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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 IV

ABSTRACT: This paper comprises the fourth part of a monograph dealing with the taxonomy of the subfamily Issinae (Fulgoridae, Homoptera) in America, North of Mexico. In part I* the genus *Dictyssa* was discussed. In part II† a key to twenty-one genera was given. The genus *Tylauira* Ball with only one species was accidentally left out of the key. Twelve genera were discussed in this second part, namely, *Euthiscia*, *Hysteropterum*, *Dictyonia*, *Dictyssonina*, *Dictyonissus*, *Neacthus*, *Misodema*, *Ulixes*, *Tylana*, *Traxus*, *Thionia* and *Picumna*. In part III‡ seven genera were discussed, namely, *Dictyobia*, *Dictydea*, *Osbornia*, *Papagona*, *Bruchomorpha*, *Danepteryx* and *Tylauira*. In the present paper the two genera *Aphelonema* and *Fitchiella* are covered, thus completing the revision of the twenty-two known North American genera in the subfamily. The genus *Aphelonema* as revised includes twelve previously described species and two color varieties. *A. rosae* Metcalf is considered as a synonym of *A. simplex* Uhler. The following new species are described in this paper: *A. impercepta*, *concinna*, *confragosa*, and *virgata*, bringing the total list of United States species to sixteen. The genus *Fitchiella* includes eight described species. The status of this group was left practically the same as is given in Lawson's revision (1933) since little additional material was available for study and three species, namely, *A. melichari* Ball, *A. grandis* Lawson, and *A. minor* Lawson, were unfamiliar to the present writer. Additional information in regard to *Fitchiella* given in this paper concerns the description and drawings of the male genitalia. The harpagones, especially in this genus, show variation and support five of the eight species of Lawson's key.

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

† The University of Kansas Science Bulletin, Vol. XXV, No. 20, 1938. (Mailing date, July 10, 1939.)

‡ The University of Kansas Science Bulletin, Vol. XXVI, No. 2, 1939. (Mailing date, Nov. 15, 1940.)

Abstract of Addendum. Additional material, involving the description of four new species, has come to the author's attention since the publication of the earlier sections of this paper. In this addendum a new species is named as *Thionia acuta* which was described under Part II as *Thionia naso* Fowl. In the genus *Neacthus* the following species are described: *unicus*, *consuetus* and *bicornis*. Also a correction to the key and literature of *Dictyssa* is made, namely, that *Dictyssa balli* Doering is a synonym of *Dictyssa doeringae* Ball.

THE GENUS APHELONEMA Uhler 1876

Stål, Carolus. Noxae vel minus cognitae Homopterum formae et species. Berl. Ent. Zeit. VI, p. 310. As *Peltonotus*, 1862.

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. 1, p. 356, 1876.

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Melichar, L. Bemerkungen zur Monographie der Issiden (Homoptera). Wiener Entomologische Zeitung XXVI, Jahrg., Heft X (5, October). As *Peltonotellus*, 1906.

Van Duzee, E. P. Studies in North American Fulgoridae. Proc. Acad. Nat. Sci. Phila. LIX, p. 492. As *Peltonotellus*, 1908.

Van Duzee, E. P. Hemipterological Gleanings. Bul. Buf. Soc. Nat. Sci. X, p. 499, 1912.

Metcalf, Z. P. A Key to the Fulgoridae of Eastern N. America with Descriptions of New Species. Jour. Elish. Mitchell Sci. Soc. XXXVIII, p. 139, 1923.

Ball, E. D. A New Species of *Aphelonema* with Notes on Others (Homoptera-Fulgoridae). Can. Ent. LVIII, p. 242, 1926.

Dozier, Herbert. The Fulgoridae or Plant-hoppers of Mississippi, Including Those of Possible Occurrence. Miss. Agri. Exp. Sta., Bul. 14, 1928.

Bunn, Ralph. Notes on the Genus *Aphelonema* Uhler with Descriptions of New Species. Jour. Kan. Ent. Soc., July, III, p. 76, 1930.

Ball, E. D. Some New Issidae with Notes of Others. Bul. Brook. Ent. Soc., 30, p. 39, 1935.

THE GENUS APHELONEMA 1876

COMPARATIVE NOTES

This genus is distinguished by the following characteristics: Elongate in shape, with the sides of the body more or less parallel; head with eyes a little wider than bases of the closed tegmina; vertex sublunate or triangular with anterior margin strongly carinate; frons with prominent lateral carinae setting off a central plate which is usually much elevated above the narrower lateral compartments, each of the latter containing usually eight pustules against the lateral carina and four against the eye, although a few species have departed from this number; pronotum lunate, bluntly curved on anterior margin, posterior margin deeply sinuated; tegmina abbreviated, exposing most of the abdomen, fused together at claval margin a little obliquely rounded at apex in most species, more so in others; only one specimen of a macropterous type found by writer; venation obscure, almost obsolete in some species, a few, such as *rugosa*, with veins elevated and forming a dense reticulation; hind tibia with one apical spine.

The male genitalia of this genus are small and difficult to study. The theca seemingly completely hides the aedeagus, except for the slender, sclerotized hook of the latter.

HISTORY OF THE GENUS UHLER 1876

Uhler (1876) described the genus with the single species *simplex* as the type species. Four other species by different authors were described under the generic names *Peltonotus* or *Peltonotellus*. These species were *A. histrionica* (Stal), 1862, *A. rugosa* (Ball), 1902, *A. bivittata* (Ball), 1902, and *A. decorata* (Van D.), 1908. Melichar, 1906, followed these writers in placing these species in the genus *Peltonotellus*, a new name given to the genus *Peltonotus* Mulsant and Rey, by Puton, in the Cat. Hemip. Palae 1886. Van Duzee in 1912 described *obscura*, which he placed in the genus *Aphelonema*. Van Duzee's Catalogue (1919) lists these six species under the genus *Aphelonema*. Metcalf (1923) in his extensive studies of eastern United States Fulgoridae keys out these six species and adds one new species, *A. rosae*. Ball (1926) described *A. nigri viridia*. Dozier (1928) adds *A. viridis*. Bunn (1930) described *A. minuta* and *convergens*, Ball (1935) described *A. orbiculata* and *A. solitaria*. In this paper the following species are described: *impercepta*, *concinna*, *confragosa* and *virgata*. The present writer considers *A. rosae* Metcalf as a synonym of *simplex*, in the belief that some secondary chemical change, perhaps, accounts for the red coloring, since touches of red show up in other species occasionally.

Two color varieties have been described, *A. simplex* var. *dorsata* Ball (1926) and *A. convergens* var. *canyonensia* Bunn (1930). This makes a total of sixteen species in this genus and two varieties.

KEY TO SPECIES

1. Vertex extremely broad, width at least five or six times median length; frons greatly exposed above, roundly protruded as viewed from the side. . . . 2
- Vertex much longer, width between eyes two to three times median length; frons through middle not exposed from above, as viewed from the side either at right angles to body or distinctly receded. 4
2. (1) Small species, length of female not over 2.55 mm., male, 1.76 mm.; central tablet of frons heart-shaped approximately one-fourth longer than greatest width. *A. obscura* Van Duzee.
Larger species, length of female, 3 to 3.75 mm.; males, 2.5 to 2.7 mm.; central tablet of frons subequal in width and length. 3
3. (2) Head and thorax orange-tan, rest of dorsum blackish brown; central frontal tablet pointed below. *A. decorata* (Van Duzee).
Uniformly pale ochreous color; central frontal tablet almost circular.

A. simplex Uhler.

4. (1) As viewed from the side head distinctly conically produced in front of eyes; frons conspicuously receded; vertex somewhat triangular, anterior margin narrowed 5
 Head not conically produced in front of eyes, sometimes shortened instead; frons more or less vertical; vertex with three anterior margins subequal 11
5. (4) Vertex triangular, median anterior margin less than length of lateral margin against eye; median frontal tablet longer than wide 6
 Vertex not so narrowed anteriorly, median anterior margin wider than lateral margin; median frontal tablet wider than long, except *histrionica* 8
6. (5) Elongate, length of female, 3.4 mm.; length of male, 2.7 mm.; median frontal tablet smooth, oval, no angles indicated at either end, two pustules between tablet and postclypeus, an extra median row of 5 pustules in each lateral compartment *A. orbiculata* Ball.
 Extremely small species, length of female under 2.5 mm.; of male under 1.9 mm.; median frontal tablet truncate at ends, only one pustule between tablet and postclypeus, the usual two rows only of pustules in each lateral compartment 7
7. (6) Body slender, sides of abdomen subparallel; base of median frontal tablet roundly narrowed, carinae continuous with no basal margin indicated.
A. impercepta n. sp.
 Body stouter, abdomen extended at sides of tegmina; base of frontal tablet straight, about one-half the width through middle *A. minuta* Bunn.
8. (5) Median frontal tablet elongate, apical pustules in lateral compartment of frons, and apices of lateral carinae widely separated; tegmina and body with conspicuous yellow and black stripes *A. histrionica* Stal.
 (Northern and Eastern)
 Median frontal tablet wider than long; lateral frontal carinae joined or closely approaching each other; pale species with occasional dark markings 9
9. (8) Vertex longer than median length of pronotum; frontal tablet twice as wide as long, lateral carinae meeting well before apex, lateral pustules evenly spaced, forming a complete circle across face *A. nigricauda* Ball.
 (Eastern)
 Vertex subequal to median length of pronotum, not extended; frontal tablet not over one-half wider than length, lateral pustules not evenly spaced 10
10. (9) Vertex about twice wider than median length; pale, robust species with a conspicuous round black spot at apex of abdomen *A. viridis* Doz.
 (Eastern)
 Vertex less than twice wider than long; longer species; a median dark stripe and lesser dark spot at apex of abdomen *A. solitaria* Ball.
 (Southwestern)
11. (4) Pale green and yellow, no dark markings present *A. concinna* n. sp.
 Body and tegmina stramineous, spotted or striped with dark markings 12
12. (11) Tegmina reticulate, veins conspicuously elevated; basal portion of postclypeus overhanging rest as a blunt tubercle (less pronounced in male).
A. rugosa (Ball).
 Tegmina not reticulate, only 1 or 2 veins visible; no tubercle on postclypeus, 13
13. (12) A conspicuous elevated vein on clavus; costal area only of tegmen dark 14
 No claval vein indicated; tegmina and abdomen with a broad conspicuous black stripe on each side of median yellow stripe 15
14. (13) Tegmina obliquely depressed through middle; black areas of abdominal segments inflated; claval vein light brown *confragosa* n. sp.
 Tegmina not depressed; abdominal segments smooth; claval vein outlined conspicuously in black *convergens* Bunn.
15. (13) Five anterior sides of vertex equal; mesal black stripes of abdomen not much wider than those of tegmina *bivittata* Ball.
 Median anterior margin of vertex longer than either the angulate or eye margin, mesal abdominal black bands at least one-third wider than those of tegmina.
virgata n. sp.

Aphelonema obscura Van Duz. 1912

Aphelonema simplex var. *obscura* Van Duz., Ball (1926).

Aphelonema simplex var. *obscura* Van Duz., Dozier (1928).

Comparative notes. The writer is not able to follow Doctor Ball in placing this form as a variety of *simplex*. It is true that it falls in the so-called *simplex* group which Doctor Ball characterizes as having a round, protruding front, slightly visible from above, and a short vertex.

It is easily separated from *simplex*, however, as Van Duzee points out in the original description, by its smaller size, darker coloring, and by its ovate, oblong, distinctly narrower frons, which in *simplex* is almost circular. The difference in size is very marked, the actual measurements of *obscura* being 2.53 mm. for the length and 1.21 mm. for the width of the female, and 1.76 for the length and .88 mm. for the width of the male.

For comparison of *obscura* with *minuta*, *viridis* and *imperccepta*, see comparative notes in the description of *minuta* Bunn.

Male genitalia. The harpago has the characteristic crescent shape, but in comparison with that of *simplex* is a more slender structure with the greatest width anterior to middle and the apical hook somewhat more slender.

The aedeagal structure is very distinct from that of *simplex*. In *obscura* the structure is so minute that it was difficult to get a lateral view which was not distorted. Obvious differences, however, from that of *simplex* are readily noted. In *obscura* the apical lobes of the theca are bluntly rounded, giving a boot-shape to the theca, and the theca does not seem to have the slender, curved, arm-like process which so many of the species have.

Notes on distribution. Described from two female specimens taken at Tifton, Georgia. Doctor Ball states that he has taken it with typical *simplex* in Kansas, Iowa, Florida and Mississippi.

Aphelonema decorata (Van Duz.) 1908

Peltonotellus decoratus Van Duz. 1908.

Aphelonema simplex var. *decorata* Ball 1926.

