

TAXONOMIC STUDY OF THE PLANTHOPPER GENUS
OECLEUS IN THE UNITED STATES
(HOMOPTERA: FULGOROIDEA: CIXIIDAE)

BY JAMES P. KRAMER

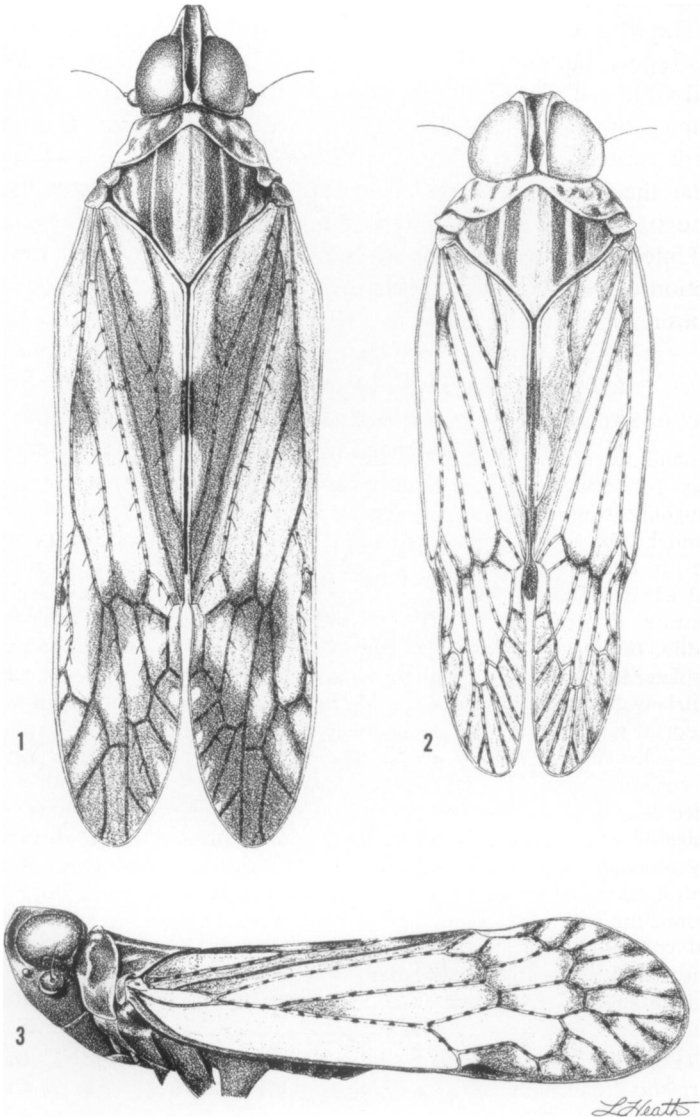
*Systematic Entomology Laboratory, IIBIII, Agr. Res. Serv., USDA*¹

INTRODUCTION

Species of the genus *Oecleus* are commonly collected phytophagous insects in the United States, particularly in our states of the Southwest. Specimens are often submitted to the Systematic Entomology Laboratory for determination by both economic entomologists and ecologists, all needing identifications before presenting their findings or observations of these insects on cultivated crops or native stands of vegetation. This research problem was prompted by these needs, and it is hoped that this study will provide a useful tool for helping to understand our species of *Oecleus* Stål and will stimulate further investigations into their relationship with the environment.

Ball and Klingenberg (1935), hereafter shortened to B&K, provided the only review of the genus in the United States which included a key to 24 species. That their key was something less than critical can be attested by the large number of misdetermined specimens, determined by them and others, in the USNM collection. They did not provide a taxonomic tool with which they and others could successfully work. Ball, like some other workers of his day, objected to the use of male genitalia for the separation of species. This prompted him to choose females as holotypes for most of the species he described. Fortunately, male allotypes, usually with the same data as the holotypes, were also selected by him. Because the features for separating species on the basis of easily observed external characters are absent, notwithstanding B&K (1935), no less than six species were found determined as *Oecleus decens* Stål, an unrecognizable species based on one fe-

¹ Mail address: c/o U. S. National Museum, Washington, D. C. 20560.



male from an unspecified locality in Mexico. Even though other examples of mixed series could be mentioned, the point has been made and is not further pursued here.

The Mexican and Central American species are not included in this report, but males of those species described by Fowler (1904) and Caldwell (1944) were studied to preclude synonymy. The fauna south of the United States is a rich one with much taxonomic work yet to be done. There is but one species of *Oecleus* known from the West Indies, *acutus* Ball, and it is included with this report.

