. Other specimens have been taken at the following places in California: Campo, Big Bear Lake, Idyllwild, San Diego county, Giant Forest, and Beaumont.

Location of types. Holotype male, and allotype female collected in the San Jacinto mountains, California, by R. H. Beamer, August 21, 1929. Many female and male paratypes taken at the same time and the same places as listed above. The types are in the Snow Entomological Collection, University of Kansas.

Ncaethus nigronervosus Melichar, 1906

(Plates LX, LXI, LXII, LXV)

Melichar, Leopold. Monographie der Issiden (Homoptera). Abh. k. k. Zoöl.-Bot. Ges. Wien, III, pt. 4, 1906.

Size. Length of body from apex of head to tip of tegmen, 3.2 mm. to 4.5 mm. Length of tegmen, 2.6 mm. to 3.7 mm.; width of tegmen, 1.5 mm. to 2.4 mm.

This species is one of the smaller species in the genus.

Color. This species generally darker than many in the genus. Vertex fuscous or somewhat dark tan through middle, margins and a median longitudinal band light yellow. Pronotum also fuscous or darkish all except margins and median light line. Mesonotum generally brown except light yellow on anterior border at apex, median carina and on lateral fourth except for two brown spots, one at extreme anterior, lateral corner and another in center of the bulla. Eyes variegated with brown. Frons all dark brown except light in the following places; all the outside margins, the median longitudinal carina, which forks slightly at apex so that the yellow spreads out into a spot on each side, and on each side a narrow, irregular longitudinal streak just mesad of each lateral margin. Genae with a brown streak anterior to eye, rest light yellow. Antenna yellow, washed in brown, with a dark brown clavola. Clypeus dark brown except for a median band down center and at each lateral carina. Prothorax and mesothorax on underside brown, margined in whitish yellow. Metathorax light. Abdomen of female blackish-brown except for a light spot in center of first few abdominal segments, an-

other at lateral corners of or entirely across the sixth and seventh abdominal sterna, all of the abdominal pleura, and the central portions of the ovipositor valves. Males with venter of thorax light yellow spotted with dark; abdomen yellow except the fifth, sixth, and seventh abdominal segments blackish brown. Legs brown except for yellow along the carinae and tip of claws, which are black. Tegmina milky translucent with dark brown to black veins.

Color variations. Melichar distinguished this species from *N. fenestratus* by stating that all the veins are black in *nigronevrosus*, while in *fenestratus* the longitudinal veins are greenish and only the cross veins are blackish. In all the males of *nigronevrosus* studied by the writer the longitudinal veins are always lighter than the transverse veins.

Furthermore, some males have the entire body light yellow washed in lighter reddish-brown.

Structural details. Vertex not deeply concave through middle nor produced anteriorly beyond eyes, the anterior margin straight or only gently rounding, its width across anterior margin four times its length at middle. Frons rectangular, the lateral margins only slightly converging at base, somewhat elevated and a median carina present, which lessens in height and finally disappears as it approaches the apex. Postclypeus as long as or longer than the lateral margin of frons. Pronotum broad, about four and one-half times its length at middle, its anterior margin rounding, but not much produced into vertex, narrowed behind eye to a thin arm, but not deeply notched in this region as in other species, two depressed pits in center of disk. Mesonotum concave through middle, raised on either side to a distinct bulla; a median carina present, and an arcuated groove at extreme anterior margin following the posterior margin of the pronotum but stopping at either bulla. Tegmina hemispherical in outline, its greatest width just anterior to apex of vertex; its length approximately one half greater than its width; veins thick but appearing somewhat thinner than *fenestratus*, many cross veins present, forming numerous, irregularly shaped cells, with those at apex long, narrow, and parallel-sided, vein Sc_1 widely separated from costal margin, arcuated inwardly rather than straight or the reverse and only extending posteriorly for a third or less of the wing; the other longitudinal veins not uniform as to their branches, frequently pectinate to the extent that Sc_2 may have three to four branches and M frequently five to seven; Cu usually only two branched and these branches frequently making a curve ventrad but not uniting. Hind wings reduced to a mere scale, without longitudinal fold.

Male genitalia. Anal flap (10th abdominal segment) short, not much more than a third longer than wide, the ventral posterior margin extending flaplike for less than half the total length, evenly rounding at apex. The eleventh segment more conspicuous than in some species, with a long, fingerlike stylus extending beyond the apex of flap.

Each harpago, as viewed from a flattened view, is a broad, inflated lobe whose ventral margin is strongly outwardly convex and whose dorsal margin is deeply concave at middle. The posterior dorsal corner is projected dorsad into a bifurcate process, the more dorsal hook slenderly pointed and abruptly recurved, the ventral hook directed caudad and bluntly pointed.

The aedeagus is a semisclerotized tube, the apical fourth of which is strongly recurved and somewhat narrowed. From a left view it shows two strongly sclerotized, flat, sharply pointed processes which are attached some place near base and extend caudad, one having a more dorsal position and following the curve in the aedeagus until it reaches the apical bend in the latter and the other laterad in position and extending for about the same distance caudad, but with its tip abruptly recurved. On the right side the aedeagus appears to show a similar lateral process of about equal size and shape as the one on the left side and the dorsal process shows from this view, too. The theca in this species is a simple semimembranous tube with its posterior margin on either side obliquely truncate.

Comparative notes. This species is one of the most variable species in the genus in size, coloring and certain structural details. Melichar apparently had only females on which to base his description. No males in any collection seem to fit his description of the veins which he stated were all black. The males seem to have lighter longitudinal veins, as in *fenestratus*.

N. nigronervosus resembles *N. fenestratus* and *jacintiensus* more than any other species. *Nigronervosus* and *fenestratus* are separated other than the male genitalia, which are vastly different, by only the following characteristics: the vertex in *nigronervosus* has a straight, or only slightly rounding anterior margin, while in *fenestratus* this margin is slightly angulate at middle; the costal cell area is extremely broad in *nigronervosus* due to the fact that vein Sc_1 bends inwardly instead of toward the costal margin as in the other species, where the area is quite narrow; the cells along the apex of the tegmen in *nigronervosus* are long, narrow and parallel-margined, while in *fenestratus* there is always a cluster of small cells at apex. This latter is the most distinctive thing between the two.

In addition to the above there are trends of differences in the wing venation which can be noted. These differences are not always apparent because there seems to be some variation in the species themselves due to the longitudinal veins breaking up into various patterns of reticulation. However, there is a marked tendency for vein M in *nigronervosus* to be pectinate, with from six to seven branches, and for these veins to bend down and encroach on the territory of the R vein, while in *fenestratus* M is usually only four-branched, its branches are usually in the dorsal half of the corium and the veins Sc_2 and R are more apt to be pectinate.

For comparison with *jacintiensus* see the description of the latter.

Notes on distribution. The type locality is given as Prescott, Ariz. Many specimens were studied from the following places in Arizona: Yarnell, Chiricahua mountains, Granite Dell, Kirkland Junction and Maricopa county. A few specimens from Cedar City, Utah, were available.

Location of types. Female holotypes in the National Museum, Washington, D. C.

Nacanthus fenestratus Melichar, 1906

(Plates LX, LXI, LXII, LXIII)

Melichar, Leopold. Monographie der Issiden (Homoptera). Abh. k. k. Zoöl.-Bot. Ges. Wien, III, pt. 4, 1906.

Size. Length of body from tip of head to apex of tegmen, 3.4 mm. to 4.2 mm. Length of tegmen, 2.9 mm. to 3.5 mm.; width of tegmen, 1.8 mm. to 2.6 mm.

This species approximates *nigronervosus* in size and is one of the smaller species in the genus.

Color. Melichar describes this species as having a pale green body and with wing covers transparent and longitudinal veins pale greenish, while the cross veins are entirely black. In a series of specimens from several localities these color characteristics seem variable. A female specimen from the National Museum Collection, bearing a Melichar determination label, is as follows: vertex yellowish-tan with the thin, sharp margins dark brown, pronotum yellowish-tan with two round reddish pits midway of its length, extreme thin margins dark brown; mesonotum yellowish-tan except for a light reddish-brown spot at lateroanterior corner of the bulla and another on the posterior half of each bulla. Frons uniform yellow with dark-brown margins, postclypeus yellow except for six or seven pairs of faintly indicated oblique stripes; rest of head uniform yellowish-tan. Thorax and abdomen all yellowish-tan, except the

inner margins of each ventral valve of ovipositor. Legs yellow except for tips of spines and claws. Tegmina milky translucent; longitudinal veins light yellow or tan, cross veins dark brown.

Color variations. Specimens which the writer has placed under this species show many color variations. Some specimens show all the veins fairly light; others show them all to be dark brown. When the veins are all dark much fuscous is found on the rest of the body; vertex, pronotum, and mesonotum are washed in it or show it at the sides; on underside all the sclerites are mottled with it and the fifth, sixth and part of the seventh segments are entirely fuscous in the female.

Structural details. Vertex not produced beyond eyes, its anterior margin slightly angulate at middle, its width at this point four times the length of one lateral margin. Frons broad, approximately one fourth longer than width across basal line, its lateral margins elevated, several depressions or dimples on each lateral half, a median carina present for three fourths of its length. Postclypeus longer through middle than the lateral margin of the frons, a deep groove present at point of union of the two sclerites. Pronotum short and broad, not much narrower than head, its length at middle twice the length of the vertex at middle, its length behind eye abbreviated to a mere slender arm, the anterior margin not greatly notched out as in some species, two round depressions present in the middle of the disk. Tegmina hemispherical in outline, its length not quite one third greater than its greatest width, which is midway of the wing or anterior to apex of vertex. Vein Sc_1 short, not extending even as far as one third the entire length, much nearer the costal margin and not curved inwardly as in *nigronevrosus*, the other longitudinal veins frequently forked just inside apical margin and with many cross veins forming a cluster of irregular small cells at apex of corium. Vein Sc_2 frequently pectinate with four branches present, vein R with two or three main branches, vein M is usually four-branched, but its branches are all in dorsal half of corium and vein Cu_1 has the usual two branches which approach each other just before apex, but do not unite, and due to the high position of the medial veins curve for only a short distance at apex. Hind wings reduced to a mere scale, without a longitudinal fold.

Male genitalia. Anal flap (10th abdominal segment) short, not much over one fourth longer than wide, its lateral margins curving outwardly, its ventral margin extended only a brief distance to form the flap proper, the extreme posterior margin of which is truncate.

The eleventh segment only slightly visible, its stylus moderately long, extending not quite to apical margin of the stylus.

Each harpago, as viewed from a flattened lateral view, is a broad, somewhat inflated lobe, whose ventral margin is strongly outwardly convex and whose dorsal margin is deeply and angulately concave. The posterior dorsal corner is projected dorsad into a triangular process, which is broad at base and then tapers to a slender, recurved apex, just ventrad of which is a small, recurved external hook.

The aedeagus is a semisclerotized tube, the apical fourth of which is strongly recurved and bluntly rounded at apex. From a left view it shows two distinct sclerotized processes, the most conspicuous one located more ventrad, attached somewhere near the base under the theca, then after emerging from the theca immediately dividing into two hooks, a short dorsal one which is sharply pointed, half the length of the other and points ventrad, the other one long, slender, not quite so sharply pointed and curved dorsad, ending at about the base of the apical fourth of the aedeagus; the second aedeagal hook on this side is partially concealed by the bifurcate process and shows only as a sharply pointed, flat blade between the dorsal short hook of the latter and the right thecal flap. On the right side the aedeagus has a flat, bladelike, sharply pointed process, lying closely adpressed to it, attached midway the length of the aedeagus and ending approximately at base of apical fourth. The theca is a semi-sclerotized tube, covering the aedeagus for about one fourth to one third its length and on the dorsal side is extended caudad as a broad, spatulate lobe which becomes slightly wider at its apex.

Comparative notes. This species resembles *N. nigronervosus* and *N. jacintiensus* n. sp. more closely than any others. For comparison with these species see notes under this heading in the descriptions of the other species.

Notes on distribution. The type localities are given as Los Angeles, St. Cruz, and Claremont, Cal.

A specimen in the National Museum collection, bearing a Melichar determination label, is from Arizona. Specimens were on hand for study from the Chiricahua mountains, Congress Junction, Oak Creek Canyon, Santa Rita mountains and Gila, Ariz. A few specimens were studied from Silver City, N. Mex., and Cedar City, Utah.

Location of types. The types from Los Angeles and Santa Cruz, Cal., are in the National Museum collection at Washington, D. C. The Claremont, Cal., specimens, collected by Baker are in the Melichar collection.