Comparative notes. A robust member of the genus with sharply contrasting coloring, the head and thorax being orange-tan and tegmina and dorsum of body solid blackish-brown. Measurements, length of body, female 3.08 mm. to 3.74 mm., male 2.64 mm.; greatest width of body, 2.64 mm. In structural details closely allied to *Aphelonema simplex*, but differing by having the anterior margin of the pronotum more evenly rounded instead of forming an indistinct

angle at the inner corners of the eyes as in *simplex*, by having a shorter mesonotum, with its lateral posterior margins less oblique, and having the head slightly more extended anteriorly as viewed from the side than in *simplex*. Doctor Ball states that *simplex* has an almost circular frontal tablet, while *decorata* is usually somewhat pointed below.

Male genitalia. The harpago and aedeagal structure much as in *simplex*, but differing in shape, which can best be seen by examination of the drawings.

Notes on distribution. Type locality given as Charlotte Harbor, Florida. Specimens were at hand for study from Tampa, Sanford, Miami and Center Keys, Florida. The specimens from Center Keys were collected by R. H. Beamer on sedge, growing between reeds which at times are immersed in salt water, due to the tides.

Aphelonema simplex Uhler 1876

Aphelonema rosae Metcalf 1923.

Comparative notes. A uniformly pale ochreous color, recognized by its very broad, short vertex, which allows the frons to show beyond it about the length of the vertex. The frons is convex and inclined forward. Tegmina pale yellowish translucent, with venation moderately distinct. Length of female, 3 mm. to 3.74 mm.; of male, 2.53 mm. to 2.7 mm.; width of female, 1.54 mm. to 1.98 mm.; of male, 1.32 mm.

For comparison with *obscura* Van Duz. and *decorata* Van Duz., see comparative notes in the discussion of those species.

Color phase. Some of the males of this species in general color are dull red, with vertex, dorsal part of frons, pronotum and mesonotum a salmon orange. Metcalf (1923) described this phase as *Aphelonema rosae* from five male specimens.

Male genitalia. Each harpago as viewed from a flattened lateral view is crescent-shaped, with its greatest width through middle, the apical fourth lengthened into a slender hook, which is not as long as in *histrionica*.

The aedeagus is completely hidden at its apex by the apical flaps of the theca, a slender sclerotized hook extends dorsad between the thecal flaps. The theca is tubular for its basal half, then becomes two spatulate flaps or lobes, whose shape can best be understood by studying the drawings.

Notes on distribution. The type locality was given as Dakota. Specimens were at hand for study from Douglas county, Kansas;

Woodside, Hartney and Red Deer River, Manitoba; Pascagonia, Mississippi; Knox, North Dakota; and Brasoria, Texas.

Dozier (1926) states that this is a widely distributed species, recorded from New Jersey, Connecticut, Virginia, Maryland, Iowa, South Dakota and Kansas.

Ball (1926) states that it is a common form from Eastern Colorado to Connecticut and New Jersey.

Aphelonema simplex var. *dorsata* Ball 1926

ORIGINAL DESCRIPTION

"Head and pronotum straw color continued as a broad dorsal stripe to the apex of the abdomen. This stripe often mottled with milky white. A shining black stripe from the eye back to the apex of abdomen on either side. Legs and below pale reddish, the venter often dark. Holotype, female, February 17, 1926, Sanford, Florida. Paratypes, 2 females, from same locality, March 16 and June 4, by writer.

This variety is intermediate in character between *simplex* and *decorata* and was taken with examples of the latter."

Comparative notes. The present writer had no specimens of this variety for study.

Aphelonema orbiculata Ball 1935

ORIGINAL DESCRIPTION

"Resembling *histrionica* Stal, but more definitely marked and with a round median facial tablet instead of an elongated one. Pale straw with a broad band on either side, arising on the elytra. Length, male 2.7 mm.

Vertex triangular, about equalling the pronotum, slightly more than half as long as the basal width, the angular margin three times as long as the truncate apex, instead of about equal as in *histrionica*. Frontal tablet round instead of long, egg-shaped, with the base truncate as in *histrionica*. Four pustules between the tablet and clypeus, instead of two. The lateral compartments very broad above and heavily pustulate, clypeus not inflated, rounding over into a 30° angle with the front.

Color pale straw, the frontal tablet and a broad median stripe, occupying one-third of the vertex, pronotum and mesonotum and abdomen and about one-half of the elytra ivory white. The margins of stripe and the median carina of abdomen rusty. The pustular areas on head and mesonotum dark, the pustules light. The outer

half of the elytra becoming smoky beyond the hinge and shading to black at the apex, where this color is continued as a broad lateral stripe on abdomen with the pustules white. The clypeus except base dark and the femora annulate. Holotype female from Mexico City, 1932. Paratype male, Chapultepee, Mexico. Kirkaldy in the Van Duzee Collection of the California Academy of Sciences."

Comparative notes. Although this writer has not seen the type of this Mexican species, it seems certain that a female specimen was taken in Socorro county, New Mexico. This specimen agrees with the description in every detail except that the broad median dorsal stripe and smoky outer half of the tegmina is only faintly indicated, where Doctor Ball speaks of them as if they were quite pronounced. This female measures 3.41 mm. in length, 1.32 mm. in width.

This species is readily separated from other members of the genus by the circular frontal tablet, with four pustules between the tablet and clypeus, instead of two, by the greatly receding frons and clypeus, by the distinctly triangular vertex, and the pronounced transverse carinae, crossing each abdominal segment. The tegmina are traversed by an irregular, only partially distinct, network of veins.

Notes on distribution. Described from Mexican material only. One specimen, if properly determined, taken in Socorro county, New Mexico, August 8, 1927, by L. D. Anderson.

Aphelonema impercepta n. sp.

Size. One of the small species in the genus. Length of body of female 2.42 mm., of male 1.9 mm.; greatest width of body of female, 1.1 mm.; of male, .88 mm.

Color. Stramineous, delicately etched in brown. Vertex stramineous, with an elongate dark spot in each lateral half, margins dark brown. Eyes stramineous. Lateral disks of frons brown, pustules yellow, central disk outlined by the dark brown carina, center smoky, median carina and line following the encircling carina yellow. Postclypeus stramineous, with a longitudinal brown stripe on each side. Gena stramineous, antennal socket encircled by a brown ring. Pronotum light fuscous tan, pustules faintly outlined in yellow. Tegmina translucent stramineous, veins slightly darker. Abdomen stramineous with traces of fine longitudinal stripes visible on each side, the two median ones more pronounced and outlining a narrow yellow stripe between them. Underside of body stramineous, except a faint longitudinal brown band across pleural pieces, starting with the spot on the gena and continuing more or less interruptedly across abdomen. Ovipositor dark brown. Legs yellow, faintly

spotted, with dark tips of claws black. Male specimens somewhat darker.

Structural details. Vertex distinctly triangular, more so than in most species, the anterior margin less in width than length of eye margin, greatest width across base about twice the median length. Length of pronotum at middle only a little greater than median length, a median carina distinct, space between it and eye occupied by large pustules in rows of five, four, and three. Mesonotum with a prominent median carina, two lateral carinae less pronounced than in other species, each lateral third containing about eight large pustules. Frons with total length and width subequal, the central disk or compartment smoothly oval, the lateral carinae completely encircling it, length of this disk over one-third longer than width, basal margin greatly narrowed, being only one-third or less of width at middle; each lateral compartment of frons bearing large pustules, the customary eight against the carina with one between apical marginal carina and postclypeus and four against the eye. From side view head distinctly angled above, postclypeus not inflated, greatly receded. Tegmina smooth, moderately short, latero-apical corners roundly cut off, four distinct longitudinal veins present. Abdomen with distinct dorsal carinae on each side following the anterior border, immediately followed by transverse rows of five or six small pustules, transversely depressed posterior to pustules.

Male genitalia. The harpago in this species seems to have its apical hook sharply recurved against the rest of the structure. Only one male specimen was available for dissection so that the author was unable to determine whether this was an artifact. Both harpagones were bent in the same way.

The aedeagal structure was so minute that few details could be made out. The usual sharply pointed, sclerotized hook extended externally between the flaps of the theca, the rest of the aedeagus being entirely hidden. The theca terminates in two blunt, short flaps.

Comparative notes. This species resembles *minuta* Bunn, *obscura* (Van Duz.) and *viridis* Doz. For comparison of these four species see the comparative notes in the description of *minuta* Bunn.

Geographical notes and notes on types. Holotype male, collected by R. H. Beamer from the Santa Rita Mountains, Arizona, on August 18, 1935. Allotype female, same place and collector, on August 17, 1932, and one male paratype. Twelve paratype females, same data as holotype. These types are in the Snow Entomological Collection, University of Kansas.

Aphelonema minuta Bunn 1930

Comparative notes. A small species measuring 2.2 mm. in length for female and 1.1 mm. for greatest width of body. In coloring the species is a pale tan, speckled indistinctly with brown, especially on lateral disks of frons and on the abdomen, where three indistinct darker longitudinal stripes are indicated.

Minuta Bunn in size, coloring and general appearance more closely resembles *obscura* (Van Duz.), *viridis* Doz., and *impercepta* Ball. These four species are easily separated by the shape of the frons and the vertex. In *minuta* the anterior median margin of the vertex is one-half the length of one oblique lateral margin and the width is three times its median length; in *obscura* this frontal margin is twice wider than on oblique lateral margin and the vertex is six times wider than its median length; in *impercepta* the median anterior margin is less than one-third of an oblique margin and the vertex width is twice the median length; in *viridis* the median anterior margin is equal to one oblique lateral margin and its width is not quite twice the median length.

The median frontal disk of *minuta* has its length at middle, a trifle longer than the width and the basal margin approximately one-half of its greatest width; in *obscura* the disk is one-third longer than wide and its basal margin is about two-thirds of its width; in *impercepta* the length of the disk is over one-third longer than the width, and the basal margin is greatly narrowed, being only one-third or less of the width at middle; *viridis* has the widest disk, at middle measuring less than its median length and its anterior basal margin is about two-thirds of its length.

Notes on distribution. Described from three females, collected at Cochise, Arizona, in 1927. No other specimens were available for study from which to make genitalia slides.

Aphelonema histrionica (Stal) 1862

Peltonotus histrionica,
Stal, Carolus.

ORIGINAL DESCRIPTION

"Oblongus, pallide griseo-stramineus; vitta latiuscula verticis, thoracis scutellique allrida, utrumque nigro-marginata; frontis arcis lateralis, clypeo, thoracis scutellique lateribus, lineis duabus mediis vittaque utrumque laterali dorsi abdominis, pectore ad partem, ventre, maculis pedum basim femorum nigris; lateribus nigris frontis, thoracis scutelloque pallido-granulatis; vittis lateralibus abdominis pal-

lido-variegatis; tegminibus multo abbreviatis, albidis, fuscobivittatis. ♂ -Long. $4\frac{2}{3}$, Lat. $1\frac{2}{3}$ millim.

Caput cum oculis thorace paullo latius, vertice ante oculos producto, transverso, longitudine paullo plus duplo latiore; fronte a medio sursum levissime, apicem versus distincte augustata, tricarinata, carinis lateralibus arcuatis, arcis lateralibus obliquis. Thorax subsemiorbicularis, basi latissime emarginatus, medio leviter carinatus. Scutellum tricarinatum, carinis parallelis."

REVISED DESCRIPTION

Size. Length of body from apex of head to apex of abdomen for female, 3.5 to 4.4 mm.; for male, 3 mm. to 2.86 mm.; greatest width of body midway of abdomen in female, 1.54 to 1.76 mm.; in male, across tegmina, 1.11 to 1.46 mm.

Color. General ground color stramineous yellow, conspicuously striped and spotted with dark. Eyes dark brown. Vertex yellow, raised lateral margins in black, in each lateral third an irregular brown stripe which enlarges considerably near caudal margin. Central disk of frons yellow mottled in pale brown, lateral carinae broken into seven black dashes alternated with yellow, lateral disk with yellow pits, surrounded by blackish-brown, leaving a yellow streak down center. Gena yellow except for black margins around eye and antennal socket. Antenna black. Clypeus pitch black. Pronotum with a broad yellow stripe down middle adjoining a similar one on vertex and mesonotum. This pale stripe margined on each side with a narrow dark stripe, rest of each lateral third light brown, slightly darker just inside of raised yellow margin, the thin carinate margins dark. Mesonotum yellow inside of lateral carinae, except for two brown streaks, contiguous with those of pronotum; each lateral third brown, except for a yellow circle around each brownish pit. Abdomen above with five dark stripes, the median one narrow, the others broad and irregularly interrupted. Tegmina semiopaque, a broad brownish stripe on costal border, another false stripe, usually indicated through middle of corium, due to an abdominal stripe showing through the tegmen. Thorax below mostly yellow, spotted in black. Abdomen below mostly black. Legs dark to black, especially basal half of femur, rest speckled in light.