Unless otherwise stated, all holo- or lectotypes are in the collection of the United States National Museum. All holo- or lectotypes have been studied.

Genus OECLEUS Stål

Oecleus Stål 1862:306. Type-species *seminiger* Stål 1862:307.

Small to moderately large cixiids (3.3-8.5 mm.); head in dorsal view (figs. 1-2), much narrower than pronotum with eyes large; vertex narrow, troughlike with sides and anterior margin carinate, sides parallel or subparallel, base narrowed and open or closed, apex variably produced beyond eyes; in lateral view (fig. 3), apex of head acutely or obtusely angled, lateral edges of vertex not more than slightly higher than upper margins of ventrally indented eyes, ocellus under each eye; in facial view sides and midline of frons and clypeus carinate, carina on midline of frons sometimes obsolete, frons elongated and narrowed toward vertex, clypeus triangular or subtriangular, ocellus on midline of frons just above fronto-clypeal suture; in dorsal view pronotum collarlike with irregular ridges, narrowest on midline, indented on posterior margin, declivant laterad, carinate or subcarinate on posterior and lateral margins; mesonotum longer on midline than combined lengths of vertex and pronotum, disc of mesonotum flattened and typically with five longitudinal carinae, central carina and lateral pair usually more distinct than pair flanking central carina, at times pair flanking central carina absent or reduced to pale pigmented lines, lateral portions of mesonotum declivant; antenna originating from large socket, scape reduced and collarlike, pedicel round or quadrately rounded with some papillose sensoria, flagellum beadlike basally and filamentous distally; hind tibiae without spines before apex; forewings essentially hyaline, rarely with color

TEXT FIGS. 1-3. — Dorsal and lateral habitus views. Fig. 1, *Oecleus perpictus* Van Duzee. Fig. 2, *Oecleus martharum* n. sp. Fig. 3, *Oecleus venosus* Van Duzee.

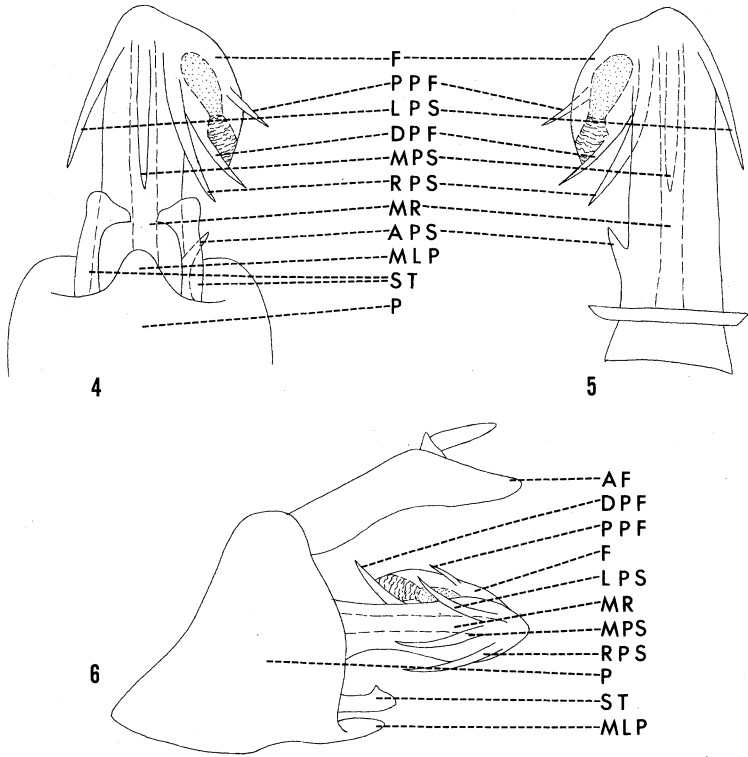
pattern, venation as in fig. 3, veins typically dotted with dark pustules which may or may not bear setae, pustules often highly obscure or obsolete. Male genitalia: pygofer longest on ventral margin, anal flap elongated, paired slender symmetrical styles flanking median lobe of pygofer, styles and basal portion of asymmetrical aedeagus articulated by vertical connective, aedeagus transverse, consisting of shaft and distal reclinate flagellum, shaft with 1 to 3 processes, flagellum with 0 to 2 processes (see later discussion).