Neaethus curvaminis n. sp.

(Plate LX, LXI, LXII, LXIV)

ORIGINAL DESCRIPTION

Size. Length of body from apex of head to tip of tegmen, 3.4 mm. to 4.1 mm. Length of tegmen, 2.8 mm. to 3.4 mm.; width of tegmen, 1.8 mm. to 2.3 mm.

This is one of the small species in the genus, approaching the size of *uniformus* and *diversus*.

Color. Typical general color stramineous as in *uniformus*, sometimes veins darker as in the *nigronervosus* group. Vertex and pronotum stramineous, with thin outer edges dark brown and a cream-colored median line. Eyes reddish-brown. Mesonotum dark tan with an arcuated light border around anterior margin, which bends posteriorly at either side and crosses each lateral bulla; the median carina and extreme apex also cream-colored. Frons uniformly stramineous with thin outer margins dark brown and median carina lighter. Clypeus yellow with a series of oblique brown bars on each side. Under and lateral sides of thorax and external genitalia golden yellow, abdominal segments cream or light green. Inner margins of ovipositor valve dark brown. Legs washed in reddish-brown; tips of claws black. Tegmina stramineous throughout, usually with the veins the same color.

Color variations. Some specimens have the frons, vertex, pronotum, and mesonotum infuscated to varying degrees and the veins of tegmina dark brown.

Structural details. Similar in appearance and structure to *uniformus* and *diversus*. Vertex narrow, being only twice as wide across its anterior border as a lateral margin or approximately twice as wide as eye, this anterior border rounding, and posterior margin abruptly elevated. Frons elongate, parallel-sided, not much narrowed across posterior or basal margin, lateral margins somewhat elevated, median carina not greatly pronounced, extending only three fourths of the total length. Postclypeus long, being as long as or a trifle longer than the lateral margin of the frons. Pronotum longer than in related species, being three times wider than greatest length, narrowed in the characteristic fashion behind the eyes to a slender, somewhat tapering lateral arm, but not notched at this point. Mesonotum broad, about twice as wide as long, an arcuated groove following the margin of the pronotum and a faint median carina indicated. Tegmina hemispherical in shape with costal and apical borders strongly rounding, their greatest width at middle of the

wing, clavus moderate in length, being only twice longer than distance beyond its apex. Vein Sc_1 moderately short, stopping approximately at apex of basal fourth of tegmen, inwardly arching so that the costal cell area is broad and being crossed by only four to six cross veins, making large, distinct cells which are always broader than long. In this species the other longitudinal veins usually have one extra branch, the characteristic pattern being Sc_2 either two- or three-branched, R three-branched, M five-branched with all its branches distinctly in the upper half of the wing, Cu_{1a} and Cu_{1b} combined before apex, but the combined vein not uniting with an M vein. Hind wings reduced to mere scales.

Male genitalia. Anal flap (10th abdominal segment) short, narrowed slightly at base, bulging through middle and ending on the ventral side in a truncate flap. The ringlike eleventh segment shows beyond the dorsal posterior margin and bears an elongate stylus whose apex extends beyond the tip of the flap.

Each harpago, as viewed from a flattened lateral view, appears as a pear-shaped plate, somewhat inflated through middle. At the posterior corner it is reflexed so that an internal phlange is formed for about one fourth its length. The outer posterior dorsal corner of the harpago is extended dorsad into a bluntly pointed hook and the extreme posterior inward corner of the phlange extends ventrad as a sharply pointed hook, the two hooks together making a bifurcate corner to this region of the harpago.

The aedeagus is a short semimembranous tube, which is somewhat broadened and bent forward at the extreme tip. On the left side it shows three processes, the longest being ventral in position, more heavily sclerotized and attached somewhat near the base of the aedeagus. It is strongly curved, tapers at the apex and ends at the point where the aedeagus curves cephalad. Another well-sclerotized but shorter hook is seen just above the former and extends only to about the middle of the aedeagus. Between these well-sclerotized hooks is a third, elongate semimembranous lobe which is only slightly longer than the dorsal hook. On the right side the aedeagus bears a sharply pointed, curved hook attached at apex of basal third and extending to base of apical third.

The theca in this species, as in *uniformus*, is conspicuous. It covers the aedeagus for a little over one fourth of its length as a tight-fitting tubular sheath. On the left side it ends truncate. On the right side its dorsal corner is extended caudad into a flat, triangularly-shaped flap, which extends slightly beyond the apex of the lateral aedagal hook.

Comparative notes. This species is closely allied with *N. uniformis* and *N. diversus*. For comparison of the three species see notes under this heading in the description of *N. diversus*.

Notes on distribution and location of types. The species was described from numerous specimens taken at various places in Arizona.

Holotype male, collected July 10, 1933, and allotype female, August 14, 1935, at Granite Dell, Ariz., by R. H. Beamer. Five paratype males and five paratype females, also from Granite Dell, one paratype male and two paratype females from Santa Rita mountains, four paratype males and six paratype females from Oak Creek Canyon, one paratype male and two paratype females from Yarnell, two paratype males from Prescott, one paratype male, Gila, and one paratype each sex, Congress Junction, all collected by R. H. Beamer in July and August.

These types are in the Snow Entomological Collection at the University of Kansas.

Neacthus uniformis n. sp.

(Plate LX, LXI, LXII, LXIV)

ORIGINAL DESCRIPTION

Size. Length of body from tip of head to apex of tegmen, 3.6 mm. to 4.2 mm. Length of tegmen, 3.1 mm. to 3.6 mm.; width of tegmen, 1.8 mm. to 2 mm.

Color. Similar in color to *N. diversus*. General color, amber yellow. Vertex lighter cream yellow at posterior lateral corners, its anterior margin dark brown. Pronotum slightly darker than vertex, its margins also brown. Mesonotum like pronotum except for a light cream anterior border anterior to the arcuated groove, which continues as a light streak across the middle of each lateral bulla, ending at the sides as a spot; the median carina and median posterior margins also cream. Eyes spotted and ringed with reddish-brown. Most of frons amber, light cream along lateral borders and the thin outer margins dark brown. Clypeus amber with a broad median cream longitudinal band. Legs light yellow to amber, with carinae of femora cream and tips of tarsal claws black. Thorax and abdomen in both sexes cream. Ventral valves of ovipositor along the median line dark brown. Tegmina semiopaque light amber; all of veins cream except cross veins in cell Cu_{1b} and apex of clavus, which are sometimes dark brown.

Structural details. Vertex not produced much beyond eye, the anterior margin slightly rounding; four times wider at its anterior margin than its median length and twice the width of one eye; hind

margin abruptly elevated. Frons short, clypeus long, the greatest length of latter equalling the length of one lateral margin. Pronotum three and one half times the greatest length, narrowed behind eye but not notched, to form a slender, somewhat tapered lateral arm; disk depressed through middle with two round, faintly depressed spots in exact center. Mesonotum one third wider than long, a median carina present and an arcuated groove close to anterior margin, which ends at either side in a bulla. Tegmina more hemispherical in outline than in *diversus*, their greatest width approximately at middle; vein Sc_1 quite straight, and costal cell area only moderately wide, with six, seven or eight cross veins, so that the small cells in this area are usually square or approximately as wide as long. The longitudinal veins coarse in texture with characteristic branching for the genus; veins Cu_{1a} and Cu_{1b} either not united at all before apex or lost in the apical reticulation. Hind wings reduced to mere scales.

Male genitalia. Anal flap (10th abdominal segment) short, narrowed slightly at base, then broadening posteriorly. The ventral posterior edge of the tube extended into a rounded lobelike flap which is shorter than in most species but is a trifle longer than in *diversus*. The stylus of the eleventh abdominal segment is blunt and short.

Each harpago, as viewed from a flattened lateral view, appears as a pear-shaped plate, somewhat inflated or swollen through middle. At the posterior corner it is reflexed for about one third of its dorsal length. The extreme posterior edge of this reflexed portion is extended into two short, sharply pointed processes, one of which extends inwardly and dorsad and one of which extends caudad and externally.

The aedeagus is a short, semimembranous tube, the tip of which curves dorsad in a semicircular position. On the left side it shows three sclerotized hooks or lobes. The most heavily sclerotized of these is attached under the theca, somewhat near the base. Beyond the rim of the theca it shows as a bifurcate process bearing a pointed blade which extends to a point at base of apical third of aedeagus and a small, sharply pointed hook which projects inwardly and is usually partly concealed by the thecal hood. Another heavily sclerotized hook is attached near base of apical third and extends to about base of apical fourth. Just dorsad of this hook is a less-sclerotized lobate-process, which ends at about the same point as the latter. The theca in this species is conspicuous. It covers the aedeagus for about one third its length as a tight-fitting tubular sheath. Beyond this point the dorsal portion becomes expanded

into a large hood which from either side view is rather triangular in outline. In reality it is a plate which has been elevated along its middorsal line into a thickened ridge and has each lateral margin extended downward as a lobate flap which partially encloses the aedeagal hooks.

Comparative notes. This species is closely allied to the following species: *N. diversus* and *N. uniformis*. For comparison of these three species see notes under this heading in the description of *N. diversus*.

Notes on distribution and location of types. This species was described from a large series of specimens taken in the Santa Rita mountains, Arizona. Holotype, male, Santa Rita mountains, Arizona, August 17, 1932; allotype female same place, August 18, 1935, by Dr. R. H. Beamer. Eight paratype males and five paratype females were collected same place in July and August, by Dr. R. H. Beamer. Forty male paratypes and thirty-four female paratypes were collected same place by F. H. Snow, in June. All types in the Snow Entomological Collection, University of Kansas.

Ncaethus diversus n. sp.

(Plates LX, LXI, LXII, LXIV)

ORIGINAL DESCRIPTION

Size. Length of body from tip of head to apex of tegmen, 3.8 mm. to 4 mm. Length of tegmen, 3.2 mm. to 3.3 mm.; width of tegmen, 2 mm.

This is a small and elongate species.

Color. Uniform, amber yellow or tan. Vertex, pronotum and mesonotum light yellow at margins, deeper through middle. Eyes brown. Frons uniform yellow with extreme margins dark brown. Clypeus light yellow with somewhat darker oblique bands on each side. Thorax and abdomen yellow tan, except basal abdominal segments of male pale whitish yellow. Legs yellowish, tarsi washed in reddish-brown, tips of claws black. Tegmina amber yellow, semitranslucent, veins thick and light cream, a few dark cross veins present in cell Cu_{1b} .

Structural details. Vertex narrow, only twice wider than width of eye, only slightly produced beyond eyes, its lateral margins diverging posteriorly. Frons one fifth longer than its width at posterior margin, its lateral margins greatly elevated and somewhat diverging near anterior or apical end; a median carina present for two thirds of its length. Length of clypeus equal to width of posterior

or basal margin of the frons. Pronotum twice as long at middle as the vertex, narrowed behind eye to a slender arm, forming a small tuberculate knob just back of the posterior lateral angle of the eye, but not deeply notched as in some species. Mesonotum on median line twice as long as pronotum, a median carina faintly indicated and two lateral ones even more faint than the middle ones. Tegmina somewhat elongate, flat, not much inflated; costal margin more parallel to margins of corium than in related species, veins thick and elevated, with longitudinal veins less pronounced; clavus long, at least twice and sometimes more than twice the distance from its apex to apex of wings; vein Sc_1 outwardly curving or at least sinuate so that some of the costal areolets are longer than wide or at most square; vein Sc_2 usually two-branched, vein R frequently four-branched, vein M four- or five-branched, all connected by cross veins of the same length which makes it difficult to determine on which vein the branches belong; vein Cu_1 branched at apex of basal third, then the branches combining or running very close together very near apex. Hind wings reduced to minute scales.

Male genitalia. Anal flap (10th abdominal segment) short, narrowed slightly at base, then broadening posteriorly. The ventral posterior edge of the tube extended into a rounded, lobelike flap which is shorter than in many species. The eleventh segment showing slightly beyond the dorsal edge of the tubular part as a small ringlike segment and with a short fingerlike stylus.

Each harpago from a flattened lateral view is an elongate lobe with its ventral margin strongly outwardly rounded and its dorsal margin shallowly concave through middle, after which the posterior third of this margin is reflexed, inwardly forming a narrow projection, the caudal angle of which is bifurcate, with a dorsal process which is bluntly rounded at end and projects inward and the ventral process which is sharply pointed and projected ventrad and externally.