Structural characteristics. Head with eyes wider than thorax. Vertex two-thirds wider than length through middle. Frons about equal in length and width, a distinct median carina present, the lateral carinae outwardly bowed so that the middle plate in length is two-fifths greater than its width, deflexed ventrad, forming an

acute angle with vertex; postclypeus short, forming an obtuse angle with the frons. Pronotum, forming a lunate disk between the eyes, with seventeen round raised pits in each lateral third, at extreme sides greatly reduced by the overlapping of the eye to a narrow arm, then widening again into a spatulate lobe below the posterior half of the eye. Mesonotum with a distinct median carina, and prominent lateral carina only slightly curved. Tegmina in female with greatest length approximately equal to length of abdomen exposed beyond their apex, in male proportionally longer due to the dovetailing of the posterior segments; venation simple, only four longitudinal veins visible and scarcely any or no reticulation. The ninth segment bears a short, blunt, fingerlike extension which curves around the apex of the harpago.

Male genitalia. Each harpago as viewed from a flattened lateral view is a narrow hooklike structure in the form of a crescent with its dorsal margin finely serrate from about middle to apex.

The aedeagal structure because of its small size is difficult to place in exact lateral view for drawing. The aedeagus itself is a sclerotized tube ending in two recurved sharp hooks, one much shorter and usually entirely hidden by the theca, the other tapering into a long, sharp pointed hook, projecting ventrad between the lobes of the theca. The theca is bilobed at apex, each lobe on its dorsal apical margin prolonged into a short pointed extension.

Notes on distribution. Doctor Ball (1926) states that this species apparently goes from coast to coast in the northern part of the United States. He found it at an altitude of 10,000 feet back of Ward, Colorado. The present writer had specimens for study from the following places: Merritt, British Columbia, Shoal Lake, Russell and Cowan in Manitoba, California, Colorado, Michigan, Minnesota, Montana, New Hampshire, New Mexico, and Wisconsin. Other records given are Iowa, New York, Massachusetts, and Nevada.

Aphelonema nigriviridia Ball 1926

Comparative notes. This species is an elongate, greenish or straw-colored species, with black markings. It is unique in structure for the genus. Its outstanding characteristics are the long and angular vertex, which is definitely longer than the pronotum, and its peculiar conical head. In lateral view the frons extends anteriorly a great distance beyond the eyes, the lateral carinae are greatly curved and meet the median carina at middle, thus carrying the circular pustules near the latter so that they form a complete circle across the

face. The disk of the frons thus enclosed by these carinae is wider than long, which is not true for the majority of species, except *viridis* and *solitaria*.

Doctor Ball (1926) states that this forms a third group in the genus *Aphelonema* and that it is closely related to some South American forms that have been placed in the genus *Plagiopsis* Berg. It may be that with greater study of tropical species that this species belongs in some other genus than that of *Aphelonema*.

Measurements in size are as follows: length of female is 3.08 mm., and greatest width 1.21 mm.; length of male is 2.2 mm. and its width .88 mm.

There is some difference in coloration in the sexes. The male has a broad shining black stripe extending from the upper part of the front across the eyes and including the outer third of the elytra and abdomen in sharp contrast to the pale yellow median band. The female is pale, with the lateral stripe on each side interrupted and only faintly indicated and the carinae and veins etched in light brown.

Male genitalia. Each harpago in flattened lateral view is typically crescent-shaped, broadest through middle and the apical third extended into a slender hook.

The aedeagus is covered by the theca, which does not have as long apical lobes as in some species and is serrate along its dorsal margin as is seen from a lateral view. A long, slender curved process of the aedeagus curves anteriorly.

Geographical distribution. The type locality is given as Sanford, Florida, where Doctor Ball states that it is found only in the wetter portions of the "flat woods" and along the margins of swamps.

Specimens have been collected at Key Largo and Homestead, Florida. It is not an abundant species as represented by collections.

Aphelonema viridis Dozier 1928

Comparative notes. This species somewhat resembles *nigriviridia* Ball. It differs, however, by having a shorter, stouter body, which measures in length 2.42 mm. for female and 1.98 mm. for male; in width, female 1.21 mm. and .88 mm. for male; by having a shorter, wider vertex, which in *nigriviridia* is definitely longer than the pronotum, while in *viridis* vertex and pronotum are subequal; by the frontal disk being only approximately one-third wider than long, while in *nigriviridia* it is one-half wider.

The color of this species is distinctive. The female is a pale green with dark eyes and two small black spots on the last two abdominal

segments along the median keel. The male differs by having a rosy-orange color.

For comparison of this species with *obscura*, *minuta* and *imperfecta*, see comparative notes under the description of *minuta* Bunn.

Notes on distribution. Type material came from Hattiesburg, Ocean Springs, Hurley, and Wade, Mississippi, taken by sweeping grass in low pine land.

Aphelonema solitaria Ball 1935

Comparative notes. A greenish or stramineous species, the female measuring in length, 2.86 mm. to 3 mm.; in width, 1.21 mm. to 1.32 mm. It is, therefore, larger than *viridis* Doz., which is one of the best characters for separating the two, and a trifle smaller than *nigriviridia* Ball.

This species resembles *viridis* Doz. and *nigriviridia* Ball. It is separated by size as indicated above and by color differences. *Solitaria* has traces of five brownish stripes on abdomen, the median one distinct, ending in an enlarged dark spot at apex, the lateral stripes more or less interrupted, whereas *viridis* is greenish-yellow with no stripes, only the apical spot, indicated, and *nigriviridia* has more conspicuous abdominal stripes and a transverse brown band on frons. Structurally the species is separated by the vertex, which is not twice wider than its median length, as it is in *viridis*, but is not as long as in *nigriviridia*, where its width is only two-fifths wider than median length. The central tablet of the frons is proportionally longer, being only one-fourth wider at middle than its median length in *solitaria*, but about one-third wider in *viridis* and about two-thirds wider in *nigriviridia*.

Notes on distribution. Described from one female from Madera Canyon, Santa Rita Mountains, Arizona, and one male, east side of Santa Rita Mountains. The writer had a series of seven females for study from the same region.

Aphelonema concinna n. sp.

Size. A small, pale-green species. Length of female from apex of head to tip of abdomen, 2.65 mm. to 3 mm.; greatest width of body, 1.21 mm. to 1.32 mm.

Color. The most delicately colored species in the genus, pale green and yellow with no dark markings. Vertex, pronotum and mesonotum light yellow through middle, lateral areas pale green, pustules pale. Eyes brown. Frons pale yellowish-green, centers of median and lateral disks partially hyaline, areas next to margins

and outlining the carinae opaque. Postclypeus with a median stripe and two spots on each side light green, rest pale yellow. Underside of thorax pale green. Legs mostly light yellow, tibiae sometimes green, claws brown. Abdominal segments green, except posterior margin, which is distinctly yellow. Ovipositor washed in brown. Tegmina uniformly pale yellow.

Structural details. Vertex broad, depressed, median anterior margin broader than the angulate and eye margins, which are equal. Frons pear-shaped, lateral carinae sharply elevated, outlining an oval central compartment, apical ends almost touching, each lateral compartment about one-half width of central one. A median carina arising on ventral half of frons and extending across postclypeus; postclypeus and anteclypeus not inflated, rounding over into about a 30° angle with frons. Pronotum rounded deeply into head, midline equal to length of vertex at middle, at sides eyes inserted almost to posterior border; each lateral third of dorsal plate with 24 pustules, lateral flap below eye with anterior margin angulate, a transverse carina indicated behind eye and one pustule present just below this against posterior margin. Mesonotum with sharply elevated lateral carinae, which narrow somewhat at apex, each lateral compartment containing 20 pustules. Tegmina squarely truncate, the apico-costal corner only slightly cut off; venation very indistinct, a partial claval suture indicated and a forked vein faintly visible on corium. Abdominal segments above with posterior margins thickened, pustules arranged as in drawing.

Comparative notes. Not easily confused with anything else in the genus because of its distinct coloring, lacking any dark markings. It might at first glance, because of its size, be confused with *viridis* Doz., *minuta* Bunn and *impercepta* n. sp. It is separated from *viridis* by having an elongate frontal tablet and from *minuta* and *impercepta* by its broad vertex, which in these species is somewhat triangular.

Geographical distribution. Described from eight female specimens. Holotype female, taken August 8, 1936, by R. H. Beamer, at Las Vegas, Nevada. Seven paratype females, same data. These types in the Snow Entomological Museum, University of Kansas.

Aphelonema rugosa Ball 1902

Comparative notes. This species resembles *histrionica* more than any other species. It is separated from the latter by having a shorter vertex, as the three anterior margins are subequal, while in *histrionica* the anterior lateral margins are much longer than the

anterior middle section. *Rugosa* also has a reticulate venation, with the veins conspicuously elevated. This species is moderately slender, measuring 3.00 mm. to 3.75 mm. in length and 1.55 mm. to 1.76 mm. in width for females; for males, 1.9 mm. to 2.4 mm. in length and 1.1 mm. to 1.21 mm. in width.

A valuable characteristic for distinguishing this species from all others in the genus, which is usually quite prominent, is the nature of the postclypeus. Here the basal portion overhangs the rest in the form of a bluntly-pointed tubercle, especially noticeable in side view.

The essential features of coloration are quoted from the original description as follows: "gray or fuscous maculate, a broad, pale median stripe on vertex, pronotum and scutellum, margined by four pairs of black dashes, vertex with a pair of ocellate spots at base, and the margins mostly dark lined; front pale yellow, sometimes irregularly washed or marked with dusky, lateral compartments black with the pustules white; clypeus black, base and a line down to the apex of the tubercle light; lateral areas of pronotum and scutellum dark, with pustules light; elytra brownish fuscous, nervures light, abdomen above with a narrow median and three pairs of lateral stripes, the two outer pairs broad and pustulate."

Variation. In a long series of this species there is considerable variation. At one extreme are those forms which have a less pronounced tuberculate postclypeus and less elevated wing veins, sometimes the tegmina being almost smooth. A decided color variation is found in some of the males which show on each tegmen a wide oblique costal stripe down middle and a broad creamy band across vertex and thorax in sharp contrast.

Male genitalia. Each harpago as viewed from a flattened lateral view is crescent-shaped, broadest through base of basal third and serrate-margined on dorsal apical third.

The ninth segment bears a fingerlike extension, which is longer and more tapering than that of *histrionica*.

The aedeagus is almost entirely hidden by the theca. The theca ends in two truncate lobes with the dorsal margins of these lobes more or less parallel, not prolonged into pointed extensions.

Notes on distribution. The type locality is Colorado. Specimens were available for study from the following places: Kansas, Scott county, Republic county, Harper county, Sherman county, Riley county and Cheyenne county, Spearville, Reno county, Phillips county, Smith county, Norton county; Minnesota, Itasca Park; Colorado, Linton, Durango, Parshall, Montrose, Fort Collins. Ma-

sonville, Craig, Pagosa Springs, Pawnee Buttes; Utah, Barelay, Soldier's Summit; Wyoming, Bozler, Wheatland, Lingle; Idaho, Hollister, Burley; Washington, Naschez, Cliffdell, Toppenish; Oregon, Grants Pass; California, Anza, San Jacinto and Laguna Mountains; Arizona, Cochise, Pearce, Ashfork; Oklahoma, Waynoka; New Mexico, Belen, Taos county, Alamogorda, Chaves county; Texas, Pecos, Fort Stockton, Seymour, Canyon, Potter county and Amarillo.

Aphelonema confragosa n. sp.

ORIGINAL DESCRIPTION

Size. A robust species, measuring in length for female 2.85 mm. to 3 mm., for male 1.75 mm. to 2 mm.; greatest width of body for female, 1.54 mm., and for male, 1.1 mm.

Color. A striking species in contrasting cream yellow and black, resembling *convergens* Bunn. Vertex cream yellow with extreme margins etched in dark brown and a conspicuous dark brown roundish spot in each lateral half against pronotal margin. Eyes dark brown, outlined in yellow. Frons uniform yellow with pustules, the lateral basal margins and the lateral carinae for half their length etched in brown. Clypeus in median basal region light, rest dark brown. Segments of antennae and an irregular band beginning at middle of eye and extending to apical corner of frons dark brown. Lateral disks of pronotum dark, pustules yellow; median disk yellow, with brown carinae etched in dark brown. Tegmina yellow except for the conspicuous claval vein which is broadly outlined in reddish-brown, and a blackish brown area across the posterior lateral corner. Abdomen from above cream yellow with a conspicuous broad shining black stripe on each side, the two black stripes outlining a median yellow band of equal width, the extreme lateral third of each segment bearing three dark dashes, the medial one of the three being the longest. Thorax from below yellow except for a cloudy dark band crossing the base of the mesothorax, coxa and pleural sclerites, thus forming a continuous oblique band with the dark costal band of the tegmen. Abdominal segments dirty yellow clouded with fuscous at the sides. Ovipositor yellow, clouded with fuscous. Legs yellow, femora with irregular patches of reddish-brown, tibiae streaked with brown, tarsi washed in dark brown, becoming darker towards apex.

Males. Similar to females in coloration except that the median yellow stripe on the abdomen is greatly narrowed and the legs are orange to red in color.