Generic diagnosis. — *Oecleus* can be separated from all other Cixiidae in our fauna by characters of the head in dorsal view (figs. 1-2). The size of the eyes is exaggerated by the narrowness of the vertex. The vertex, even though often mainly parallel sided, is always narrower basally than apically and is separated from the face by a short transverse carina. The only genus in our fauna with which it might be confused is *Oeclidius* Van Duzee in the Kinnaridae. *Oeclidius* also has a narrow vertex but differs by having the vertex broadest basally, then tapered to a narrow or closed apex. Further, *Oeclidius* has a distinct carina on the midline of the pronotum; this character is absent in *Oecleus*. The male genitalia of the two genera differ in many respects; the most obvious difference is the lack of an aedeagal flagellum in *Oeclidius*.

Male genitalia. — Successful separation of the species of *Oecleus* depends almost entirely upon the cryptic features of the male genital capsule. Figures 4-6 provide generalized views of these structures with the parts labeled according to the terminology used in this report. Those parts of the male genitalia of prime taxonomic value are the median lobe of the pygofer (MLP), anal flap (AF), and the various parts of the aedeagus (fig. 5).

The aedeagus is the most complex component of the male structures. It consists of a sclerotized shaft and a recumbent semi-membranous apical flagellum. At rest the flagellum is invariably found on the right of the shaft. In copulation the flagellum inflates and assumes a position at the apex of the shaft so that its sides are roughly parallel with those of the shaft. The gonopore is at the apex of the flagellum. Within the flagellum are two differently sclerotized oval structures which aid in the transfer of sperm. Basad of the flagellum, within the shaft on its long axis, the hollow middle rod (MR) provides the gonoduct.

The number and shape of the processes found on the shaft and



TEXT FIGS. 4-6. — Generalized male genitalia. Fig. 4, Apical portion of pygofer, styles, and aedeagus in ventral view. Fig. 5, Aedeagus in dorsal view. Fig. 6, Pygofer, anal flap, style, and aedeagus in left lateral view. AF = anal flap, APS = acute process of shaft, DPF = distal process of flagellum, F = flagellum, LPS = left process of shaft, MLP = median lobe of pygofer, MPS = middle process of shaft, MR = middle rod of shaft, P = pygofer, PPF = proximal process of flagellum, RPS = right process of shaft, ST = style.

flagellum provide the most important taxonomic features. The number on the shaft may be 3, 2, or 1. When 3 are present, they are termed right process (RPS), middle process (MPS), and left process (LPS). When 2 are present, they are termed right process and left process. The flagellum may have 2, 1, or 0 processes.

When 2 are present, they are called proximal process (PPF) and distal process (DPF). At times it is more useful to refer to the processes of the flagellum as inner process and outer process where they are contiguous, parallel, and subequal in length. Rarely the shaft bears an acute projection (APS) on the right margin near the base or near the middle. With the exception of the median lobe of the pygofer (MLP) and the anal flap (AF), both of taxonomic value, the rest of the labeled parts in figs. 4-6 serve mainly to orient the reader.

Notes on keys and descriptions. — Before attempting to use the keys which follow, one should become fully familiar with the generalized male genitalia shown in figs. 4-6 and the previous discussion of these structures. Two keys are presented, the first for those species found in the eastern states, and the second for all species found in the United States.

In the descriptions, the anterior prolongation of the vertex refers to that portion of the vertex which extends beyond the anterior margins of the eyes. The ground color of the head, thorax, and legs is often difficult to state with precision because of frequent intraspecific gradients from tawny to black. In almost all species, however, the carinate portions are lighter in color than the rest of the surfaces. The forewings are essentially hyaline in all of the species, but some specimens intraspecifically may be less so than others. In even the palest of species, there is usually a pair of variably darker lines on the commissural margin of each forewing; and each stigma is usually darker than the area around it.

KEY TO SPECIES OF OECLEUS FOUND EAST OF THE MISSISSIPPI RIVER

(males only)

1. Aedeagus in ventral view with only left process on left margin of shaft, both processes short and stout (fig. 137) *productus* Metc.
Aedeagus in ventral view with both right and left processes on left margin of shaft, both processes long and slender (figs. 116, 119) **2**
2. Head in dorsal view with vertex produced anteriorly for less than greatest width of vertex (distribution: widespread) *borealis* Van D.