The aedeagus is shorter than in some species, being a thick, tubular semisclerotized process which ends bluntly at apex in two lobes. On the left side it bears a sharply pointed, sclerotized process attached at middle and extending to about the apex of the middle third of the aedeagus. Just dorsad of this middle hook is a more lobate process. A second long, curved, well-sclerotized hook, partially covered by the theca, is attached somewhat near the base of the aedeagus and extends to the same distance as the median one. At a point where it emerges from the theca it bears a short, dorsal, sharply pointed spine. On the right side the aedeagus shows only

a median, slightly curved process. The theca is a cylinder around the basal third of the aedeagus, after which dorsad it extends over the aedeagus as a lobelike hood, which is slightly broader and longer on the left side than on the right.

Comparative notes. *N. diversus* is closely allied with *N. uniformus* and *curvaminis*. The three species are difficult to distinguish externally and the genitalia are more similar than in other species. The latter, however, do show variations, which are constant. Many slides of *uniformus* were made to prove this. The following external differences are helpful in distinguishing the three: *curvaminis* is more readily separated from the other two because the vein Sc_1 is distinctly arched inwardly, making the small cells in the costal area wider than long, in *uniformus* vein Sc_1 is straight and the costal cells are square, in *diversus* Sc_1 tends to curve outwardly, thus making the costal cells usually longer than wide; the number of cross veins in the costal area tends to vary in the three species, numbering four or five in *curvaminis* and *diversus*, and seven or eight in *uniformus*; the clavus in *diversus* is relatively longer, being more than twice as long as the distance from its apex to apex of tegmen, while in *curvaminis* and *uniformus* it is only approximately twice longer; the longitudinal veins branch more in *curvaminis* than in the other two, especially M, which is five-branched in *curvaminis* and only four in *uniformus* and *diversus*; in *diversus* the clypeus is relatively shorter, being equal only to the basal or posterior margin of the frons and in the other two it is equal to one lateral margin of the frons.

Location of types. Holotype male and allotype female, collected in the Santa Rita mountains, Arizona, by Paul Oman, June 27, 1933. Also twenty-nine female and twenty-one male paratypes collected during June at the same place and by the same collector. Also one male paratype collected June 12, 1933, and two others, August 18, 1935, by R. H. Beamer. The types and most of the paratypes in the National Museum, Washington, D. C.; the other paratypes in the Snow Entomological Collection, University of Kansas.

THE GENUS MISODEMA Melichar, 1906

Melichar, Leopold. Monographie der Issiden (Homoptera). Abk. k. k. Zoöl.-Bot. Ges. Wien., III, pt. 4, 1906.

Comparative notes. The most distinctive characteristics of this genus are the following: opaque tegmina with a coarse reticulation of thick, strongly elevated veins, a very short clavus, as compared to length of the tegmen and costal margin not inflected; scutellum

long with three prominent longitudinal carinae; wings lacking; hind tibiae with four strong spines.

Misodema reticulata Melichar, 1906

(Plates LXVI, LXVII)

Melichar, Leopold. Monographie der Issiden (Homoptera). Abh. k. k. Zool. Bot. Ges. Wien, III, pt. 4, 1906.

Size. Length of body from tip of head to apex of tegmen, 3.5 mm. to 4 mm.

Color. Uniform testaceous brown or gray-brown; tegmina same, but approaching amber when light is transmitted through them. Vertex light brown except anterior margin, lateral margins and median carina, which are light yellow. Frons uniform brown with a yellow median carina, narrow yellow lateral margins and a longitudinal row of yellow spots just mesad of each lateral margin. Pronotum brown with a cluster of round yellow spots on each lateral half. Mesonotum dark brown at base, lighter brown areas across apex. Tegmina opaque, uniformly dark brown, with elevated prominent veins, which are more yellowish than the cells. Underside of body and legs brown.

Structural characteristics. Head narrower than pronotum. Vertex subequal in length and width, depressed through middle, a weak median carina present, lateral margins elevated, anterior margins triangularly produced cephalad for a considerable distance beyond eyes, so that vertex and frons as viewed from the side form an acute angle. Frons about one fifth longer than wide, lateral margins rounding, greatest width across anterior third, anterior margin deeply notched to receive postclypeus, posterior margin as viewed from the cephalic aspect somewhat rounding. Clypeus about one half the length of the frons, slightly inflated. Pronotum collarlike, strongly produced anteriorly into the head, very narrowed at sides, deeply emarginate behind, and length through middle subequal to length of vertex at middle. Scutellum large, anteriorly greatly produced into pronotum, narrowly tapered at sides and moderately produced caudad to a rounded apex; three longitudinal carinae present. Tegmina longer than body, considerably inflated, at base broadly expanded, gradually narrowing toward apex; traversed by conspicuous thick veins making an irregular network so that the course of the longitudinal veins is obscured; clavus short, with its tip scarcely reaching to middle of anal margins, costal margin not inflected at base. Hind wings lacking. Hind tibiae with four spines.

Comparative notes. The outstanding structural characteristics of the species are the heavy reticulation of the tegmina, the short clavus, the strongly produced vertex, the collarlike pronotum, the tricarinate scutellum and the quadrispinose hind tibiae. It resembles most closely *Dictyonissus griphus* Uhler, but is easily distinguished from the latter by the appearance of the tegmina, which are opaque and hairless in *Misodema*, but translucent and covered with conspicuous hairs in *Dictyonissus*.

Location of type. National Museum, Washington, D. C.

Notes on distribution. Melichar listed this species from Mexico and Texas. The label on the type specimen states that it was collected in Texas, by C. V. Riley.

THE GENUS DICTYSSONIA, 1936

Ball, E. D. Some New Issids With Notes on Others (Homoptera, Fulgoridae). Proc. Biol. Soc. Wash. 49: 155-158, 1936.

Comparative notes. Doctor Ball in his description of the genus states that this genus is the size and form of *Dictyobia* Uhler and resembles it in several respects. It is separated from this genus by having definite bullae at the outer angles of the tegmina, uniformly finely reticulate tegmina, in which the major venation is almost lost in the reticulation and the posterior margins rounding together. The genus is separated from *Neaethus* Stål, Doctor Ball points out, by having tegmina much longer and narrower behind and finer reticulation and from the genus *Dictyssa* likewise, by having this finer reticulation.

In wing venation this genus fits in the tribe *Issini* rather than *Hysteropterini*, in which it is placed in the present key mainly because it has only vestiges of hind wings. The wing venation is as follows: Sc_1 lacking apparently, altho the veins forming the dark reticulation run together at the place where Sc_1 would be found and simulate a longitudinal vein; veins Sc_2 and R are fused for a short distance after leaving the main vein trunk and vein Sc_2 appears to have two branches and R three; vein M appears to have six branches, but with all of these three veins the longitudinal branches are not easily distinguished in the apical reticulation. Vein Cu_1 is distinctly a single vein and in this respect resembles the *Issini* and *Thionini*. The hind tibiae bear two lateral spines.

There is only one species in the genus.

Dictyssonina beameri Ball, 1936

(Plates LXVI, LXVII)

Comparative notes. This is a medium-sized *Issid*, measuring 4.8 mm. to 5 mm. in length, testaceous-brown in color with semi-translucent, whitish-gray tegmina, thickly traversed with reddish-brown longitudinal veins and a fine pitch brown reticulation, so that superficially the insect has a peppered appearance.

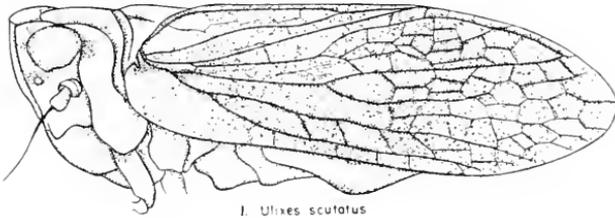
In his description Doctor Ball states that this species is the size of *Dictyobia permutata* Uhl., but is distinguished by having the elytra more inflated and rounding together behind, with definite bullae. It likewise has a finer reticulation, whiter wings, and much narrower vertex than this species.

Location of types and notes on distribution. Described from three examples taken in the Pinery Canyon, in the Chiricahua mountains in Arizona. Holotype male and one paratype male in Doctor Ball's collection, Tucson, Ariz., and one paratype in the Snow Entomological Collection at the University of Kansas.

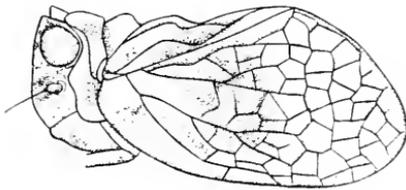
PLATE XLIX

1. Lateral aspect of *Ulixes scutatus* Walker.
2. Dorsal aspect of *Ulixes scutatus* Walker.
3. Lateral aspect of *Traxus fulvus* Metcalf.
4. Dorsal aspect of *Traxus fulvus* Metcalf.
5. Dorsal aspect of *Tylana ustulata* Uhler.
6. Dorsal aspect of head and thorax of *Euthiscia tuberculata* Van Duzee.
7. Lateral aspect of *Euthiscia tuberculata* Van Duzee.

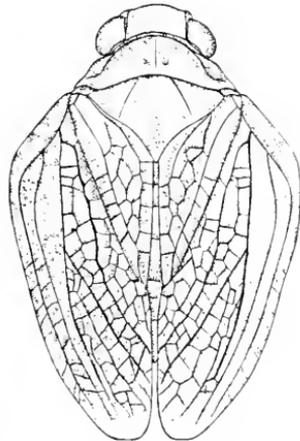
PLATE XLIX



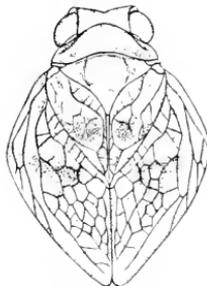
1. *Ulixes scutatus*



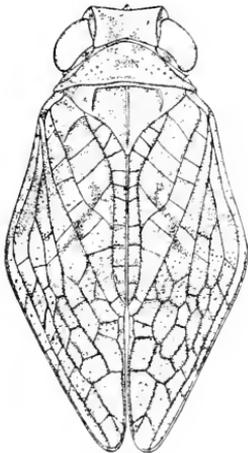
3. *Troxus fulvus*



2. *Ulixes scutatus*



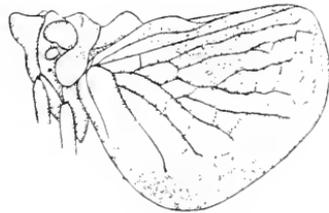
4. *Troxus fulvus*



5. *Tylana ustulata*



6. *Euthiscia tuberculata*

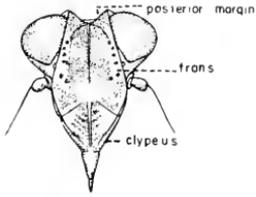


7. *Euthiscia tuberculata*

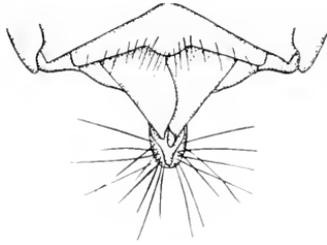
PLATE I

1. Frontal aspect of head of *Picumna ovatipennis* Walker, drawn from homotype in British Museum Collection.
2. Ventral aspect of female abdomen of *Picumna ovatipennis* Walker, drawn from homotype in British Museum Collection.
3. Dorsal aspect of *Picumna ovatipennis* Walker, drawn from homotype in British Museum Collection.
4. Dorsal aspect of *Picumna maculata* (Melichar).
5. Dorsal aspect of *Picumna chinai* n. sp.
6. Dorsal aspects of *Thionia simplex* (Germar).