Structural characteristics. Head wider than prothorax. Vertex

at greatest width twice wider than greatest length, the five angulate margins about equal in width, the lateral angle in line with the anterior margin of eye so that the vertex is not greatly protruded forward. Forms elongate, its greatest length one-fourth longer than greatest width; lateral carinae greatly elevated, setting off a narrow central disk which at middle is about one-half of its length, a median carina indicated only on lower half of central disk; eight small pustules in lateral disk lying against the lateral carina and four next to eye. Postclypeus not inflated, rounding over into a 30° angle with the frons. Pronotum at middle one-fourth longer than median length of vertex, lateral margins next to eye greatly elevated, deeply convex at middle, twenty-one pustules on each side mesad of eye in rows of seven, six, five and three, respectively. Mesonotum conspicuous with a more or less rectangular area outlined through middle with the raised lateral carinae forming the side boundaries and a transverse carina the anterior boundary, the lateral disks heavily pustulate. Tegmina abbreviated, truncate at apex with outer costal angle rounded, giving a distinctly ovate shape to each tegmen as viewed from above; the longitudinal vein of the claval region elevated and very conspicuous, joined near apex by the inner branch of a forked vein of the corium, no veins indicated between these two main veins, the area between them distinctly depressed. Terga of the abdominal segments transversely depressed except where crossed by the shining black band which is somewhat inflated.

Male genitalia. Each harpago in flattened lateral view somewhat more slender than related species. The ventral hook of the ninth segment smaller and of a different shape than in *bivittata*. (See diagrams.)

The thecal-aedeagal structure of the *bivittata* type, but differing distinctly from it by having the thecal flaps roundly bulged at the dorsal posterior angle instead of obliquely cut off as in *bivittata*. The aedeagus entirely hidden by the theca but a slender, sclerotized process indicated along its dorsal side.

Comparative notes. This species more closely resembles *A. convergens* Bunn, *A. bivittata* (Ball) and *virgata* n. sp. The color patterns of all four species are different and can be used in distinguishing them. *Bivittata* and *virgata* are easily separated structurally by lacking the conspicuous elevated claval vein which the other two have. The tegmina of *confragosa* is furthermore distinctive from the rest by having the apico-costal corners greatly cut off, giving the tegmina a distinctly ovate shape instead of the wedge

shape type of the others and having the middle region of each tegmen deeply depressed. The shape of the vertex in the four species differs somewhat in the different species. On *bivittata* the vertex is narrower than in the other three, its width being only a little more than twice its median length while in the others the width is almost three times greater and the five anterior margins are all equal. In *convergens* the vertex seems proportionally longer since the lateral margins next to eyes are shorter than the angulate margins in front of them while the median anterior margin is widest of all. In *virgata* the median anterior margin is wide as in *convergens*, but the angulate and eye margins are equal in length, thus shortening the amount of vertex anterior to eye. In *confragosa* the margin against eye is longer than either the angulate or median margin and the latter two are equal in length. The four species show differences in regard to the frons as follows: *convergens* has widely separated lateral carinae so that the median compartment at middle is about three times the width of one lateral compartment; in *confragosa* the middle compartment is narrower than in other species with a lateral compartment measuring in width at middle one-half or more of the width of the median compartment, the black stripes along the lateral carinae are lacking and a median carina is distinctly indicated on apical half, in *bivittata* and *virgata* each lateral compartment is one-half of the width of the median compartment, but the two species are separated by *virgata* having a larger postclypeus than *bivittata* has.

Location of types and distributional notes. Holotype male and allotype female, collected in the Mustang Mountains, Arizona, June 12, 1933, by R. H. Beamer. Five paratype females and eight paratype males same data. One female paratype collected by R. H. Beamer at Tucumcari, New Mexico, June 4, 1933. These types in the Snow Entomological Museum, University of Kansas. Seven female paratypes and twenty-seven male paratypes, collected by Paul Oman in the Mustang mountains, Arizona, June 20, 1933, and two female and two male paratypes, same collector from the Santa Rita Mountains, Arizona, June 12, 1933. These paratypes in the National Museum, Washington, D. C.

Aphelocoma convergens Bunn 1930

Ball (1935) as *bivittata* Ball.

Comparative notes. A black and yellow striped species closely resembling *bivittata* Ball. It differs in color from *bivittata* by having the oblique yellow lines of the tegmina converging at mesocaudal angles and not continuous with abdominal stripes.

Structurally *convergens* can be separated from *bivittata* in several ways. In *convergens* the vertex is extended considerably beyond the eyes so that the latero-anterior angle is in line with the anterior margin of the eye and none of the frons is visible from above while in *bivittata* the anterior margin of the vertex is in line with anterior margin of the eye and the frons is usually indicated from above. Another distinguishing feature is the shape of the pronotum. In *convergens*, the anterior margin between the eyes is straight, the carina of the vertex in front of it is more pronounced, the lateral margins mesad of the eyes are greatly elevated and the posterior margin is not deeply emarginate at middle. In *bivittata* the anterior margin is distinctly rounded and the posterior angulately emarginate at middle with the lateral margins not greatly elevated. The most easily recognized structural difference is the venation of the tegmina; in *bivittata* the longitudinal veins are scarcely visible while in *convergens* a single claval vein is very distinct and elevated, even to the extent of looking like a carina outlined in black; while in the corium a distinct but less pronounced forked vein starts near the costal border and has its inner branch extending to the apex of the tegmen.

In size *convergens* seems to average slightly larger than *bivittata*, the females measuring 3 mm. in length and about 1.54 mm. in greatest width, while the males average 2 to 2.25 mm. in length and 1.2 mm. in width.

Male genitalia. There are distinctive differences between *bivittata* and *convergens* in these structures. The ninth segment of *bivittata* shows in situ a fingerlike extension on each side of the genitalia (see drawing). This is lacking in *convergens*. The shape of the harpago in flattened view is different in the two species (see diagrams).

The apical flaps of the theca show greater differences than those of more greatly dissimilar species. In *convergens* the dorsal angles of the thecal flaps are posteriorly directed knobs while in *bivittata* they are more angulate and directed forward.

Notes on distribution. Holotype, allotype and five paratypes from Cochise county, Arizona, and 6 paratypes from Colfax county, New

Mexico. Available for study for this paper was a long series from the Santa Rita Mountains, Arizona. A few scattered specimens from Phoenix and Flagstaff, Arizona, and Monument, Colorado.

Aphelonema convergens var. *canyonensis* Bunn 1930

This variety is not as distinct a color difference as is usually true for varietal forms. Bunn states that a distinct yellow replaces the greenish yellow of the typical form and that the two black stripes just mesad of the lateral carinae of the scutellum are wider and tend to be continued across the pronotum and vertex as a continuous stripe.

This difference of coloration is of course more pronounced when extremes of both forms are being compared, true *convergens* having distinctly whitish light areas and *canyonensis* distinctly yellow yet many specimens are found where these differences are slight and makes it confusing which variety to call them.

Aphelonema bivittata (Ball) 1902

As *Peltonotellus bivittatus*.

Comparative notes. A medium sized species of *Aphelonema*, measuring 2.4 mm. to 3 mm. in length for the female and 1.3 mm. in width; for the male, 2.2 mm. to 2.35 mm. in length and 1.1 mm. in width. It is easily recognized by its striped color, having a broad dorsal yellow stripe running from vertex to tip of abdomen, a pair of oblique lines under the eyes and meeting the median line on the last abdominal segment yellow, the frons greenish-yellow with the lateral carinae black in sharp contrast, the lateral carinae of mesonotum and a pair of stripes within them black.

The outstanding structural features are the six-sided vertex with the anterior and lateral margins equal, and the narrow, elongate middle plate of the frons which is about twice as long as width through middle. The ninth segment has a fingerlike projection which hooks around the tip of each harpago. This shows only faintly in ventral view, but from a flattened view on a microscope slide shows as in figure.

Male genitalia. The harpago in flattened view has a characteristic shape, differentiated from that of other species by having a distinct bend near the apex so that the slender apical hook is almost at a right angle to the median portion.

The apical flaps of the theca are narrowed on dorsal region forming rather backward projecting rounding points. The aedeagus is

practically hidden by the theca except for a slender, backward projecting hook.

Notes on distribution. This species was described from specimens taken in Colorado, Nebraska, Kansas and Iowa.

The writer had specimens for study from Cheyenne and Jewell counties, Kansas, Las Animas county, Colorado, Apache county, Chiracahua Mountains, Faraway Ranch and St. Johns, Arizona, Wichita, N. F., Oklahoma and Blue Springs, Colfax county, and Socorro county, New Mexico.

Doctor Ball (1935) states that this species is found more abundantly in Arizona than in the plains region from which it was described. Also he makes the observation that it becomes highly variable in the tropics and hence the color variations are numerous among these species.

Aphelonema virgata n. sp.

ORIGINAL DESCRIPTION

Size. Length of body of female, 2.64 mm. to 3.22 mm.; of male, 2.12 mm.; greatest width of body of female, 1.32 mm. to 1.76 mm., for male, 1.25 mm.

Color. A yellow-and-black striped species, resembling *bivittata*. Head yellow, etching along margin of vertex and an oval spot on each lateral disk against pronotal margin blackish-brown. Eyes black. Front yellow, lateral carinae outlined their full length with a broad, black stripe, a small dark spot along lateral basal margin and an irregular one at latero-apical angle. Clypeus blackish-brown except a basal light area in the shape of an inverted bell. Gena yellow with an oblique, irregular, black stripe beginning at eye and running to epistomal suture. Pronotum yellow with lateral margins mesad of eye etched in brown, pustules pale brown, a black border, encircling eyes. Mesonotum with a broad median stripe, a narrow stripe on each side of the lateral carina and pustules yellow, rest black. Tegmina with claval margins broadly yellow, together forming a median yellow stripe continuous with one on abdomen, a broad oblique yellow band in each tegmen, starting at base of costal border and ending midway of apical border. Abdomen from above black except for a distinct median yellow stripe and four interrupted, less conspicuous paler stripes on each side. From below thorax yellow, except pleural pieces of meso- and metathorax, which are shining blackish-brown, forming an oblique line with the dark outer angle of the tegmen. Sterna of abdomen and ovipositor blackish-brown

except occasional inconspicuous lighter spots. Legs yellow, variously marked with brown, the more conspicuous marks being a brown spot at base of mesothoracic coxa, a spot at base of each femur and two semicircular brown spots near the apex, tibia darker yellow streaked in brown, tarsi washed in brown, clavus black.

Structural details. Head approximately same width as prothorax. Vertex transverse, about one-third wider than median length, not extended greatly beyond eyes, the lateral angle in line with anterior margin of eye, the three anterior margins subequal and longer than lateral margin against eye. Frons elongate, its greatest length one-fourth longer than greatest width, the lateral carinae greatly elevated, the central disk equal in width at base and apex, at middle twice wider than one lateral disk, the latter greatly depressed; no median carina indicated; in each lateral disk eight pustules following the lateral carina and four lying against eye. Postclypeus slightly inflated, forming slightly less than a forty-five degree angle with frons, anteclypeus considerably recessed.

Median length of pronotum one-fourth longer than that of vertex, concave through middle, nineteen pustules in each lateral disk starting at eye arranged in rows of six, five, five, and three, at extreme sides almost covered by eye, then expanded ventrad into a spatulate lobe which extends forward almost to antenna and bears only one pustule near its posterior margin. Mesonotum three-fourths wider than long, concave through middle, lateral carinae sharp and conspicuously elevated. Tegmina truncate, apico-costal corners roundly cut off but not as much as in certain species, the claval vein faintly indicated at base only, an indistinct branched vein in corium. Abdominal segments smooth in contour, only slightly depressed at sides.

Male genitalia. Ventral hook of ninth segment larger than in related species, roundly pointed. Each harpago in flattened lateral view not greatly widened through middle, its apical hook extremely slender and bent almost at right angles.

Theca-aedeagal structure characteristic, the aedeagus entirely hidden by the theca, the thecal flaps blunt, rounded at apex with their dorso-anterior corners fitting snugly against the basal tube.

Comparative notes. This species resembles *bivittata*, *convergens*, *confragosa* and *virgata*. For comparison of these four species, see notes under *confragosa*.

Location of types and distributional notes. Described from allotype female, taken at Silver City, New Mexico, July 23, 1936, holo-

type male, Las Vegas, New Mexico, July 18, 1936, 1 paratype female, Silver City, New Mexico, July 23, 1936, 2 paratype females, same place, July 22, 1936, 1 paratype female, Las Vegas, New Mexico, July 18, 1936. These types collected by R. H. Beamer and deposited in the Snow Entomological Museum, University of Kansas. Two paratype females and 1 male, collected by Paul Oman, June 24, 1933, from Patagonia, Arizona. These types in the National Museum, Washington, D. C.

Fitchiella (Fitch) Van Duzee 1856

Fitch, Asa. Trans. N. Y. St. Agric. Soc. XVI, p. 396. As *Naso*.