Head in dorsal view with vertex produced anteriorly for more than greatest width of vertex (distribution: southcentral Florida)
 *tamiamus* B&K

KEY TO UNITED STATES SPECIES OF OECLEUS

(males only)

1. Shaft with acute projection on right side near base or middle 2
 Shaft without such a projection 3
2. Projection of shaft near base, median lobe of pygofer triangularly produced (fig. 7) *rhion*, n. sp.
 Projection of shaft near middle, median lobe of pygofer roundly produced (fig. 10) *piperatus* B&K
3. Shaft with one process 4
 Shaft with two or three processes 5
4. Larger tawny species; face, carina included, tawny; forewings unmarked; anal flap in lateral view strongly convex on distal ventral margin (fig. 14) *snowi* Ball
 Smaller dark species; face, carina excepted, intense black; each forewing with dark, narrow, transverse, subapical stripe; anal flap in lateral view weakly convex on distal ventral margin (fig. 17)
 *vates*, n. sp.
5. Shaft with three processes 6
 Shaft with two processes 12
6. All processes more than half length of shaft, apex of middle process abruptly narrowed and hooked, nearly touching base in ventral view (fig. 19) *martharum*, n. sp.
 All processes not more than half length of shaft, apex of middle process gradually narrowed and curved to the right in ventral view (fig. 22) 7
7. Males less than 4 mm. long, usually about 3.5 mm. 8
 Males 4 mm. or longer 10
8. Face, carina excepted, and all veins of forewings brown
 *pigmy* B&K (in part)
 Face pale or if brownish, carina excepted, then only veins beyond claval apex brown or partly brown 9
9. Left process at apex turned to right, or right process straight or nearly so and not forming caliperlike structure with middle process in ventral view *pigmy* B&K (in part)
 Left process curved to left, and right process curved to form caliperlike structure with middle process in ventral view 10
10. Middle process stouter than right process in ventral view (fig. 25)
 *monilipennis* Van D.

- Middle process as stout or less stout than right process in ventral view 11
11. Middle and right process subequal in stoutness in ventral view (fig. 28) *fulvidorsum* Ball
 Middle and right process clearly unequal in stoutness, middle process slender and right process stout in ventral view (fig. 31) .. *balli*, n. sp.
12. Aedeagus in lateral view with large round bulge on ventral margin of shaft (fig. 35) *campestris* Ball
 Aedeagus in lateral view with at most a slight convexity on ventral margin of shaft 13
13. Shaft in lateral view roundly expanded on dorsal margin in distal half and anal flap subtriangular in outline (fig. 53) 14
 Without above combination of characters 15
14. Right process about twice length of left process (fig. 52) *arnellus* B&K
 Right process and left process subequal in length (figs. 43, 49) *subreflexus* Van D.
15. Flagellum with two processes 16
 Flagellum with one process 30
16. Proximal flagellar process in lateral view strongly recurved near apex (figs. 38, 41) 17
 Proximal flagellar process in lateral view straight or only slightly recurved near apex (figs. 71, 89) 18
17. Right process short, about one-fourth length of shaft (fig. 37) *sagittanus* B&K
 Right process long, about three-fourths length of shaft (fig. 40) *centronus* B&K
18. Right process strongly bowed or curved and protruding beyond outer margin of flagellum at least in part in ventral view 19
 Right process straight or slightly bowed but not protruding beyond outer margin of flagellum in ventral view 22
19. Bases of flagellar processes widely separated (figs. 57, 60), anal flap in lateral view not convex on ventral margin (figs. 56, 59) *nolinus* B&K
 Bases of flagellar processes contiguous, anal flap in lateral view convex on ventral margin 20
20. Median lobe of pygofer roundly produced at middle, right process abruptly bowed in distal half (fig. 61) *planus* B&K
 Median lobe of pygofer spatulately produced at middle, right process not abruptly bowed in distal half 21
21. Right process curved to transect flagellar processes in ventral view (fig. 64) *lyra*, n. sp.
 Right process not curved to transect flagellar processes in ventral view (fig. 67) *troxanon*, n. sp.