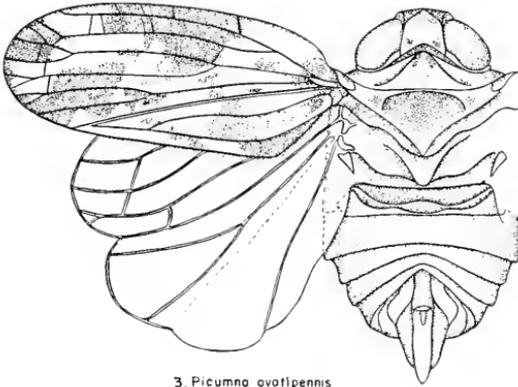
PLATE L



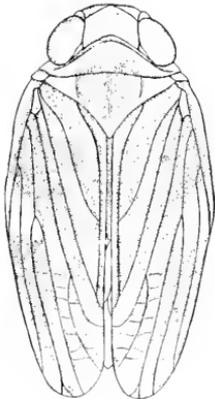
1. *Picumna ovatipennis*



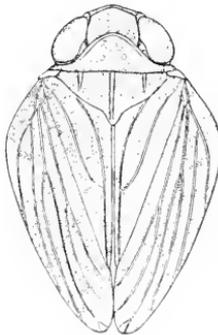
2. *Picumna ovatipennis*



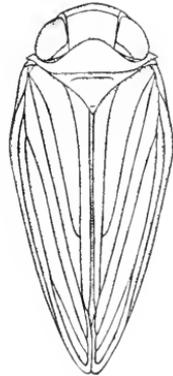
3. *Picumna ovatipennis*



4. *Picumna maculata*



5. *Picumna chinai*

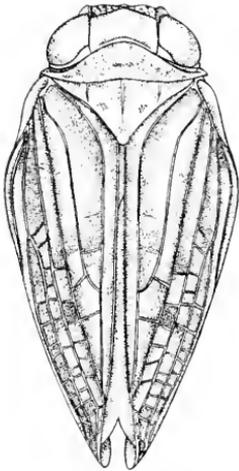


6. *Thionia simplex*

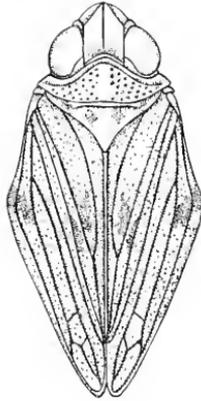
PLATE LI

1. Dorsal aspect of *Thionia omani* n. sp.
2. Same view of *Thionia producta* Van Duzee.
3. Same view of *Thionia quinquata* Metcalf.
4. Same view of *Thionia bullata* Say.
5. Same view of *Thionia naso* Fowler.
6. Same view of *Thionia elliptica* (Germar).

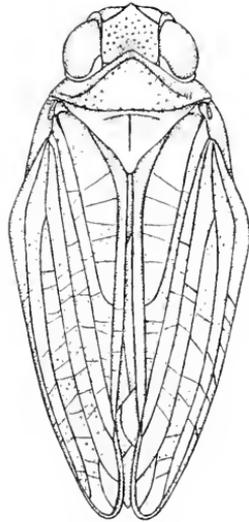
PLATE LI



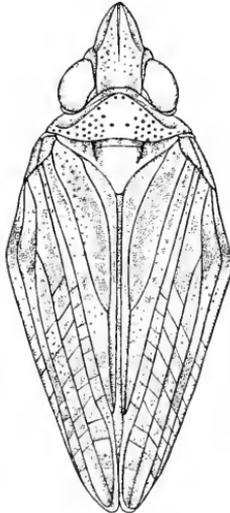
1. *Thionia omani*



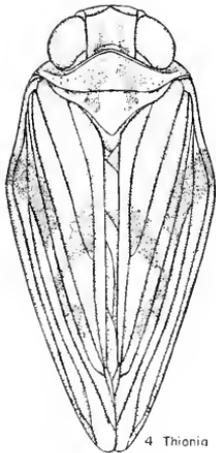
2. *Thionia producta*



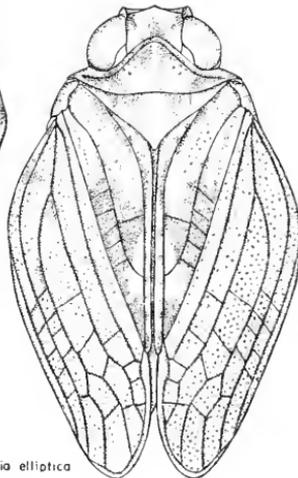
3. *Thionia quinquata*



5. *Thionia nasa*



4. *Thionia bullata*

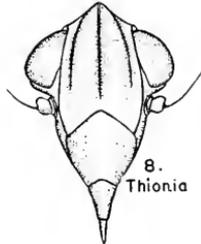
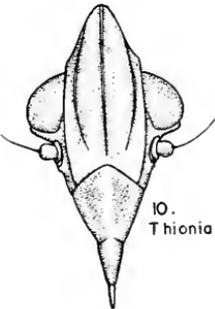
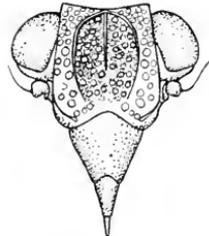
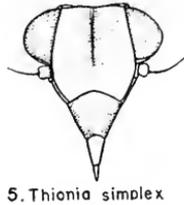
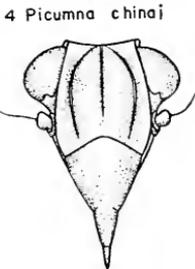
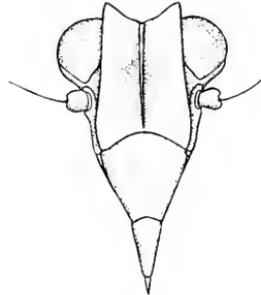
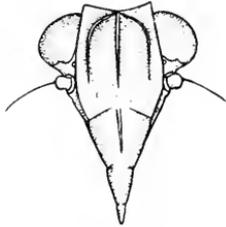
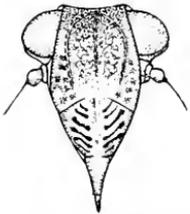
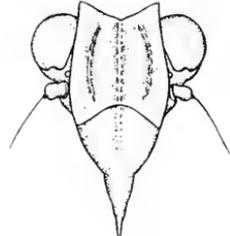
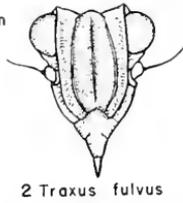
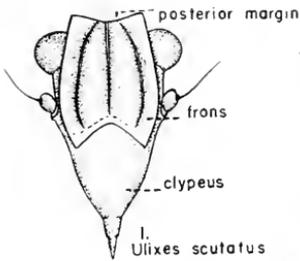


6. *Thionia elliptica*

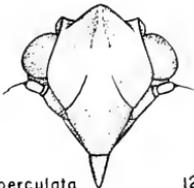
PLATE LII

1. Frontal aspect of *Ulixes scutatus* Walker.
2. Same view of *Traxus fulvus* Metcalf.
3. Same view of *Tylana ustulata* Uhler.
4. Same view of *Picumna chinai* n. sp.
5. Same view of *Thionia simplex* (Germar).
6. Same view of *Thionia elliptica* (Germar).
7. Same view of *Thionia bullata* Say.
8. Same view of *Thionia producta* Van Duzee.
9. Same view of *Thionia omani* n. sp.
10. Same view of *Thionia naso* Fowler.
11. Same view of *Euthiscia tuberculata* Van Duzee.
12. Same view of *Thionia quinquata* Metcalf.
13. Same view of *Picumna maculata* (Melichar).

PLATE LII



11. *Euthiscia tuberculata*



12. *Thionia quinquata*

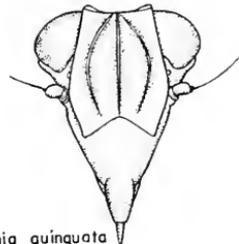


PLATE LIII

1. Flattened dorsal view of anal segments (10th and 11th) of *Traxus fulvus* Metcalf.
2. Same view of *Picumna maculata* (Melichar).
3. Same view of *Picumna chinai* n. sp.
4. Same view of *Thionia naso* Fowler.
5. Same view of *Thionia elliptica* (Germar).
6. Same view of *Thionia producta* VanDuzee.
7. Same view of *Thionia simplex* (Germar).
8. Same view of *Euthiscia tuberculata* VanDuzee.
9. Same view of *Tylana ustulata* Uhler.
10. Same view of *Thionia bullata* Say

PLATE LIII

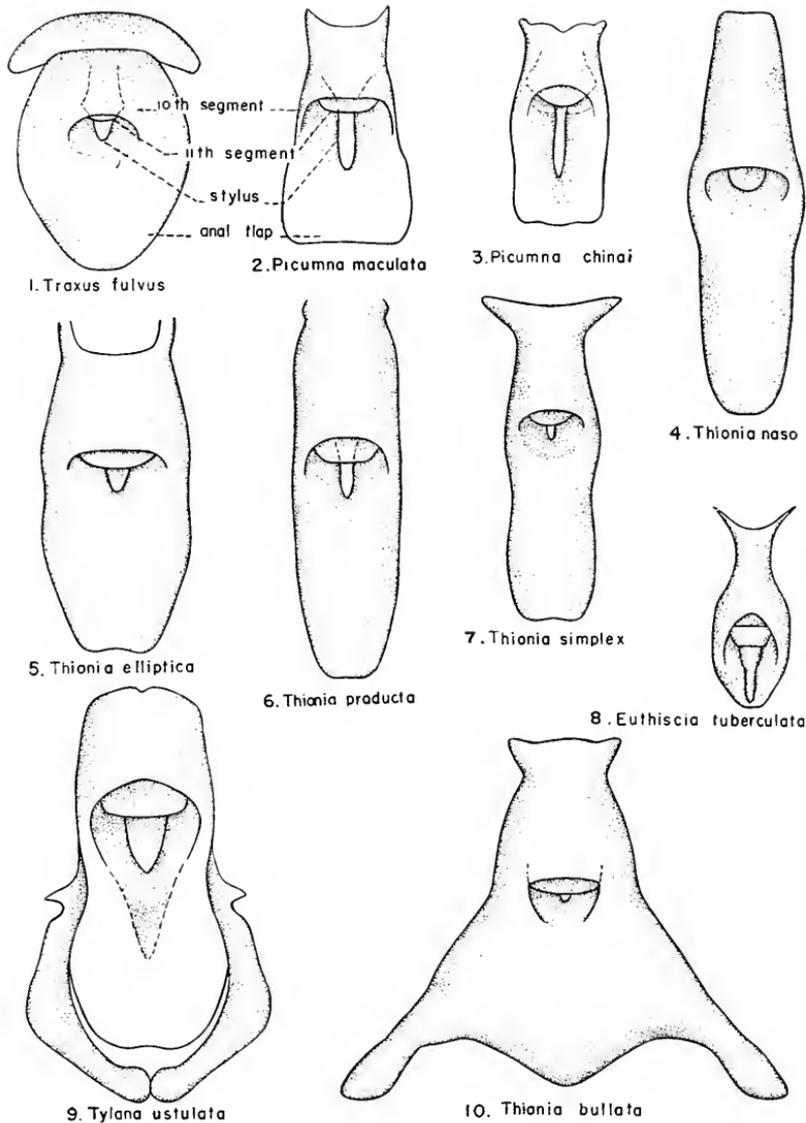
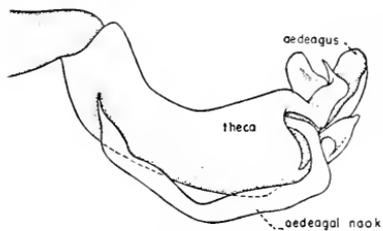


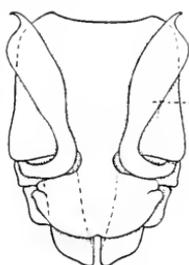
PLATE LIV

1. Left view of aedeagus of *Picumna chinai* n. sp.
2. Ventral view of theca and aedeagus of *Picumna chinai* n. sp.
3. Same view of *Picumna maculata* (Melichar).
4. Left view of theca and aedeagus of *Tylana ustulata* Uhler.
5. Same view of *Picumna maculata* (Melichar).
6. Ventral view of theca and aedeagus of *Euthiscia tuberculata* VanDuzec.
7. Same view of *Tylana ustulata* Uhler.
8. Same view of abdomen showing aedeagus of *Ulixes scutatus* Walker, drawn from type material from British Museum Collection.
9. Left view of theca and aedeagus of *Euthiscia tuberculata* VanDuzec.
10. Dorso-posterior view of abdomen and aedeagal structure of *Ulixes scutatus* Walker from the type material in the British Museum Collection.