Melichar, Leopold. Monograph der Issiden (Homoptera). Abh. K. K. Zool. Bot. Ges. Wien III, p. 4, 1906. As *Naso*.

Ball, E. D. New Genera and Species of Issidae (Fulgoridae). Proc. Biol. Soc. Wash. XXIII, p. 42, 1910. As *Naso*.

Lawson, Paul B. The Genus *Fitchiella* (Homoptera, Fulgoridae). Bull. Brooklyn Ent. Soc. XXVIII, No. 5, pp. 194-198, 1933.

COMPARATIVE NOTES

This genus is similar to *Bruchomorpha*, especially the long-nosed species of the latter. It is most readily distinguished by the expanded fore and middle tibiae except in *robertsoni* where it is nearly normal. Other outstanding characteristic is the long head process which frequently is bulbous at the end. In the lateral compartments of the frons are eight circular pits against the lateral carinae and four against the eye. The vertex is broad and short, usually six to eight times its median length. Tegmina short, veins distinct, claval region rugulose. Hind wings lacking.

HISTORY OF THE GENUS

Fitch in 1856 described the genus as *Naso*, with *robertsoni* as the type. Van Duzee in 1917 changed the genus name to *Fitchiella*, as *Naso* was preoccupied. In 1906 Melichar described *fitchi*. In 1910 Ball described *melichari*. In 1933 Lawson described five additional species, namely, *F. albifrons*, *F. rufipes*, *F. grandis*, *F. minor* and *F. mediana*. The present writer did not have available for study *F. melichari*, *F. grandis* or *F. minor*, but the original descriptions are herein given.

Several of the species in the genus are not easy to identify, especially the so-called *melichari* series, which includes *melichari*, *grandis*, *minor* and *mediana*. However, this writer believes that five species are sufficiently distinct when carefully studied, namely, *F. robertsoni*, *F. fitchi*, *F. albifrons*, *F. rufipes* and *F. mediana*. The harpagones as viewed from a side view are easily distinguishable and add another character to those given by Lawson for separating these

five species. Larger series of all the *melichari* series are needed before one can feel very certain as to the validity of two or three of the species. Of all the eight species, *F. fitchi* seems to be the only one taken in any great numbers.

KEY TO SPECIES

(Based on Lawson's key)

1. Head process transversely depressed through middle, knobbed at apex; light species marked with black.....*F. robertsoni* Fitch, p. 209
Head process not particularly depressed; brown to black species..... 2
2. (1) A large mottled brown species, females measuring over 4.6 mm. in length; males half this length; lateral frontal carina deeply scalloped.....*F. fitchi* Melichar, p. 210
Mostly black species, females measuring 4.25 mm. or under..... 3
3. (2) Frons with longitudinal white stripe; harpago slender, three times longer than width through middle.....*F. albifrons* Lawson, p. 211
Frons entirely dark..... 4
4. (3) Venter of head process and most of legs reddish; harpago stout, less than twice longer than width at middle.....*F. rufipes* Lawson, p. 211
Venter of head process black and legs (except in *minor*) usually entirely black, 5
5. (4) Head process very large and quadrate apically.....*F. grandis* Lawson, p. 213
Head process smaller and rounded apically..... 6
6. (5) Head process quite short; fore tibiae reddish.....*F. minor* Lawson, p. 213
Head process longer; fore tibiae usually dark..... 7
7. (6) Head process longer; fore tibiae very wide.....*F. melichari* Ball, p. 210
Head process shorter; fore tibiae narrower; harpago over twice longer than width through middle, apical hook lengthened to a fine point.
F. medianna Lawson, p. 212

Fitchiella robertsoni (Fitch) 1856

COMPARATIVE NOTES

This species is a unique species for the group in that it does not have the greatly expanded fore and middle tibiae. For that reason it might easily be taken for a *Bruchomorpha*. It differs from this group, however, by having a long bulbous nasal process and the fact that the fore and middle tibiae are a trifle expanded. It is strikingly colored, having a tan background with conspicuous dashes on the abdominal terga, the cells of the tegmina, two roundish spots on mesonotum, vertex and central disk of frons, all dark brown to black, and the bulbous end of the nasal process shining black. The vertex is much longer in this species, being not over three times wider than median length. It also differs by having the lateral carinae of the frons converging considerably posterior to apex and by having the frons deeply depressed across middle. Length of female, 4.4 mm.; greatest width, 1.76 mm.; length of male, 2.86 mm., greatest width, 1.1 mm.

Male genitalia. The harpago in flattened lateral view is distinctive. Its greatest width is through the base, from which point it gradually narrows down to the curved tapering apex.

The aedeagus is mostly hidden by the theca, so that it is difficult to distinguish anything but the sclerotized recurved hook which protrudes between the apical flaps of the theca. See drawing.

Notes on distribution. Dozier states that it is recorded from New York, Maryland, Florida, Indiana, Kansas, Arkansas, Oklahoma and Texas. He adds Mississippi.

Fitchiella fitchi (Melichar) 1906

COMPARATIVE NOTES

This is a large species, measuring 4.6 mm. to 5 mm. in length for female; for greatest width of female, 2.4 mm.; for male, 1.1 mm. It is easily distinguished by its large size, conspicuous coloring, which consists of a yellowish-tan with all margins, carinae and pustules heavily outlined in dark brown. Structurally it is easily recognized by the rough appearance of the frons and the pronounced sinuate lateral carinae. The tegmina are more distinctly reticulate than in other species, with the veins conspicuously yellow.

Male genitalia. The harpago in flattened lateral view is distinctive. It appears hook-shaped rather than crescentlike, broadest through middle, but with the ventral margin less smoothly rounded.

The aedeagus is characteristically hidden by the theca, with only the tips of two sclerotized hooks visible. The theca itself is rectangular through base and has its apical flaps narrower and longer than in other species.

Geographical distribution. Van Duzee's catalogue lists this species from Kansas and Colorado. A large series was available for study, all of which was collected in Kansas.

Fitchiella melichari (Ball) 1910

As *Naso melichari* 1910.

ORIGINAL DESCRIPTION

"Closely resembling *robertsoni* in size and form. Smaller, with the cephalic process less inflated at the apex. Pitchy black, without markings. Length, 3.75 mm.

Vertex short, transverse, sharply separated from the front by a distinct carina. Front broad at base, broader than in *fitchi*, tapering gradually into a long, pointed snout as seen from above. The lateral carinae expanded just before the eyes, then contracted near the middle of the process, forming a somewhat diamond-shaped compartment, beyond this regularly narrowing to the apex. Median carina obscure on the disk, becoming prominent almost foliaceous

around the extremity. As seen from the side, this protuberance is inclined at an angle of about 45 degrees, with the extremity rounded and enlarged. Pronotum large, with anterior and median carinae present. Elytra rather narrow, with a large number of irregular longitudinal veins. Abdomen narrow, the segments weakly pustulate.

Color. Pity black, the posterior margin of the eyes fulvous, the rostrum and coxae white, and often a testaceous iridescence to the front and elytra.

Described from 3 females from Arizona in the collection of the author."

Fitchiella albifrons Lawson 1933

COMPARATIVE NOTES

This is a small species, uniformly dark reddish-brown to black in color, except a broad longitudinal white stripe indicated on frons, pronotum and mesonotum, also base of expanded tibiae, spots on femora and a longitudinal stripe on hind tibia whitish. Tegmina with many conspicuous longitudinal veins present, claval area less pebbled than in related species.

This species belongs in the *melichari* series of the genus. Lawson states that it is separated from *melichari* by being smaller, by having the head process straighter below apically, and by having the front distinctly more concave.

Male genitalia. The harpago of this species is the most slender of any in the genus. It resembles a sickle blade. The theca differs from that of other species by having short, slender apical flaps, roundly pointed.

Location of types. Holotype female and allotype male, collected by R. H. Beamer in the Santa Rita Mountains, Arizona, and three paratypes in the Snow Entomological Collection, University of Kansas.

Notes on distribution. Additional specimens have been collected by R. H. Beamer from Tucumcari Mountains, Santa Rita Mountains and Ruby, Arizona.

Fitchiella rufipes Lawson 1933

COMPARATIVE NOTES

This species belongs in the *melichari* series. It is distinguished on color by having the lower half of head process and first two pairs of legs down to upper third of tibiae reddish and the hind legs pale, tinged with red to near end of tibiae.

Structurally it is distinguished by having a long nasal process of which the apex is more rounded than in *albifrons* and not swollen as in other species. Size, female length, 3.25 mm. to 4 mm.; male, 2.75 mm. to 3 mm.

Male genitalia. The harpago in flattened lateral view is distinctive. It is shorter and broader than in other species, its greatest length not much more than twice its greatest width, the apical hook short and bluntly-pointed.

The theca has the characteristic boot-shape, with the dorsal toe of the boot less extending and roundly pointed. The aedeagus is entirely hidden except for the prominent sclerotized hook.

Location of types. Holotype female and male allotype, and three paratypes in the Snow Entomological Collection, University of Kansas. A few paratypes in the collection of E. D. Ball.

Notes on distribution. Type locality is Zion National Park, Utah. Paratypes from Oak Creek and Granite Dell, Arizona, and Kanab and Provo, Utah. A few additional specimens on hand from Congress Junction and Yarnell, Arizona, Loyal Valley, Texas, and Three Rivers, California.

Fitchiella mediana Lawson 1933

COMPARATIVE NOTES

A uniformly black species, which according to Lawson is close to *F. melichari*, but separated from that species by having the head process shorter and fore tibiae smaller. Length of female is given as 3 to 4 mm., and of male 2.5 to 3 mm.

Additional structural features are that the head process is moderately long, not swollen apically, the ventral angle sharp and cephalad of half the distance of the eye.

Male genitalia. Each harpago in flattened lateral view moderate in comparative length and width, widest through middle where it is slightly less than half of the length, the apical hook long and finely tapering.

The aedeagus boot-shaped, with the dorsal toe region greatly extended dorsad, before which it is deeply notched, at which point the sclerotized hook of the aedeagus emerges from between the flaps of the theca and extends almost to base of the theca.

Location of types. Holotype female, male allotype, and eight paratypes in the Snow Entomological Collection, University of Kansas.

Geographical distribution. Type locality, Sabino Canyon, Arizona. Two paratypes from Tucson, Arizona.

Fitchiella grandis Lawson 1933*Original Description*

"A black species with very large, apically quadrate, head process. Length, female, 4.25 mm.

Head process very large and truncate apically, straight ventrally fully half way to eyes. Front very large and wide, extending almost to tip of head process, median carina not strong, fading out on basal third. Vertex very short. Pronotum a little over twice as wide as long, median carina distinct, with many pustules. Scutellum longer than pronotum, tricarinate, lateral portions pustulate. Elytra short and reticulated. Fore and middle tibiae not as large relatively as in *melichari*. Posterior margin of last ventral segment of female slightly produced on median half, which is slightly concave.

Color. Black, except for few light markings on legs.

Holotype, female, Santa Rita Mountains, Arizona, altitude 4,500 feet, September 9, 1925, A. A. Nichol. Type in Doctor Ball's collection.

This species is easily recognized by its very large, apically quadrate, head process."

Fitchiella minor Lawson 1933*Original Description*

"A black species close to *F. mediana*, but with shorter head process and with reddish fore and middle tibiae. Length, female, 3.75 mm.

Head process quite short, ventral notch cephalad of middle of distance to eye. Front with median carina fading out at base. Vertex very short. Pronotum about twice as wide as long, with strong median carina and many pustules. Scutellum longer than pronotum, with three carinae and many lateral pustules. Elytra short and reticulated. Fore and middle tibiae distinctly smaller than in *mediana*. Last ventral segment of female triangular; posterior margin produced and truncate on median half.

Color. Black, with suggestion of white stripe along sutural margin of elytra. Fore and middle tibiae reddish. Holotype, female, Tucson, Ariz., March 10, 1931, E. D. Ball. Type in Doctor Ball's collection.

This species has the shortest head process in the series of closely related species composed of this, *F. mediana*, and *F. melichari* (Fig. 5.), the last having the longest process. This species also has the smallest fore tibiae of the three, with *melichari* (fig. 5a) having the largest."

ADDENDUM

Thionia acuta n. sp.

= *Thionia naso* Doering not Fowler. See *University of Kansas Science Bulletin*, Vol. XXV, No. 20, June 1, 1938.

At the time of the revision of the genus *Thionia*, published in Part II of this paper (1938), the writer did not have access to the type of *Thionia naso* Fowler. A series of specimens from Concean, Texas, was, therefore, wrongly designated as Fowler's species, based on a comparison made by Doctor Ball with the single type. Mr. Paul Oman, of the National Museum, recently pointed out to the present writer that in his opinion the Concean material could not be Fowler's species. With the addition of the Ball collection to the National Museum collection, the type of *naso* became available for study. Subsequent comparison of the Concean material with the latter proves conclusively that the Concean material is not *naso* Fowler and is, therefore, a new species. The name *acuta* has been assigned to it. For the complete description of *acuta* n. sp. see the description of *Thionia naso*, Fowler, p. 463, *University of Kansas Science Bulletin*, Vol. XXV, No. 20, June 1, 1938.