- 22. Both right and left processes half or less length of shaft 23
 - Either right or left process or both more than half length of shaft 25
- 23. Anal flap elongate and slender (fig. 71), forewing with extensive color pattern (fig. 1) *perpictus* Van D.
 - Anal flap much broadened distally, forewing without color pattern .. 24
- 24. Median lobe of pygofer narrowly spatulate (fig. 73), flagellar processes of unequal size (fig. 75) *chrisjohni*, n. sp.
 - Median lobe of pygofer roundly spatulate (fig. 76), flagellar processes of equal size (fig. 78) *lineatus* Ball
- 25. Right and left processes subequal in length (fig. 79) *natatorius* Ball
 - Right process clearly longer than left process 26
- 26. Proximal or inner flagellar process minute (fig. 84), median lobe of pygofer broad and roundly produced (fig. 82), (distribution: Haiti) *acutus* Ball
 - Proximal or inner flagellar process not minute, median lobe of pygofer spatulately produced, (distribution: Western United States) 27
- 27. Anal flap neither strongly convex nor lobed on ventral margin near middle (fig. 89) *capitulatus* Van D.
 - Anal flap strongly convex or lobed on ventral margin near middle .. 28
- 28. Both flagellar processes short and barely extending beyond margins of flagellum in dorsal view (fig. 93) *jenniferae*, n. sp.
 - Both flagellar processes long and clearly extending beyond margins of flagellum in dorsal view 29
- 29. Anal flap with irregular lobe on ventral margin distally (fig. 86), right process more than twice length of left process (fig. 85) *excavatus* Ball
 - Anal flap broadly convex on ventral margin distally (fig. 95), right process less than twice length of left process (fig. 96) .. *palton*, n. sp.
- 30. Central portion of median lobe of pygofer in ventral view narrowly spatulate with length at least twice basal width (figs. 97, 100) 31
 - Central portion of median lobe of pygofer in ventral view subtriangular or broadly spatulate with length and basal width subequal (figs. 116, 119) 32
- 31. Right process moderately broad with apex acute in ventral view (fig. 97), ventral margin of anal flap not strongly convex distally in lateral view (fig. 98) *glochis*, n. sp.
 - Right process slender with apex needlelike in ventral view (fig. 100), ventral margin of anal flap strongly convex distally in lateral view (fig. 101) *venosus* Van D.
- 32. Both left and right processes positioned on left margin of shaft in dorsal or ventral view 33
 - Only left process positioned on left margin of shaft in dorsal or ventral view 40

33. Processes crossed at or before their midlengths in dorsal or ventral view 34
 Processes not crossed or subapically crossed in dorsal or ventral view 36
34. Processes unequal in length and width (figs. 103, 104) *cucullus*, n. sp. (in part)
 Processes equal or subequal in length and width (figs. 107, 113) 35
35. Males 5.5-6 mm. long (distribution: Arizona) *netron*, n. sp.
 Males 4.8-5.1 mm. long, (distribution: California) *netrion*, n. sp. (in part)
36. Shaft in dorsal or ventral view with constriction on right side near middle (figs. 113, 115) *netrion*, n. sp. (in part)
 Shaft not so constricted 37
37. Both processes moderately stout, right process in ventral view in part superimposed on left process for at least half their common length (fig. 106) *cucullus*, n. sp. (in part)
 Both processes slender, right process in ventral view not superimposed on left process or only slightly so at their extreme bases (figs. 110, 119) 38
38. Both processes not bowed to the right, right process somewhat undulated, processes usually crossed subapically in ventral view (fig. 110); central and lateral carinae of mesonotal disc black (distribution: Arizona) *quadrilineatus* Van D.
 Both processes bowed to the right with similar curvature, processes crossed subapically or not in ventral view (figs. 116, 119); central and lateral carinae of mesonotal disc tawny (distribution: mainly east of Arizona) 39
39. Head in dorsal view with vertex produced anteriorly for less than greatest width of vertex (distribution: widespread) .. *borealis* Van D.
 Head in dorsal view with vertex produced anteriorly for more than greatest width of vertex (distribution: southcentral Florida) *tamiamus* B&K
40. Flagellar process long and extending beyond apex of flagellum in lateral view 41
 Flagellar process short or long but not extending beyond apex of flagellum in lateral view 42
41. Left process long, strongly projecting beyond left lateral margin of shaft and bowed to the right, right process more narrowly bowed to the right in ventral view (fig. 122) *pontifex*, n. sp.
 Left process short, not projecting as above and slightly bowed to the left, right process nearly straight or broadly bowed to the left in ventral view (fig. 125) *augur*, n. sp.
42. Left process slender, needlelike and obliquely projecting away from left margin of shaft in ventral view (fig. 128) *epetron*, n. sp.