PLATE LIV



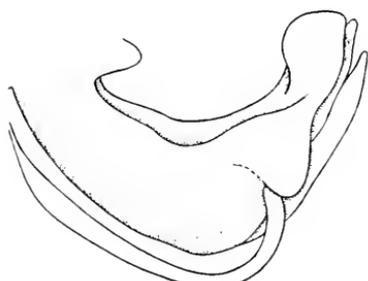
1. *Picumna chinae*



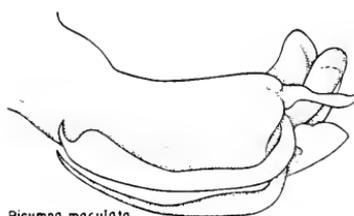
2. *Picumna chinae*



3. *Picumna maculata*



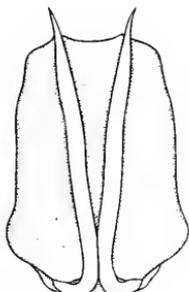
4. *Tylana ustulata*



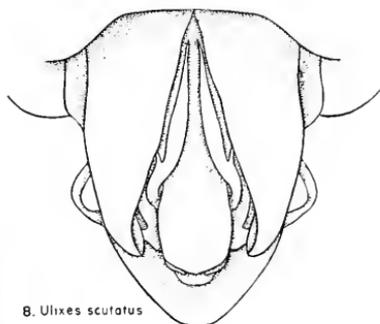
5. *Picumna maculata*



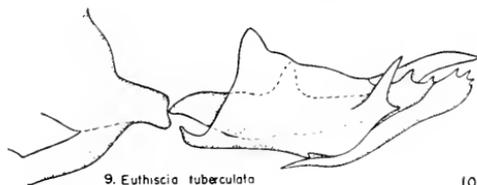
6. *Euthiscia tuberculata*



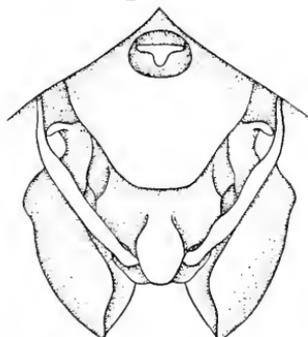
7. *Tylana ustulata*



8. *Ulixes scutatus*



9. *Euthiscia tuberculata*

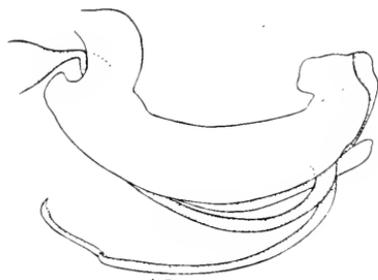


10. *Ulixes scutatus*

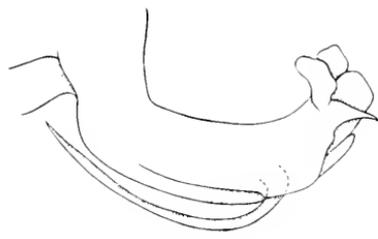
PLATE IV

1. Left view of aedeagus and theca of *Thionia naso* Fowler.
2. Same view of *Thionia simplex* (Germar).
3. Same view of *Traxus fulvus* Metcalf.
4. Same view of *Thionia elliptica* (Germar).
5. Ventral view of aedeagus and theca of *Traxus fulvus* Metcalf.
6. Same view of *Thionia elliptica* (Germar).
7. Same view of *Thionia producta* VanDuzee.
8. Left view of aedeagus and theca of *Thionia producta* VanDuzee.
9. Ventral view of aedeagus and theca of *Thionia bullata* Say.
10. Left view of aedeagus and theca of *Thionia bullata* Say.

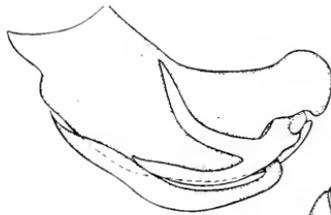
PLATE LV



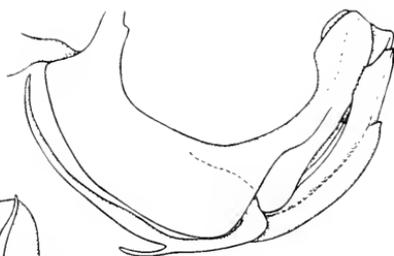
1 *Thionia neso*



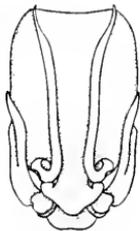
2. *Thionia simplex*



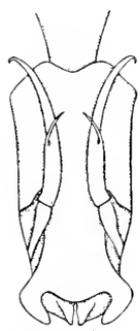
3. *Traxus fulvus*



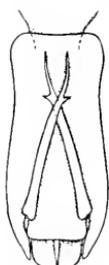
4. *Thionia elliptica*



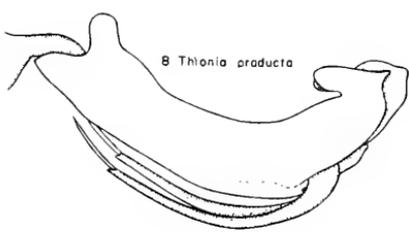
5. *Traxus fulvus*



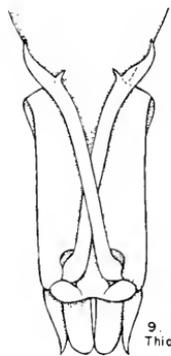
6 *Thionia elliptica*



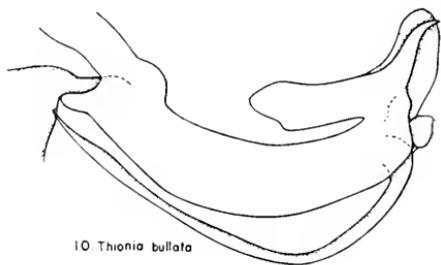
7. *Thionia producta*



8 *Thionia producta*



9. *Thionia bullata*

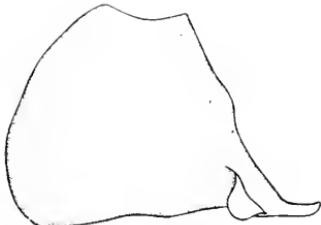


10 *Thionia bullata*

PLATE LVI

1. Flattened lateral view of harpago of *Picumna chinai* n. sp.
2. Same view of *Picumna maculata* (Melichar).
3. Same view of *Euthiscia tuberculata* VanDuzee.
4. Same view of *Tylana ustulata* Uhler.
5. Same view of *Thionia simplex* (Germar).
6. Same view of *Thionia producta* VanDuzee.
7. Same view of *Thionia elliptica* (Germar).
8. Same view of *Traxus fulvus* Metcalf.
9. Same view of *Thionia bullata* Say.
10. Same view of *Thionia naso* Fowler.

PLATE LVI



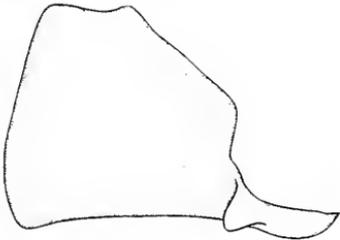
1. *Picumna chinai*



2. *Picumna maculata*



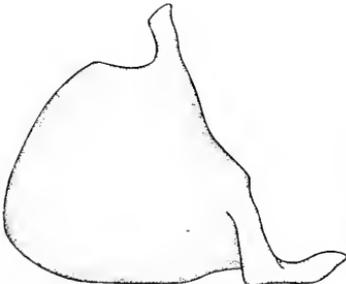
3. *Euthiscia tuberculata*



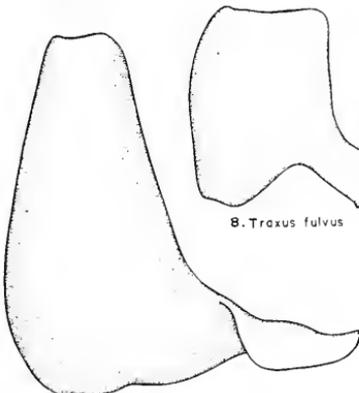
4. *Tylana ustulata*



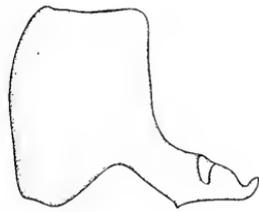
5. *Thionia simplex*



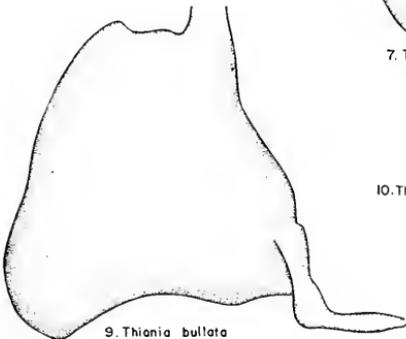
6. *Thionia producta*



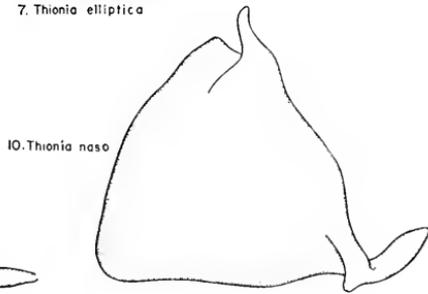
7. *Thionia elliptica*



8. *Traxus fulvus*



9. *Thionia bullata*

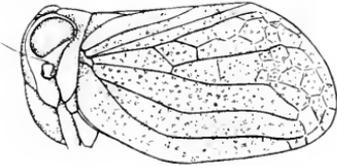


10. *Thionia naso*

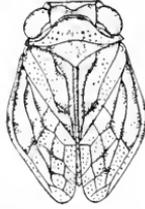
PLATE LVII

1. Lateral view of *Hysteropterum aurorum* Uhler.
2. Dorsal view of *Hysteropterum sepulchralis* Ball.
3. Lateral view of *Hysteropterum sepulchralis* Ball.
4. Dorsal view of *Hysteropterum aurorum* Uhler.
5. Dorsal view of *Hysteropterum cornutum* Melichar.
6. Lateral view of *Hysteropterum cornutum* Melichar.
7. Lateral view of *Hysteropterum unum* Ball.
8. Dorsal view of *Hysteropterum fuscomaculosum* n. sp.
9. Lateral view of *Hysteropterum fuscomaculosum* n. sp.
10. Dorsal view of *Hysteropterum unum* Ball.
11. Lateral view of *Hysteropterum putiferum* Walker.
12. Dorsal view of *Hysteropterum putiferum* Walker.
13. Lateral view of *Hysteropterum bufo* VanDuzee.
14. Dorsal view of *Hysteropterum bufo* VanDuzee.

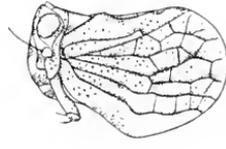
PLATE LVII



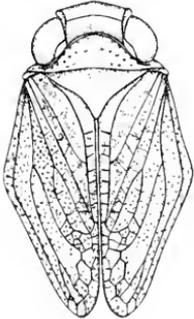
1. *Hysteropterus aureum*



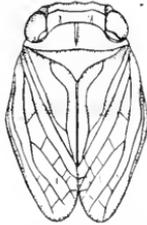
2. *H. sepulchralis*



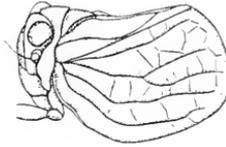
3. *H. sepulchralis*



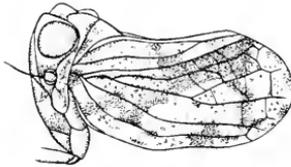
4. *H. aureum*



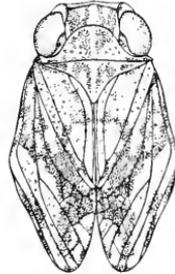
5. *Hysteropterus cornulum*



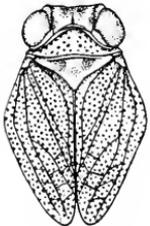
6. *Hysteropterus cornulum*



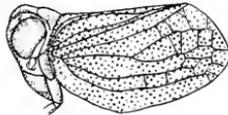
7. *H. unum*



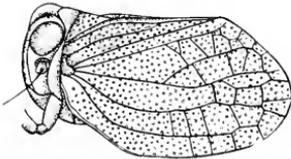
10. *H. unum*



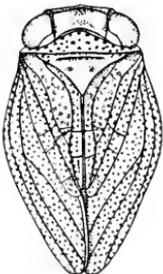
8. *H. fuscomaculosus*



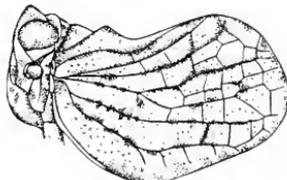
9. *H. fuscomaculosus*



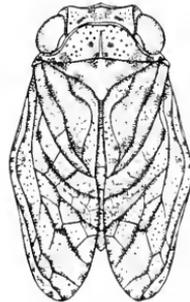
11. *H. punctiferum*



12. *H. punctiferum*



13. *H. bufo*

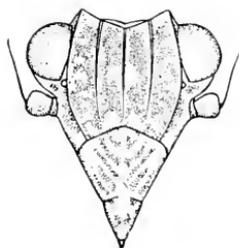


14. *H. bufo*

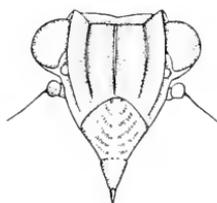
PLATE LVIII

1. Frontal aspect of head of *Hysteropterum unum* Ball.
2. Same aspect of *Hysteropterum sepulchralis* Ball.
3. Same aspect of *Hysteropterum bufo* VanDuzee.
4. Same aspect of *Hysteropterum puntiferum* Walker.
5. Same aspect of *Hysteropterum aureum* Uhler.
6. Same aspect of *Hysteropterum fuscomaculosum* n. sp.
7. Left view of aedeagus and theca of *Hysteropterum puntiferum* Walker.
8. Frontal aspect of head of *Hysteropterum cornutum* Melichar.
9. Left view of aedeagus and theca of *Hysteropterum fuscomaculosum* n. sp.
10. Same view of *Hysteropterum sepulchralis* Ball.
11. Same view of *Hysteropterum cornutum* Melichar.
12. Same view of *Hysteropterum aureum* Uhler.
13. Same view of *Hysteropterum unum* Ball.