Type specimens are: Male holotype, female allotype, eight female paratypes and three male paratypes, taken by Mr. Paul Oman at Concean, Texas, June 4, 1933. These types are in the National Museum. Two male paratypes and two female paratypes taken by R. H. Beamer, at Concean, Texas, on June 6, 1936.

Dictyssa doeringae Ball

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

= *Dictyssa balli* Doering. See *University of Kansas Science Bulletin*, Vol. XXIV, No. 17, July 15, 1936.

An amusing exchange of names between Doctor Ball and the writer was made in regard to this species. Both recognized this material as new at about the same time and after comparing notes on the subject, Doctor Ball graciously told the writer to describe it in the present monograph. Apparently later he forgot this conversation and described it himself in a short paper dealing with a few new Issids which, only because of the delayed mailing date of the *Kansas Science Bulletin*, appeared in actual distribution before the latter. Ball's species, therefore, has priority over *Dictyssa balli* Doering.

Dictyssa monroviae Doering

A notation in regard to additional paratypes for this species should be made. A series of paratypes from Del Mar, California, collected by Paul Oman, is in the National Museum at Washington, D. C.

THE GENUS *NEAETHUS*

During the summer of 1938, Dr. R. H. Beamer and the Kansas University biological survey party, while collecting in California, made a concentrated study of the insect fauna of the various species of the *manzanita* plant. The collections were made by sweeping the bushes and, therefore, of course, are not an absolute check in regard to host relationship as specimens might easily move from one bush to another during the disturbance of sweeping. Nevertheless, in regard to the genus *Neaethus* it did bring to light three more new species which were not included in Part II of this monograph and apparently offers partial explanation, at least, as to the great numbers of species in this genus with their slight variations. Like the genus *Clastoptera* in the family Cercopidae, which showed species variation coinciding with the various varieties of oak in the southwestern mountains, the genus *Neaethus* apparently has spread out in the same manner following the evolution of manzanita plant.

Neaethus unicus n. sp.

Size. Length of body to tip of tegmen of female, 4.95 mm.; of male, 4.5 mm. Length of tegmen of female, 4.05 mm.; of male, 3.6 mm. Width of tegmen, 2.25 mm.

Color. General color stramineous. Eyes brown. Lateral disks of frons light brown through middle. Postclypeus with a broad median stripe. Pleural segments washed in brown. Middle segments of abdomen blackish-brown in sharp contrast to yellow apical segments. Mesal margins of ovipositor dark brown. Coxae and femora of hind legs fuscous. Claws and tips of spines on legs black. Tegmina with cells milky, longitudinal veins yellow, cross-veins dark brown.

Structural characteristics. Vertex, greatest width four times length at middle. Greatest width of eye one-fourth total width of head. Length of pronotum at middle twice the same length of vertex, anterior margin greatly elevated, a transverse depressed line across middle, disk depressed. Disk of mesonotum depressed through middle, a faint median carina indicated. Frons one-fifth longer than width at dorsal margin. Length of frons and postclypeus at

middle approximately equal. Postelypeus with no median carina. Tegmina ovate, greatest width in line with apex of clavus, width at this point slightly less than two-thirds of length, cells large, veins thick and elevated; vein Sc_1 running almost half length of tegmen, few cross veinlets in Sc_1 cell; vein Sc_2 and R each branching once; vein M apparently five-branched; vein Cu_1 branched just back of middle. Hind wings unique for the genus, being as long as the body.

Male genitalia. Anal flap of female without prongs, only slightly indented at middle of posterior margin. Each harpago, in flattened lateral view, crescent-shaped, slender, the dorsal margin deeply concave through middle, the posterior third slightly deflexed inwardly, below this a small, external ventrad-directed hook.

Aedeagus and theca unique. From a right view the theca is conspicuous, being a semimembranous sleeve covering half the aedeagus at base, beyond which the dorsal portion extends caudad as a flat lobe, narrowing finally into a slender, fingerlike apex. On this side the distal half of the aedeagus bears a long, flattened, external, heavily sclerotized process, lying closely adpressed to the side and its tip is bulbous. From a left view the theca is shorter and its posterior margin is obliquely truncate. The apical portion of the aedeagus is the same as on the left side. Near the base are two additional pronglike hooks, which are exposed for half their length beyond the thecal margin, the ventral one of the two being unique by having a lateral, slightly curved, side prong.

Comparative notes. This species is readily distinguished from other members of the genus by the hind wings, which extend as far as the apex of the abdomen. No other species has wings of this length. In most species the wings are reduced to mere scales, except for three species, *perlucidus*, *fragosus* and *grossus*, where they extend to the tip of the tegmina.

Location of types. Holotype male, allotype female, and 61 paratypes taken by R. H. Beamer from Lempoc, California, August 6, 1938. They were swept from *Arctostaphylos pechoensis viridissima* East. Types and most of the paratypes in the Snow Entomological Collection at the University of Kansas.

Ncaethus bicornis n. sp.

Size. Length of body from apex of head to tip of tegmen, female, 4.1 mm. to 4.29 mm., male, 3.75 mm. to 4.18 mm. Length of tegmen, female, 3.7 mm.; male, 3.08 mm. Greatest width of tegmen, 1.98 mm. to 2.2 mm.

Color. This species has the typical *Neacthus* ground coloring of golden tan, but has enough dark mottling to give it a much duskier appearance than many species have. Eyes reddish-brown, cross-barred with yellow crescents. Thin carinate margins of vertex dark brown, a thin light yellow longitudinal stripe down middle and continued across pro- and mesonotum. On vertex a pair of slender brown bars against elevated posterior margin. On pronotum brown markings distributed as follows: two round depressed spots in center of disk, a large area back of each eye, a cluster of about nine darker small round dots partly covering this spot and on disk mesad to it. The extreme lateral corners of mesonotum and two pseudo round spots on disk dark brown. Frons dusky brown except the elevated median carina, a longitudinal row of roundish spots just mesad of outer borders and a spread-eagle spot on ventral half. Postclypeus dark brown on disk, sides light at base, mottled near apex; anteclypeus with elevated median carina light, a thin brown stripe on each side next to carina, rest mottled. Gena dusky around eye, lighter below. Segments of body and legs smoky, mottled at various points.

Structural characteristics. Vertex narrow, anterior margin twice wider than one lateral margin. Width of eye one-half that of vertex. Pronotum at middle equal in length to one lateral margin of vertex. Mesonotum with middle half depressed, lateral carinae distinct, middle carina only slightly indicated. Frons with a prominent median carina extending three-fourths its length, lateral margins less elevated than in some species, almost parallel-sided. Clypeus and frons on median line equal in length, the postclypeus invaginated into frons for about one-fifth of the greatest length of latter. Postclypeus with a distinct median carina. Tegmina quadrangular rather than hemispherical in shape, greatest width in line with apex of clavus, at which point it is five-eighths of its length; veins thick, cells large; vein Sc_1 widely separated from costal margin, costal cell area reflexed, venation usually of the following pattern: Sc_2 with two main branches, R two main branches, M three main branches, Cu_1 , two-branched, the branches of which unite at apex, then run ventrad as a single vein which joins a branch of M, making a partial ambient vein at apex. Hind wings reduced to a mere scale.

Male genitalia. This species is separated easily from all other species in the genus by the anal flap (tenth abdominal segment) which has the posterior ventral margin greatly extended into two long prongs at the side with a broad space between.

Each harpago in flattened lateral view unusually broad, its outline subtriangular, the greatest width being across the apical fourth and the dorso-apical region bearing a large external hook which is unusually broad at base but tapers to a short recurved hook at apex.

The aedeagus on the left side is covered by the sleeve-like theca for half its length. At the base, almost entirely covered by the theca except the extreme tip, the aedeagus bears a hook which is bifurcate, with the dorsal fork abbreviated. Near the middle it bears a conspicuous, well-sclerotized, process which is somewhat sinuate and has its slender apex bent slightly ventrad. Near base of apical third is a short, pointed, dorsad directed hook and the extreme apex of the aedeagus ends in a sclerotized fine point.

On the right side the posterior dorsal extension of the theca is more evident and a dorsal, sharply pointed, sclerotized process is plainly visible.

Comparative notes. This species resembles *Neaethus similis* and *Neaethus vitripennis*. From *similis* it is distinguished by its much smaller size, narrower vertex and the male genitalia. From *vitripennis* it is distinguished by its smaller size, its general body coloring, which is mainly fuscous, and its milky tegmina with dark veins, while *vitripennis* has golden yellow body with transparent yellow tegmina. The anal flap is unique for the genus due to the presence of the bifurcate apex, with the prongs or horns much longer than in *vitripennis* or any other species. Differences in the aedeagal structure can readily be seen by comparison of the drawings.

Location of types. Holotype male, collected at Mt. Tamalpais, California, August 15, 1938, by R. H. Beamer. Female allotype, same data. Thirty-five paratypes same data. Thirty-two paratypes, collected August 16, 1938, by R. H. Beamer, at Santa Rosa, California. These specimens were swept from *Arctostaphylos manzanita* Parry.

Types and most of the paratypes in the Snow Entomological Collection, University of Kansas.

Neaethus consuetus n. sp.

Size. Length of body from apex of head to tip of tegmen, female, 4.51 mm. to 5.28 mm.; male, 4.51 mm. Length of tegmen, female, 4.07 mm. to 4.4 mm.; male, 3.85 mm. Greatest width of tegmen, 2.43 to 2.97 mm.

Color. Females similar to *bicornis*, in general color, males less fuscous. Eyes tan, uniformly cross-barred with five conspicuous maroon crescents. Female coloring as follows: Vertex and thorax

from above golden-yellow, a faint median narrow stripe lighter, the anterior margin of vertex and three spots in each lateral half reddish-brown, a darker brown spot on pronotum arm posterior to eye, mesad of which is a cluster of about nine minute brown spots and a depressed round brown spot. Each lateral corner of mesonotum dark brown, forming with the dark spot on pronotum a conspicuous lateral stripe. Frons curiously mottled, the median carina and approximately the outer fourth cream-colored, disk on each side of the median carina light-brown, margined with dark reddish-brown, which thus forms a narrow dark stripe running lengthwise down center of each lateral half, the lateral pale stripe irregularly speckled with dark brown. Postclypeus yellow, with a longitudinal reddish-brown stripe on each side of yellow median stripe. Genae uniform yellow, a brownish spot on lateral area of postclypeus. Body and legs fuscous, some yellow along borders of segments. Body coloring of males golden-tan, scarcely any fuscous or darker markings present. Tegmina of both sexes similar, cells semitranslucent, veins fuscous, cross-veins of clavus and cell Cu_2 almost black, sometimes a conspicuous black spot at extreme apex of this cell.

Structural characteristics. Vertex broader than in *bicornis* n. sp., its anterior margin approximately one-sixth wider than one lateral margin, the lateral margins slightly converging anteriorly. Pronotum at middle equal in length to one lateral margin. Mesonotum depressed through middle, carinae absent or faintly indicated. Frons elongate, width at posterior or dorsal margin slightly more than two-thirds greatest length, median length equal to length of postclypeus, lateral margins parallel, less elevated than in some species. Postclypeus invaginated into frons for only about one-sixth the length of latter, a prominent median carina present. Tegmina quadrangular, greatest width just anterior to apex of clavus, at this point width about five-eighths of its length. Veins thick, vein Sc_1 widely separated from costal margin, costal cell area reflexed, venation usually of the following pattern: Sc_2 with two or three main branches, R, with two branches, M, four or five branches, Cu_1 , two branches with branches united at apex. Hind wings reduced to a mere scale.

Male genitalia. Posterior ventral margin of anal flap forked with the length of the prongs nearer that of *maculatus* than any other group.

Each harpago in flattened lateral view, also resembling that of *maculatus* in general shape, has the apical region truncate and is

much broader through this area than at base. The external apical hook is unique for this species, being very broad across base and then narrowing to a very small pointed recurved apex.

The aedeagal structure more closely resembles *maculatus* than other species. The theca for the most part is a long slender sleeve, which on the right side ends truncately at base of approximate apical fourth of aedeagus. On the left side the theca is abbreviated at about middle of aedeagus except for a posterior dorsal extension which runs to base of apical sixth and whose margins partially fold together, making the flap appear bilobed at tip. On the right side only the recurved apical portion of the aedeagus extends beyond the thecal margin and only the apical half of a lateral, well-sclerotized process is visible. On the left side approximately half the aedeagus is exposed and two processes are visible, one of which arises under the theca near middle and is a prominent, sinuate, flattened process, which ends in a small, recurved hook and extends posteriorly as far as the tip of the thecal process; the second arises at about base of apical third, is closely adpressed to the aedeagus, is sharply tapered and ends slightly beyond the thecal tip. Through the seminembranous theca can be seen a short, more bluntly pointed process with apex directed dorsad.

Comparative notes. The genitalia place this species near *maculatus*. The main differences in these structures are that the thecal flap is more slender and that the prominent right aedeagal hook is longer and more curved in *consuetus* than in *maculatus*, while the second visible thecal hook on the right in the latter is short and arises near middle, in place of being a long pointed process, situated nearer the apex as in *consuetus*.

Externally, these two species are approximately the same size and have similarly shaped tegmina. They are readily distinguished by color. The tegmina of *maculatus* are golden-tan, crossed with two oblique fuscous bands, and the veins are less thick and uniformly light. The general body coloring is likewise uniformly golden, with little darker markings. In *consuetus* the females especially have fuscous bodies, and the tegmina are milky, semiopaque, with heavy dark veins and no oblique brown stripes.

Distribution of types. Male holotype, female allotype, five female and six male paratypes taken August 13, 1938, at Santa Cruz, California, by R. H. Beamer, on *Arctostaphylos tomentosa* Pur. and *Arctostaphylos sensitiva* Jap.

PLATE XIII

FIG.

1. Dorsal view of *Apheloneuma nigriviridia* Ball.
2. Dorsal view of *Apheloneuma confragosa* n. sp.
3. Dorsal view of *Apheloneuma convergens* Bunn.
4. Dorsal view of *Apheloneuma virgata* n. sp.
5. Dorsal view of *Apheloneuma concinna* n. sp.
6. Dorsal view of *Apheloneuma bivittata* Ball.
7. Dorsal view of *Apheloneuma impercepta* n. sp.
8. Dorsal view of *Apheloneuma solitaria* Ball.
9. Dorsal view of *Apheloneuma viridis* Doz.
10. Dorsal view of *Apheloneuma obscura* Van Duzee.
11. Dorsal view of *Apheloneuma minuta* Bunn.
12. Dorsal view of *Apheloneuma orbiculata* Ball.
13. Dorsal view of *Apheloneuma rugosa* (Ball).
14. Dorsal view of *Apheloneuma simplex* Uhler.
15. Dorsal view of *Apheloneuma histrionica* Stal.
16. Dorsal view of *Apheloneuma decorata* (Van Duzee).

PLATE XIII

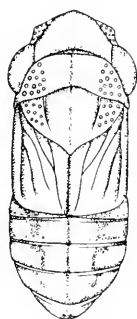
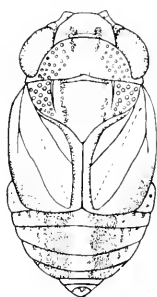
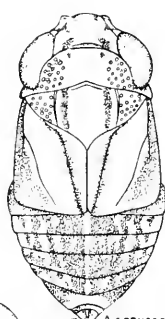
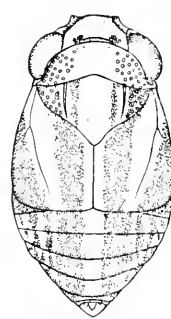
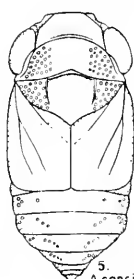
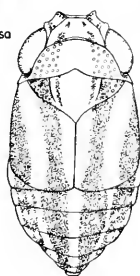
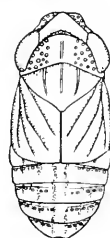
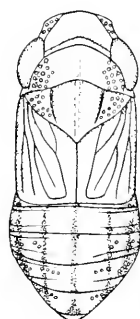
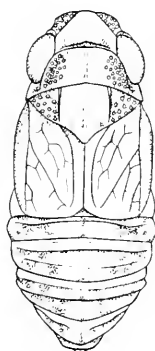
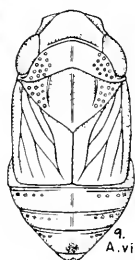
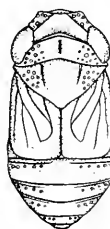
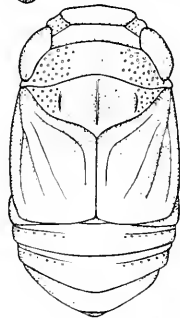
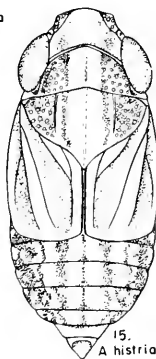
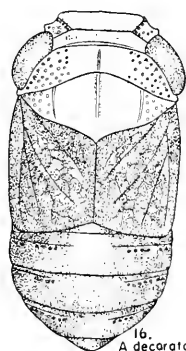
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PLATE XIV

FIG.

1. Lateral view of head of *Aphelonema histrionica* Stal.
2. Lateral view of head of *Aphelonema viridis* Doz.
3. Lateral view of head of *Aphelonema obscura* Van Duzee.
4. Lateral view of head of *Aphelonema decorata* (Van Duzee).
5. Lateral view of head of *Aphelonema nigriviridia* Ball.
6. Lateral view of head of *Aphelonema simplex* Uhler.
7. Lateral view of head of *Aphelonema concinna* n. sp.
8. Lateral view of head of *Aphelonema minuta* Bunn.
9. Lateral view of head of *Aphelonema convergens* Bunn.
10. Lateral view of head of *Aphelonema solitaria* Ball.
11. Lateral view of head of *Aphelonema impercepta* n. sp.
12. Lateral view of head of *Aphelonema bivittata* Ball.
13. Lateral view of head of *Aphelonema rugosa* (Ball).
14. Lateral view of head of *Aphelonema orbiculata* Ball.
15. Lateral view of head of *Aphelonema confragosa* n. sp.
16. Lateral view of head of *Aphelonema virgata* n. sp.
17. Cephalic view of head of *Aphelonema minuta* Bunn.
18. Cephalic view of head of *Aphelonema simplex* Uhler.
19. Cephalic view of head of *Aphelonema bivittata* Ball.
20. Cephalic view of head of *Aphelonema confragosa* n. sp.
21. Cephalic view of head of *Aphelonema virgata* n. sp.
22. Cephalic view of head of *Aphelonema decorata* (Van Duzee).
23. Cephalic view of head of *Aphelonema viridis* Doz.
24. Cephalic view of head of *Aphelonema solitaria* Ball.
25. Cephalic view of head of *Aphelonema concinna* n. sp.
26. Cephalic view of head of *Aphelonema nigriviridia* Ball.
27. Cephalic view of head of *Aphelonema obscura* Van Duzee.
28. Cephalic view of head of *Aphelonema histrionica* Stal.
29. Cephalic view of head of *Aphelonema rugosa* (Ball).
30. Cephalic view of head of *Aphelonema impercepta* n. sp.
31. Cephalic view of head of *Aphelonema orbiculata* Ball.
32. Cephalic view of head of *Aphelonema convergens* Bunn.

PLATE XIV

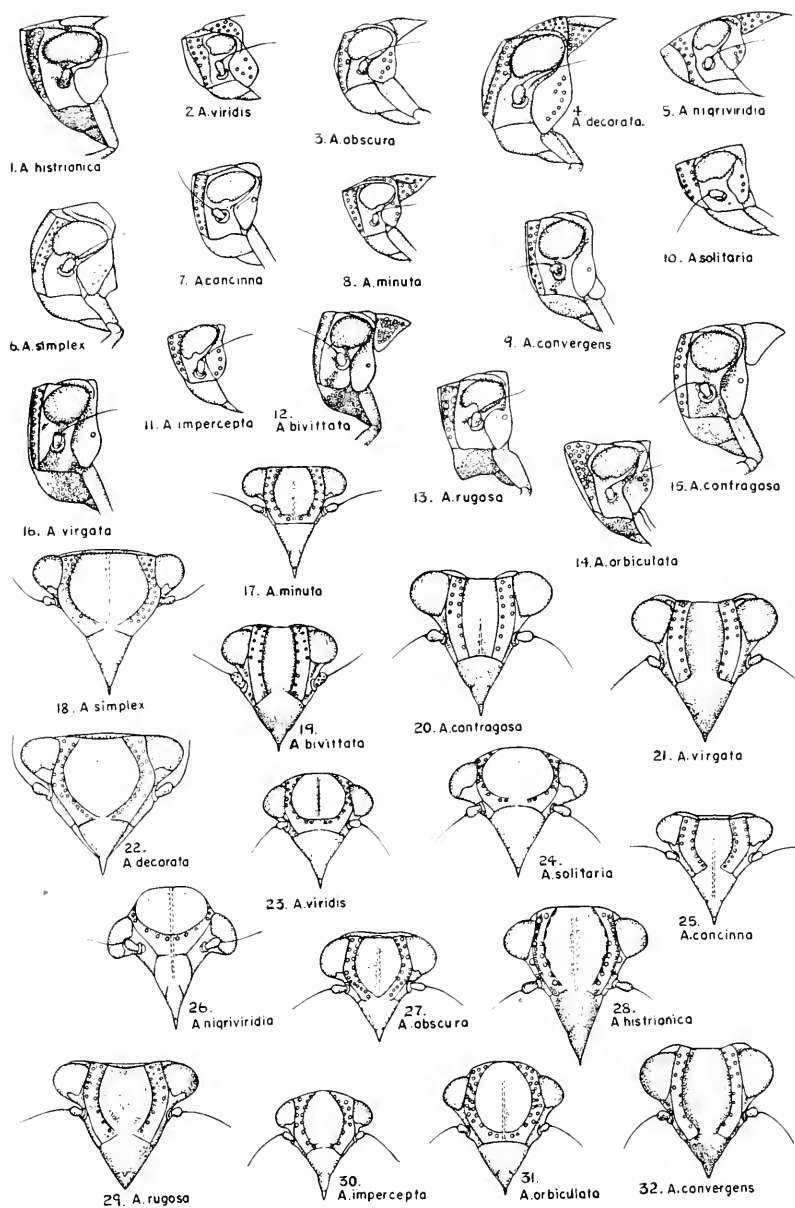


PLATE XV

FIG.

1. Lateral view of harpago of *Aphelonema rugosa* (Ball).
2. Lateral view of harpago of *Aphelonema bivittata* Ball.
3. Lateral view of harpago of *Aphelonema convergens* Bunn.
4. Lateral view of aedeagus and theca of *Aphelonema bivittata* Ball.
5. Lateral view of aedeagus and theca of *Aphelonema decorata* (Van Duzee).
6. Lateral view of aedeagus and theca of *Aphelonema rugosa* (Ball).
7. Lateral view of harpago of *Aphelonema decorata* (Van Duzee).
8. Lateral view of harpago of *Aphelonema nigriviridia* Ball.
9. Lateral view of aedeagus and theca of *Aphelonema impercepta* n. sp.
10. Lateral view of aedeagus and theca of *Aphelonema simplex* Uhler.
11. Lateral view of harpago of *Aphelonema virgata* n. sp.
12. Lateral view of harpago of *Aphelonema confragosa* n. sp.
13. Lateral view of harpago of *Aphelonema obscura* Van Duzee.
14. Lateral view of aedeagus and theca of *Aphelonema nigriviridia* Ball.
15. Lateral view of harpago of *Aphelonema impercepta* n. sp.
16. Lateral view of harpago of *Aphelonema histrionica* Stal.
17. Lateral view of harpago of *Aphelonema simplex* Uhler.
18. Lateral view of aedeagus and theca of *Aphelonema obscura* Van Duzee.
19. Lateral view of aedeagus and theca of *Aphelonema confragosa* n. sp.
20. Lateral view of aedeagus and theca of *Aphelonema histrionica* Stal.
21. Lateral view of aedeagus and theca of *Aphelonema convergens* Bunn.
22. Lateral view of aedeagus and theca of *Aphelonema virgata* n. sp.