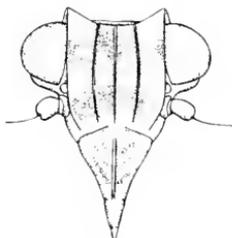
PLATE LVIII



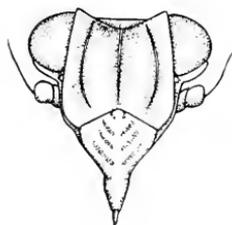
H unum



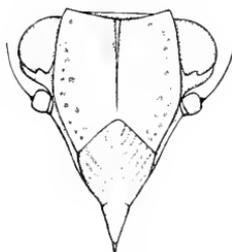
2. H sepulchralis



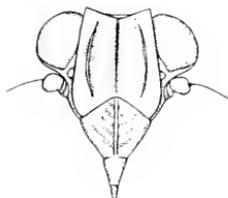
3 H bufo



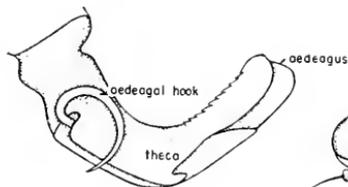
4 H punctiferum



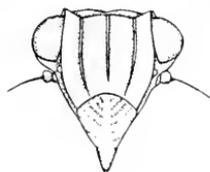
H.aurareum



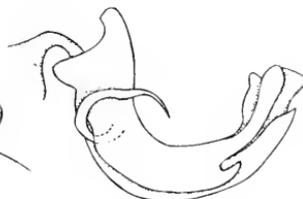
6. H fuscumaculosum



7. H. punctiferum



8. H. cornutum



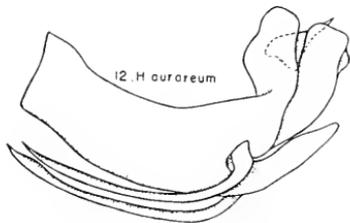
9. H fuscumaculosum



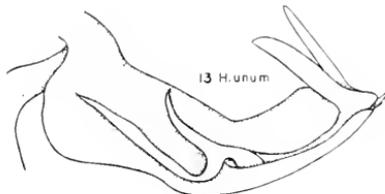
10 H. sepulchralis



11 H. cornutum



12. H. aurareum



13 H. unum

PLATE LIX

1. Flattened dorsal view of anal segments (10th and 11th) of female of *Hysteropterum unum* Ball.
2. Same view of male of *Hysteropterum unum* Ball.
3. Same view of female of *Hysteropterum aureum* Uhler.
4. Same view of male of *Hysteropterum aureum* Uhler.
5. Same view of male of *Hysteropterum cornutum* Melichar.
6. Same view of female of *Hysteropterum cornutum* Melichar.
7. Same view of female of *Hysteropterum fuscomaculosum* n. sp.
8. Same view of male of *Hysteropterum punctiferum* Walker.
9. Same view of male of *Hysteropterum sepulchralis* Ball.
10. Same view of female of *Hysteropterum sepulchralis* Ball.
11. Same view of male of *Hysteropterum fuscomaculosum* n. sp.
12. Same view of female of *Hysteropterum punctiferum* Walker.
13. Flattened lateral view of harpago of *Hysteropterum unum* Ball.
14. Same view of *Hysteropterum sepulchralis* Ball.
15. Same view of *Hysteropterum cornutum* Melichar.
16. Same view of *Hysteropterum punctiferum* Walker.
17. Same view of *Hysteropterum fuscomaculosum* n. sp.
18. Same view of *Hysteropterum aureum* Uhler.

PLATE LIX

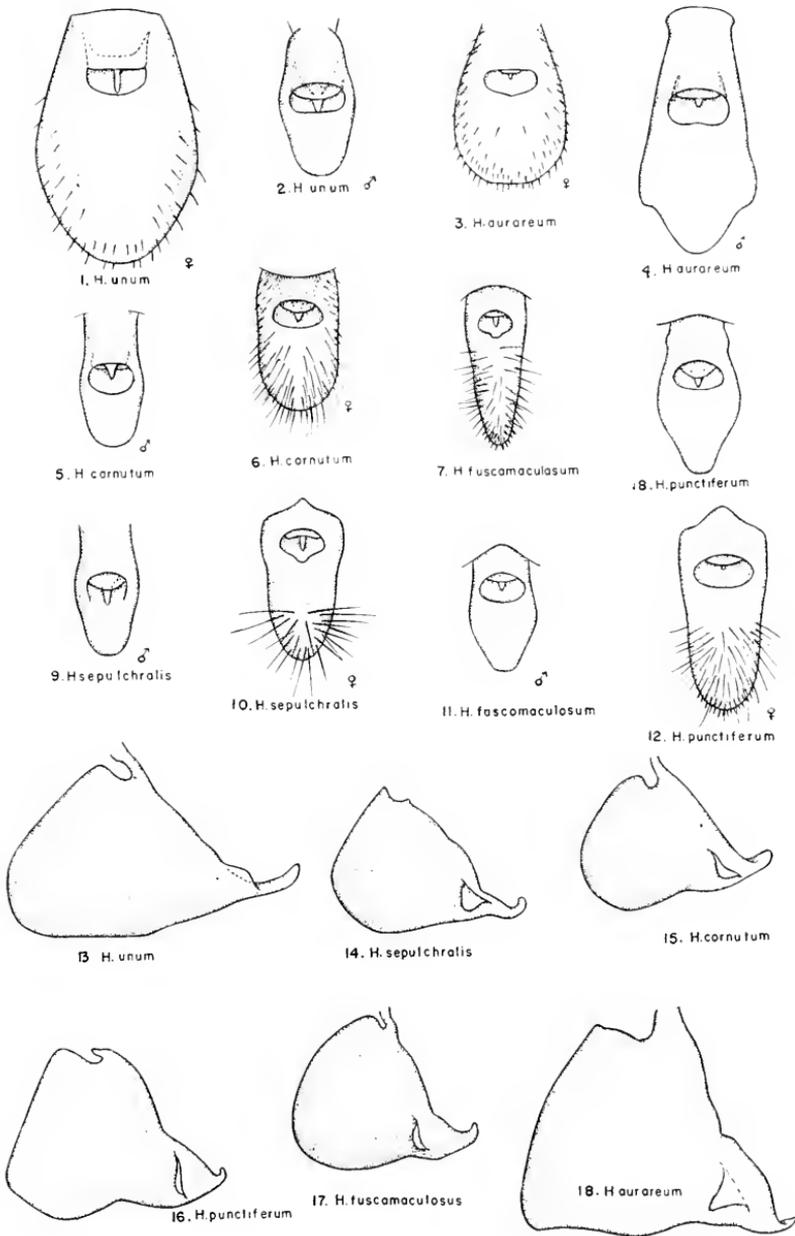


PLATE LX

1. Lateral aspect of *Ncaethus fenestratus* Melichar.
2. Same view of *Ncaethus curvaminis* n. sp.
3. Same view of *Ncaethus diversus* n. sp.
4. Same view of *Ncaethus uniformis* n. sp.
5. Same view of *Ncaethus similis* n. sp.
6. Same view of *Ncaethus perlucidus* n. sp.
7. Same view of *Ncaethus fragosus* VanDuzee.
8. Same view of *Ncaethus sinchamatus* n. sp.
9. Same view of *Ncaethus maculatus* Melichar.
10. Same view of *Ncaethus vitripennis* Stal.
11. Same view of *Ncaethus nigronervosus* Melichar.
12. Same view of *Ncaethus grossus* Melichar.
13. Same view of *Ncaethus jacinticusus* n. sp.

PLATE LX

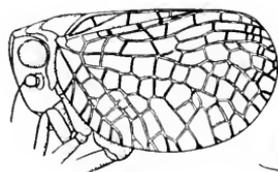
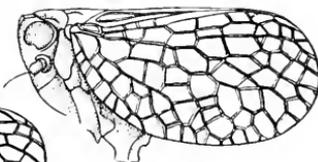
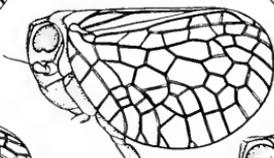
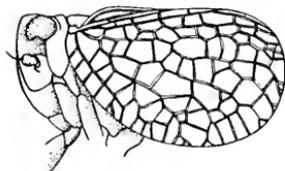
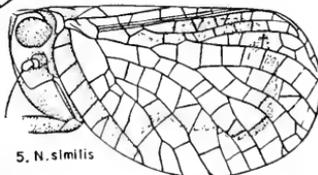
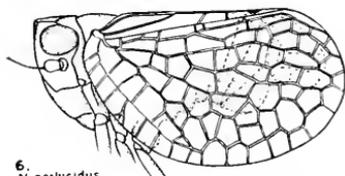
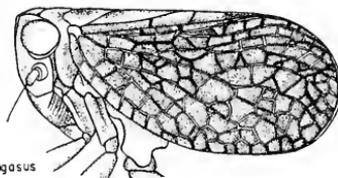
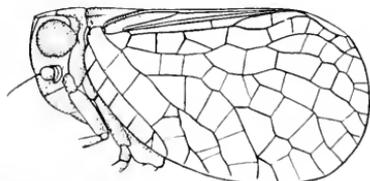
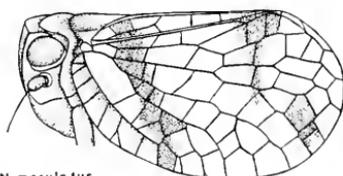
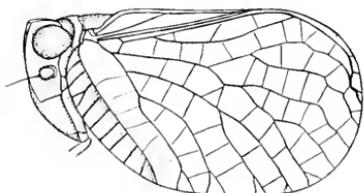
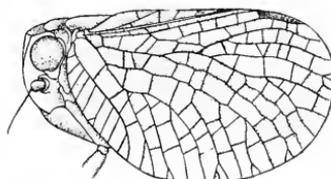
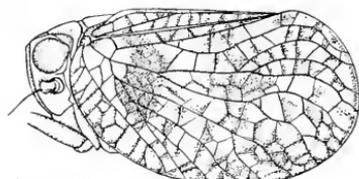
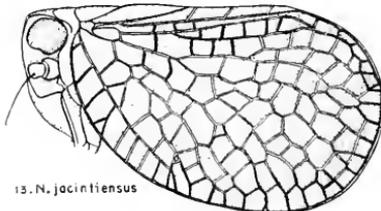
1. *N. fenestratus*3. *N. diversus*2. *N. curvaminis*4. *N. uniformis*5. *N. similis*6. *N. perlucidus*7. *N. fragosus*8. *N. sinehamatus*9. *N. maculatus*10. *N. vitripennis*11. *N. nigranervosus*12. *N. grossus*13. *N. jacintiensus*

PLATE LXI

1. Dorsal aspect of head and pronotum of *Neacthus uniformis* n. sp.
2. Same view of *Neacthus curvaminis* n. sp.
3. Same view of *Neacthus diversus* n. sp.
4. Same view of *Neacthus fenestratus* Melichar.
5. Same view of *Neacthus nigronervosus* Melichar.
6. Same view of *Neacthus similis* n. sp.
7. Same view of *Neacthus maculatus* Melichar.
8. Same view of *Neacthus jacinicensis* n. sp.
9. Same view of *Neacthus perlucidus* n. sp.
10. Same view of *Neacthus vitripennis* Stal.
11. Same view of *Neacthus sinchamatus* n. sp.
12. Same view of *Neacthus grossus* Melichar.
13. Frontal aspect of head of *Neacthus uniformis* n. sp.
14. Same view of *Neacthus diversus* n. sp.
15. Same view of *Neacthus fenestratus* Melichar.
16. Dorsal aspect of head and pronotum of *Neacthus fragosus* VanDuzee.
17. Frontal aspect of head of *Neacthus nigronervosus* Melichar.
18. Same view of *Neacthus curvaminis* n. sp.
19. Same view of *Neacthus sinchamatus* n. sp.
20. Same view of *Neacthus grossus* Melichar.
21. Same view of *Neacthus similis* n. sp.
22. Same view of *Neacthus maculatus* Melichar.
23. Same view of *Neacthus perlucidus* n. sp.
24. Same view of *Neacthus vitripennis* Stal.
25. Same view of *Neacthus jacinicensis* n. sp.
26. Same view of *Neacthus fragosus* VanDuzee.