PLATE XV

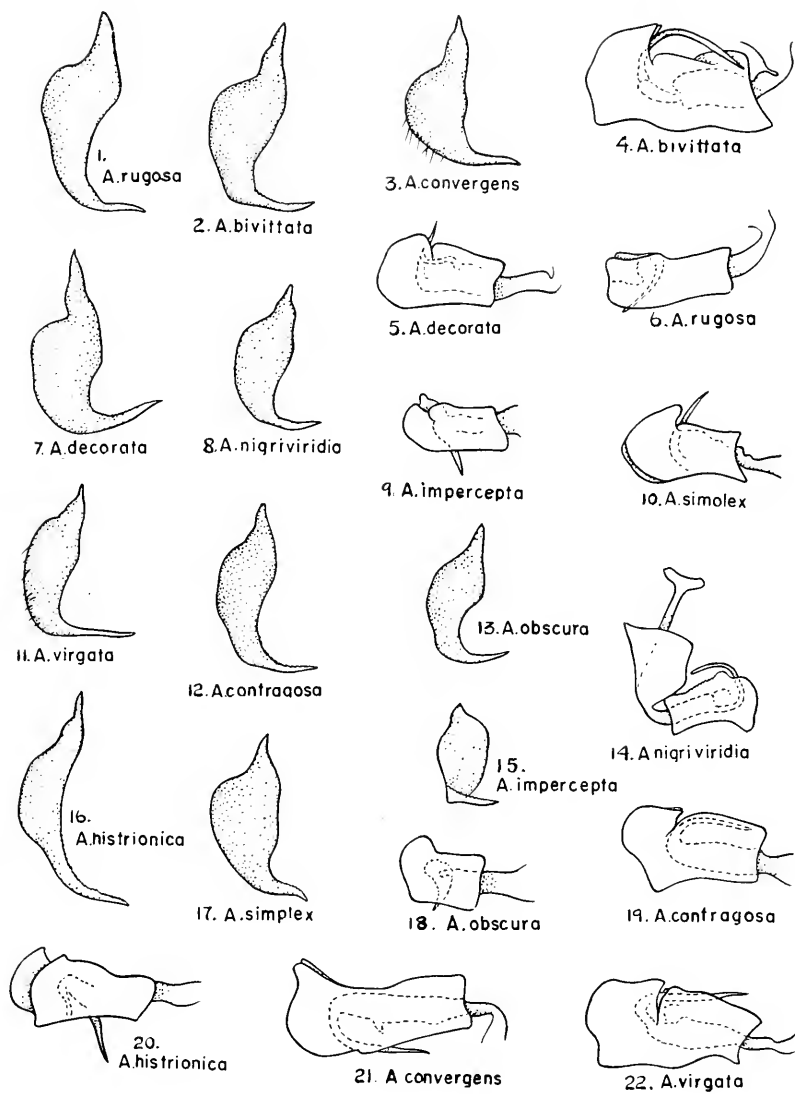


PLATE XVI

FIG.

1. Lateral view of aedeagus and theca of *Fitchiella rufipes* Lawson.
2. Lateral view of aedeagus and theca of *Fitchiella robertsoni* Fitch.
3. Lateral view of aedeagus and theca of *Fitchiella albifrons* Lawson.
4. Lateral view of aedeagus and theca of *Fitchiella fitchi* Melichar.
5. Lateral view of aedeagus and theca of *Fitchiella mediana* Lawson.
6. Lateral view of harpago of *Fitchiella rufipes* Lawson.
7. Lateral view of harpago of *Fitchiella albifrons* Lawson.
8. Lateral view of head of *Fitchiella albifrons* Lawson.
9. Lateral view of head of *Fitchiella rufipes* Lawson.
10. Lateral view of harpago of *Fitchiella fitchi* Melichar.
11. Lateral view of head of *Fitchiella fitchi* Melichar.
12. Lateral view of head of *Fitchiella robertsoni* Fitch.
13. Lateral view of harpago of *Fitchiella mediana* Lawson.
14. Lateral view of harpago of *Fitchiella robertsoni* Fitch.
15. Dorsal view of *Fitchiella rufipes* Lawson.
16. Dorsal view of *Fitchiella albifrons* Lawson.
17. Dorsal view of *Fitchiella mediana* Lawson.
18. Dorsal view of *Fitchiella robertsoni* Fitch.
19. Dorsal view of *Fitchiella fitchi* Melichar.

PLATE XVI

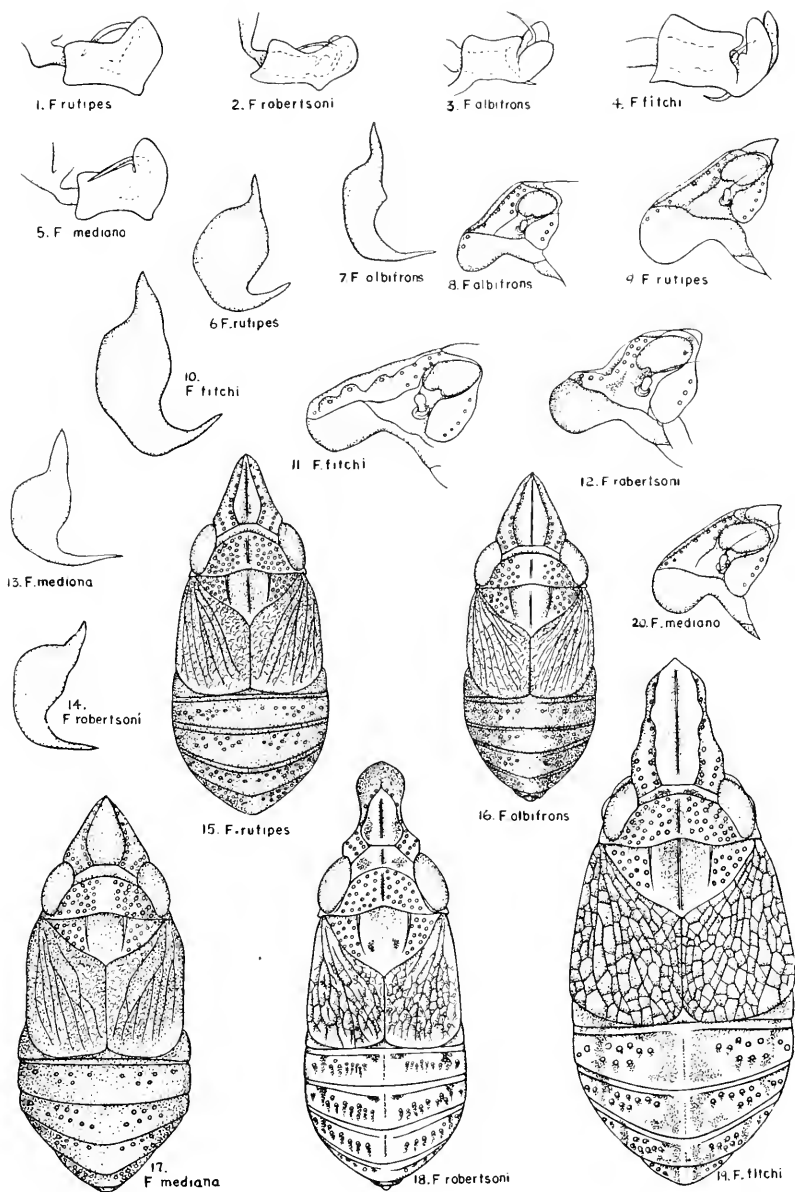


PLATE XVII

FIG.

1. Lateral right view of aedeagus and theca of *Neaethus unicus* n. sp.
2. Lateral left view of aedeagus and theca of *Neaethus unicus* n. sp.
3. Lateral right view of aedeagus and theca of *Neaethus consuetus* n. sp.
4. Lateral left view of aedeagus and theca of *Neaethus consuetus* n. sp.
5. Lateral left view of aedeagus and theca of *Neaethus bicornis* n. sp.
6. Lateral right view of aedeagus and theca of *Neaethus bicornis* n. sp.
7. Flattened dorsal view of tenth abdominal segment of *Neaethus bicornis* n. sp.
8. Flattened dorsal view of tenth abdominal segment of *Neaethus consuetus* n. sp.
9. Flattened dorsal view of tenth abdominal segment of *Neaethus unicus* n. sp.

PLATE XVII

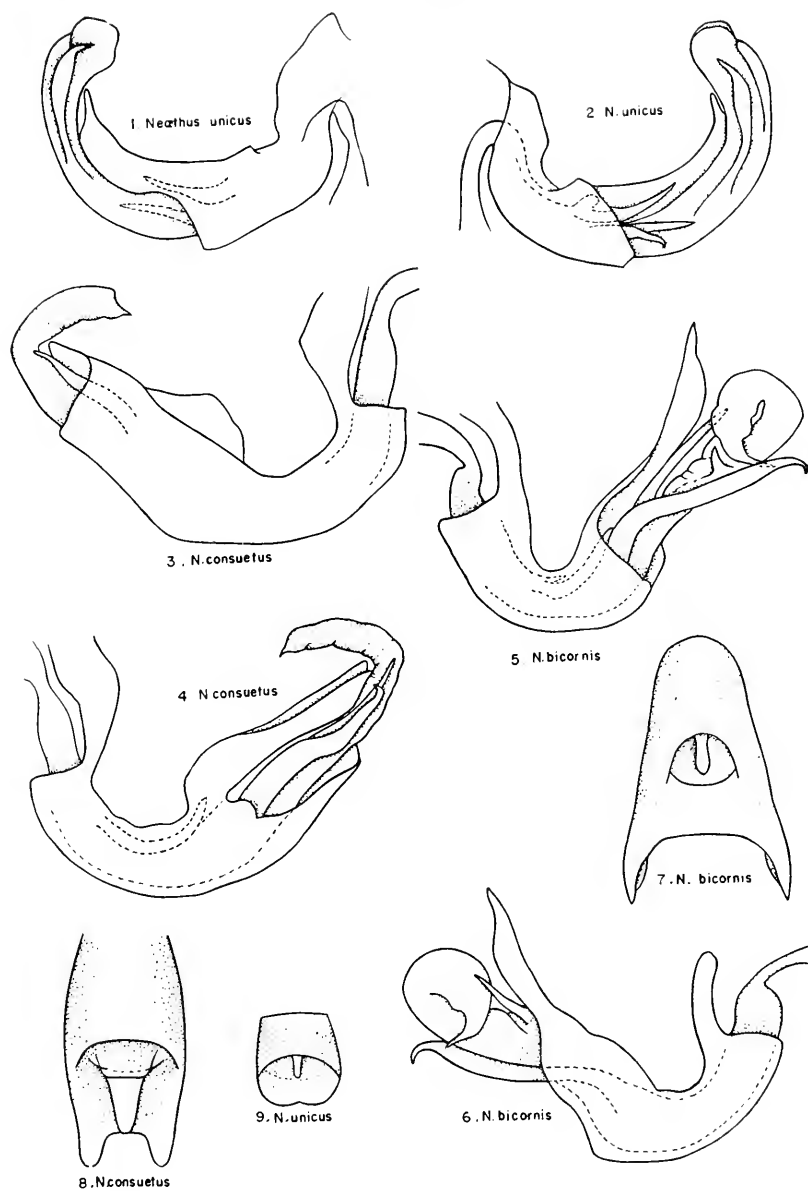
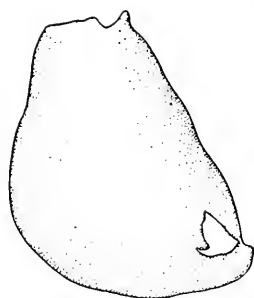
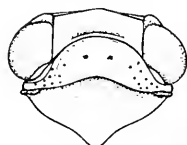
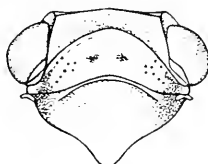
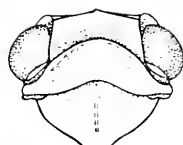
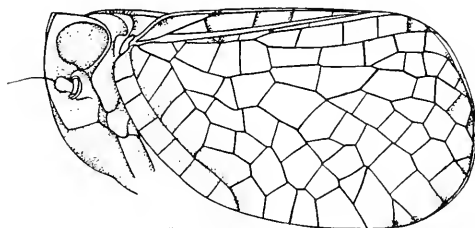
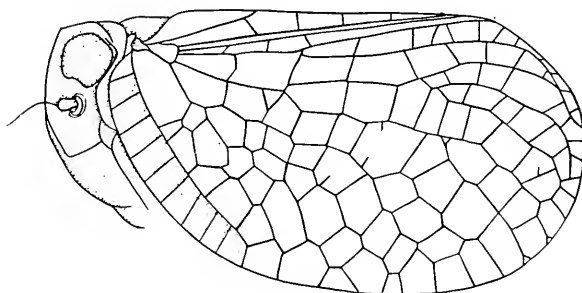
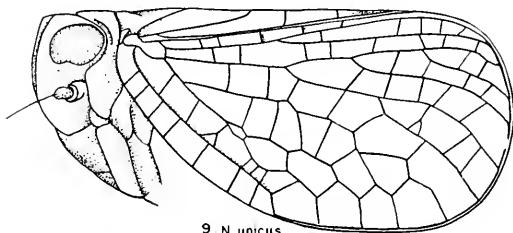


PLATE XVIII

FIG.

1. Lateral view of harpago of *Neacthus consuetus* n. sp.
2. Lateral view of harpago of *Neacthus unicus* n. sp.
3. Lateral view of harpago of *Neacthus bicornis* n. sp.
4. Dorsal view of head and thorax of *Neacthus bicornis* n. sp.
5. Dorsal view of head and thorax of *Neacthus consuetus* n. sp.
6. Dorsal view of head and thorax of *Neacthus unicus* n. sp.
7. Lateral view of *Neacthus bicornis* n. sp.
8. Lateral view of *Neacthus consuetus* n. sp.
9. Lateral view of *Neacthus unicus* n. sp.

PLATE XVIII

1. *Neathus consuetus*2. *Nunicus*3. *N. bicornis*4. *N. bicornis*5. *N. consuetus*6. *Nunicus*7. *N. bicornis*8. *N. consuetus*9. *N. unicus*