PLATE LXI

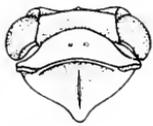
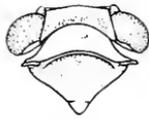
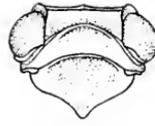
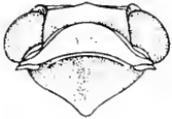
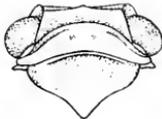
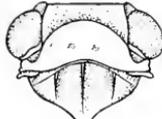
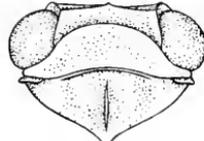
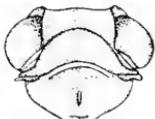
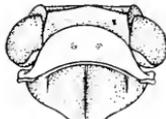
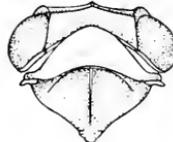
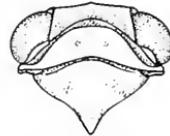
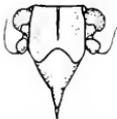
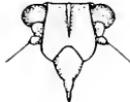
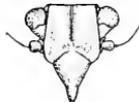
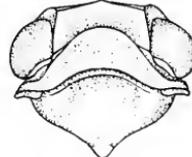
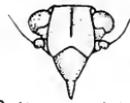
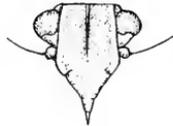
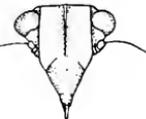
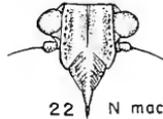
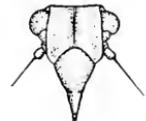
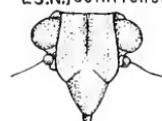
1. *N. uniformis*2. *N. curvaminis*3. *N. diversus*4. *N. fenestratus*5. *N. nigronervosus*6. *N. similis*7. *N. maculatus*8. *N. jacintiensus*9. *N. perlucidus*10. *N. vitripennis*11. *N. sinehamatus*12. *N. grossus*13. *N. unformis*14. *N. diversus*15. *N. fenestratus*16. *N. fragosus*17. *N. nigronervosus*18. *N. curvaminis*19. *N. sinehamatus*20. *N. grossus*22. *N. maculatus*25. *N. jacintiensus*21. *N. similis*23. *N. perlucidus*24. *N. vitripennis*26. *N. fragosus*

PLATE LXII

1. Flattened dorsal view of anal segments (10th and 11th) of male of *Neacthus uniformis* n. sp.
2. Same view of *Neacthus diversus* n. sp.
3. Same view of *Neacthus fenestratus* Melichar.
4. Same view of *Neacthus curvaminis* n. sp.
5. Same view of *Neacthus grossus* Melichar.
6. Same view of *Neacthus similis* n. sp.
7. Same view of *Neacthus vitripennis* Stal.
8. Same view of *Neacthus fragosus* VanDuzee.
9. Same view of *Neacthus jacintiensus* n. sp.
10. Same view of *Neacthus perucidus* n. sp.
11. Same view of *Neacthus nigrouerosus* Melichar.
12. Same view of *Neacthus sinchamatus* n. sp.
13. Flattened lateral view of harpago of *Neacthus nigrouerosus* Melichar.
14. Same view of *Neacthus maculatus* Melichar.
15. Flattened dorsal view of anal segment of male of *Neacthus maculatus* Melichar.
16. Flattened lateral view of harpago of *Neacthus similis* n. sp.
17. Same view of *Neacthus uniformis* n. sp.
18. Same view of *Neacthus diversus* n. sp.
19. Same view of *Neacthus curvaminis* n. sp.
20. Same view of *Neacthus fenestratus* Melichar.
21. Same view of *Neacthus fragosus* VanDuzee.
22. Same view of *Neacthus grossus* Melichar.
23. Same view of *Neacthus jacintiensus* n. sp.

PLATE LXII

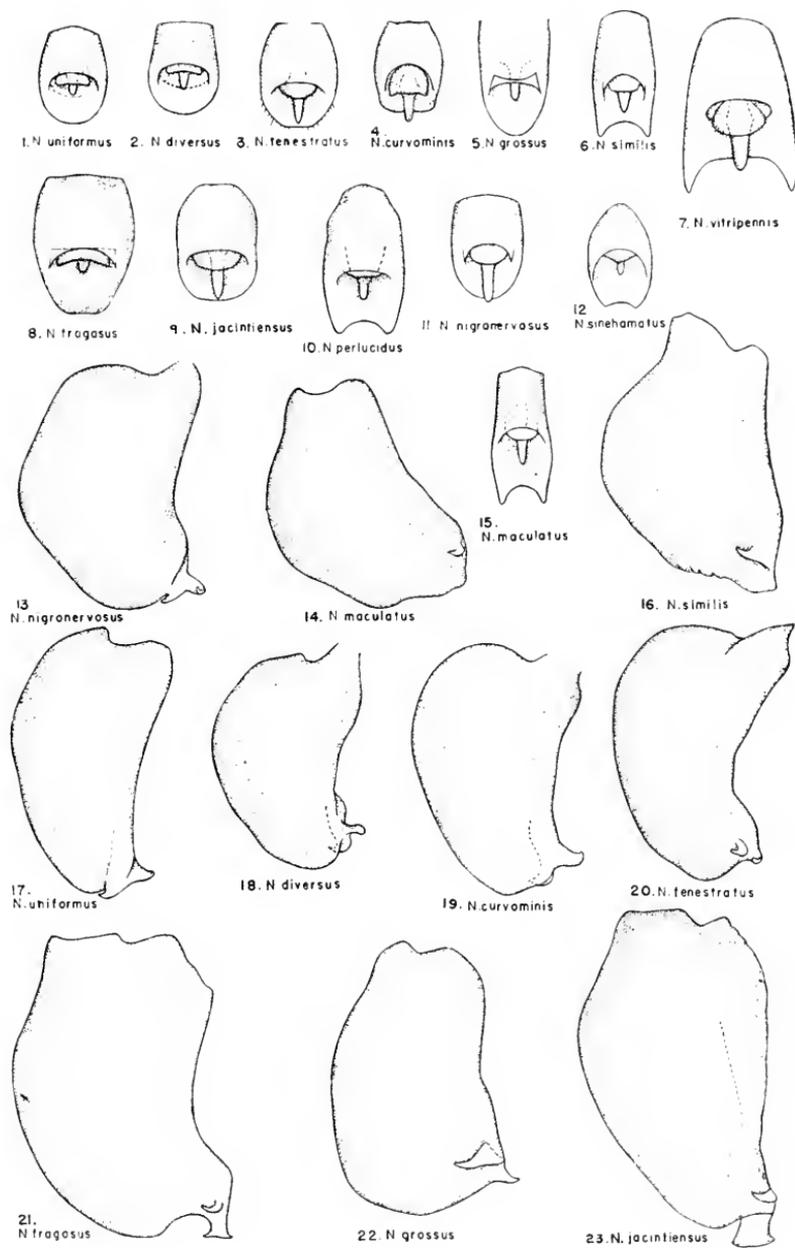


PLATE LXIII

1. Left view of aedeagus and theca of *Neacthus perlucidus* n. sp.
2. Right view of aedeagus and theca of *Neacthus perlucidus* n. sp.
3. Left view of aedeagus and theca of *Neacthus sinchamatus* n. sp.
4. Right view of aedeagus and theca of *Neacthus vitripennis* Stal.
5. Right view of aedeagus and theca of *Neacthus sinchamatus* n. sp.
6. Left view of aedeagus and theca of *Neacthus vitripennis* Stal.
7. Flattened lateral view of harpago of *Neacthus sinchamatus* n. sp.
8. Same view of *Neacthus perlucidus* n. sp.
9. Same view of *Neacthus vitripennis* Stal.

PLATE LXIII

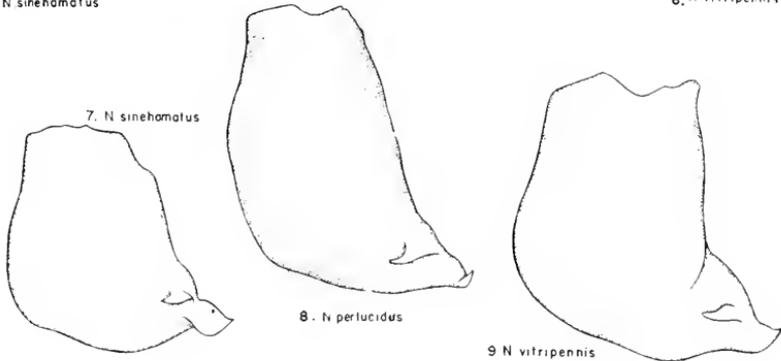
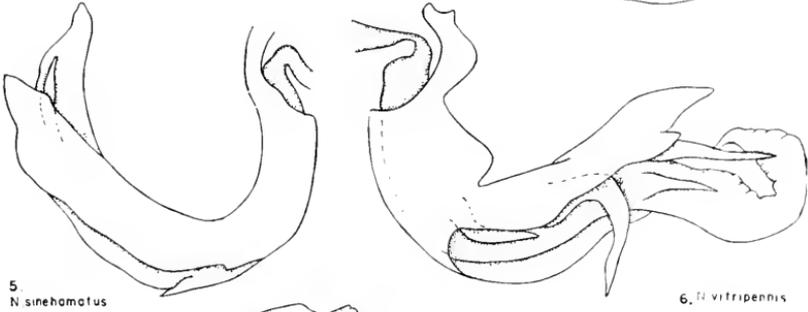
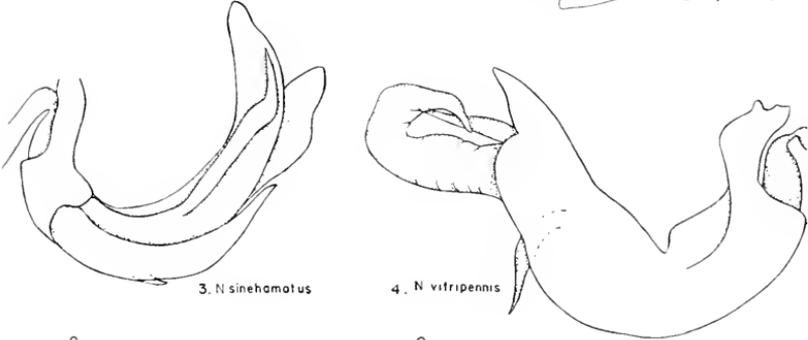
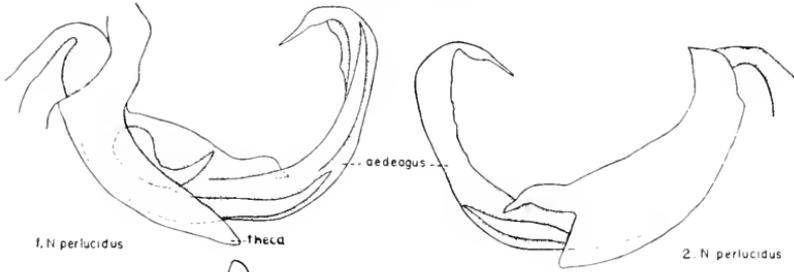
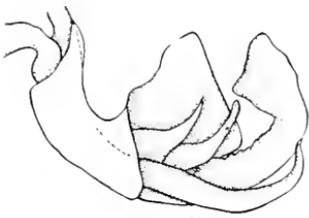


PLATE LXIV

1. Left view of aedeagus and theca of *Neacthus curvaminis* n. sp.
2. Right view of aedeagus and theca of *Neacthus curvaminis* n. sp.
3. Left view of aedeagus and theca of *Neacthus diversus* n. sp.
4. Right view of aedeagus and theca of *Neacthus diversus* n. sp.
5. Left view of aedeagus and theca of *Neacthus uniformis* n. sp.
6. Right view of aedeagus and theca of *Neacthus uniformis* n. sp.
7. Left view of aedeagus and theca of *Neacthus fenestratus* Melichar.
8. Right view of aedeagus and theca of *Neacthus fenestratus* Melichar.
9. Left view of aedeagus and theca of *Neacthus fragosus* VanDuzee.
10. Right view of aedeagus and theca of *Neacthus fragosus* VanDuzee.

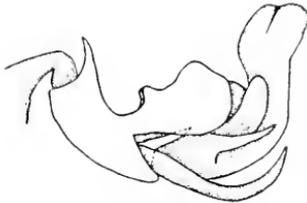
PLATE LXIV



1. *N. curvominis*



2. *N. curvominis*



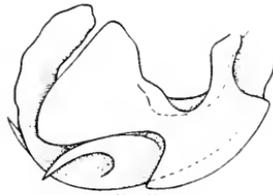
3. *N. diversus*



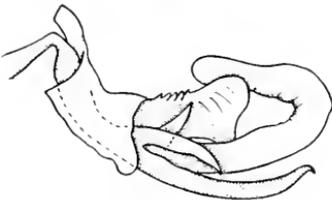
4. *N. diversus*



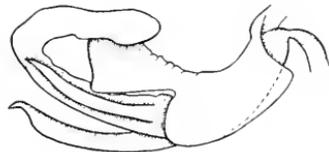
5. *N. uniformis*



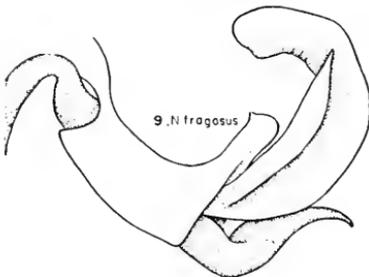
6. *N. uniformis*



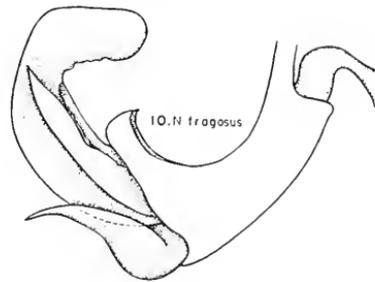
7. *N. fenestratus*



8. *N. fenestratus*



9. *N. fragosus*

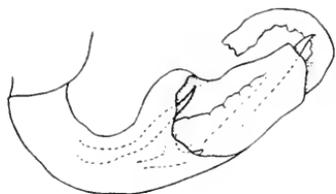


10. *N. fragosus*

PLATE LXV

1. Left view of aedeagus and theca of *Neaethus similis* n. sp.
2. Right view of aedeagus and theca of *Neaethus similis* n. sp.
3. Left view of aedeagus and theca of *Neaethus nigronervosus* Melichar.
4. Right view of aedeagus and theca of *Neaethus nigronervosus* Melichar.
5. Left view of aedeagus and theca of *Neaethus maculatus* Melichar.
6. Right view of aedeagus and theca of *Neaethus maculatus* Melichar.
7. Left view of aedeagus and theca of *Neaethus grossus* Melichar.
8. Left view of aedeagus and theca of *Neaethus jacinticusus* n. sp.
9. Right view of aedeagus and theca of *Neaethus grossus* Melichar.
10. Right view of aedeagus and theca of *Neaethus jacinticusus* n. sp.

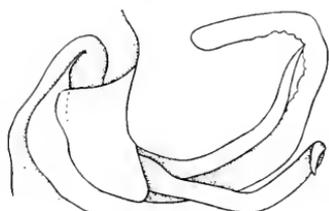
PLATE LXV



1. *N. similis*



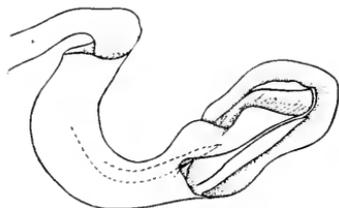
2. *N. similis*



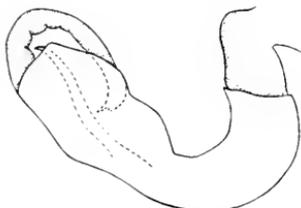
3. *N. nigronervosus*



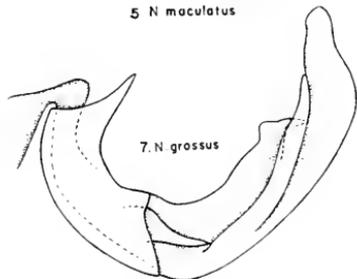
4. *N. nigronervosus*



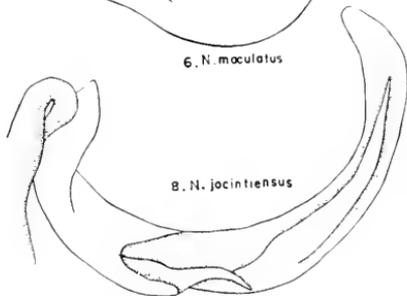
5. *N. maculatus*



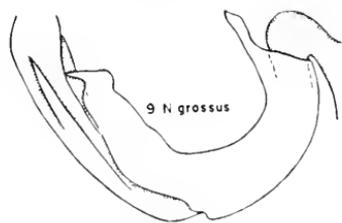
6. *N. maculatus*



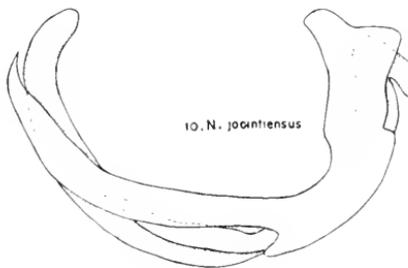
7. *N. grossus*



8. *N. jacinthensis*



9. *N. grossus*



10. *N. jacinthensis*

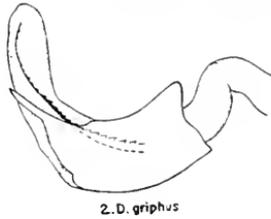
PLATE LXVI

1. Right view of theca and aedeagus of *Dictyonia obscura* Uhler.
2. Right view of theca and aedeagus of *Dictyonissus griffus* Uhler.
3. Left view of theca and aedeagus of *Dictyonissus griffus* Uhler.
4. Left view of theca and aedeagus of *Dictyonia obscura* Uhler.
5. Right view of theca and aedeagus of *Dictyonissus nigropilosus* n. sp.
6. Left view of theca and aedeagus of *Dictyonissus nigropilosus* n. sp.
7. Lateral aspect of *Dictyonia obscura* Uhler.
8. Lateral aspect of *Misodema reticulata* Melichar.
9. Dorsal aspect of *Misodema reticulata* Melichar.
10. Lateral aspect of *Dictyonissus griffus* Uhler.
11. Dorsal aspect of *Dictyonissus griffus* Uhler.
12. Dorsal aspect of *Dictyonissus nigropilosus* n. sp.
13. Dorsal aspect of *Dictyssonina beameri* Ball.

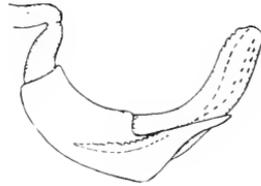
PLATE LXVI



1. *D. obscuro*



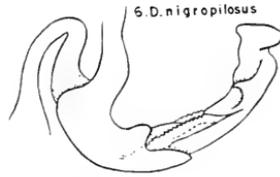
2. *D. griffus*



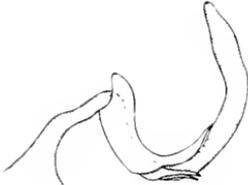
3. *D. griffus*



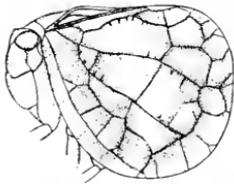
5. *D. nigropilosus*



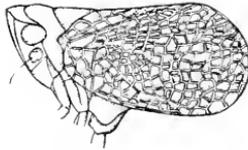
6. *D. nigropilosus*



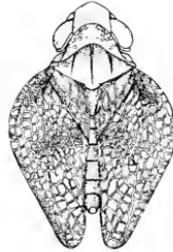
4. *D. obscuro*



7. *Dictyonia obscuro*



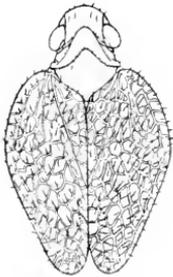
8. *M. reticulata*



9. *Misodema. reticulata*



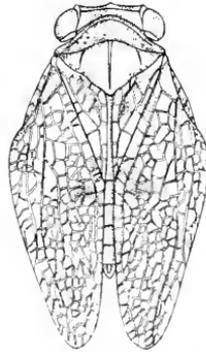
10. *D. griffus*



11. *Dictyonissus griffus*



12. *Dictyonissus nigropilosus*

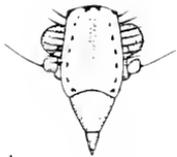


13. *Dictyssonina beameri*

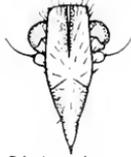
PLATE LXVII

1. Frontal aspect of head of *Dictyonissus griphus* Uhler.
2. Same view of *Dictyonissus nigropilosus* n. sp.
3. Same view of *Misodema reticulata* Melichar.
4. Same view of *Dictyssonina beameri* Ball.
5. Flattened lateral view of harpago of *Dictyonissus nigropilosus* n. sp.
6. Dorsal view of head and pronotum of *Dictyonia obscura* Uhler.
7. Frontal aspect of head of *Dictyonia obscura* Uhler.
8. Flattened lateral view of harpago of *Dictyonia obscura* Uhler.
9. Same view of *Dictyonissus griphus* Uhler.
10. Dorsal view of anal segments of male and female of *Dictyonia obscura* Uhler.
11. Ventral view of abdomen of male of *Dictyonissus griphus* Uhler.
12. Dorsal view of anal segments of male of *Dictyonissus griphus* Uhler.
13. Ventral view of abdomen of male of *Dictyonia obscura* Uhler.
14. Ventral view of abdomen of female of *Dictyonissus griphus* Uhler.
15. Dorsal view of anal segments of male of *Dictyonissus nigropilosus* n. sp.
16. Ventral view of abdomen of female of *Dictyonia obscura* Uhler.

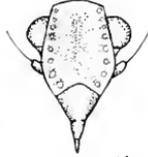
PLATE LXVII



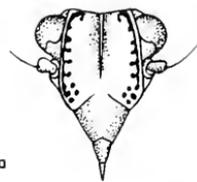
1. *Dictyonissus griphus*



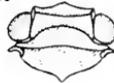
2. *Dictyonissus nigropilosus*



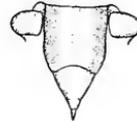
3. *Misodema reticulata*



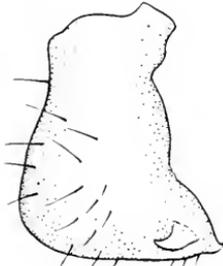
4. *Dictyssonina beameri*



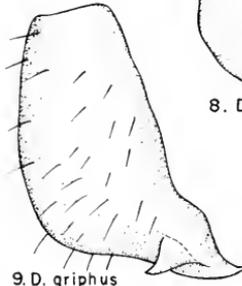
6. *D. obscura*



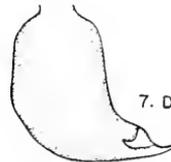
7. *Dictyonia obscura*



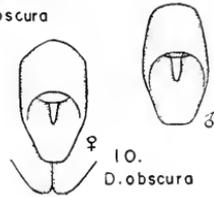
5. *D. nigropilosus*



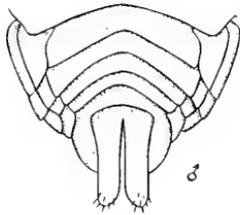
9. *D. griphus*



8. *D. obscura*



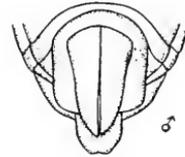
10. *D. obscura*



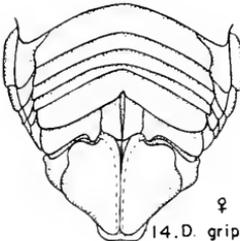
11. *D. griphus*



12. *D. griphus*



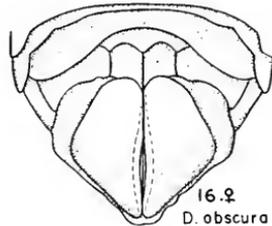
13. *D. obscura*



14. *D. griphus*



15. *D. nigropilosus*



16. *D. obscura*