- Left process stouter, not needlelike, not projecting as above in ventral view 43
43. Right process in ventral view unusually broad basally and broadly curved to the left (fig. 131) *patulus*, n. sp.
Right process in ventral view not as above 44
44. Left process in ventral view with apex not reaching midpoint of bulge on left side of shaft (figs. 134, 137, 143, 146), or if so, right process obliquely directed to right (fig. 140) *productus* Metc.
Left process in ventral view with apex reaching to or beyond midpoint of bulge on left side of shaft, right process straight or curved to left (figs. 149, 152, 155, 158) *obtusus* Ball

Oecleus rhion Kramer, n. sp.

(Figs. 7-9)

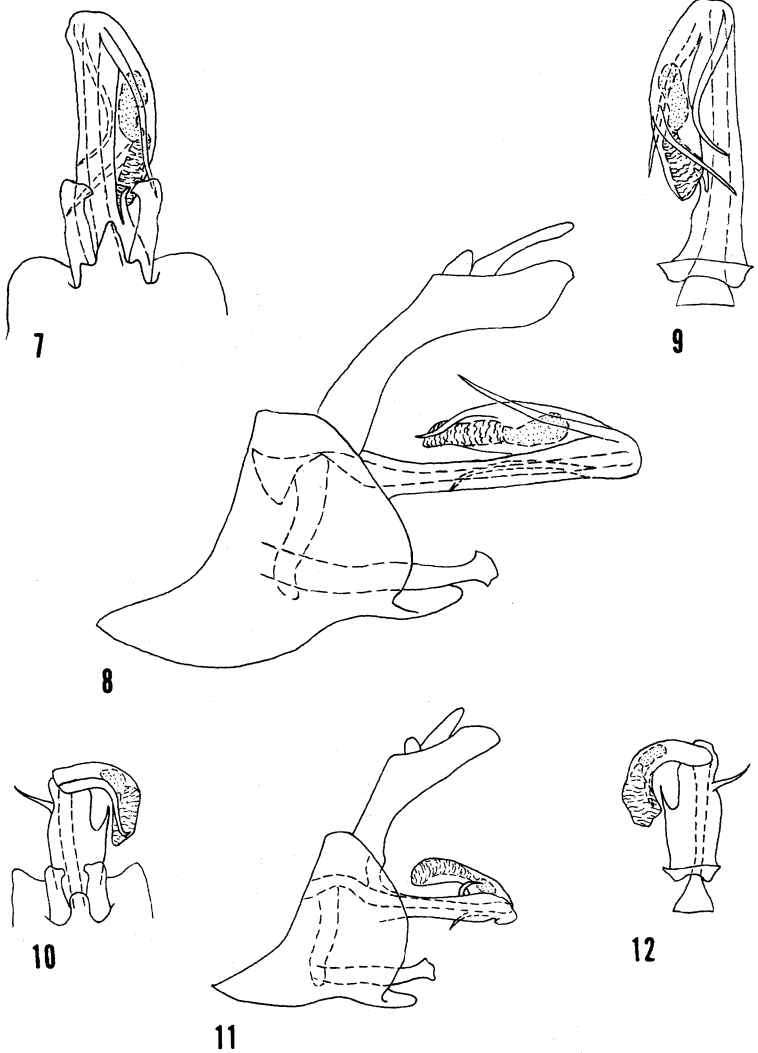
Salient features. — Length of males 4.5-5.5 mm., females 5.5-5.8 mm. Ground color of head, thorax, and legs light brown to almost fuscus with all carinae paler; vertex usually closed basally and produced anteriorly for about distance equal to greatest width; disc of mesonotum with five pale longitudinal carinae on darker ground color; pair of carinae flanking central carina sometimes not reaching anterior margin of mesonotum; forewings hyaline with veins pale brown; pustules on veins slightly darker and moderately distinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 7) triangularly produced from quadrate base; aedeagal shaft with two processes (figs. 7, 9), both slender and more than half length of shaft, right process obliquely extended to or beyond outer margin of flagellum, left process usually broadly curved to left distally; flagellum with one long process (figs. 8, 9) directed obliquely to left; slender, acute projection on right margin of shaft near base (fig. 7); anal flap in lateral view (fig. 8) slender with slight irregularity on distal margin.

Type. — Holotype male (USNM 73668), Atascosa Mt., Arizona, 15 August 1935, E. D. Ball.

Specimens studied. — ARIZONA, Atascosa Mt., Nogales, Sabin Canyon, Sonoita, Quinlan Mts. Collection dates 22 June to 15 August. Total specimens studied: 7 males and 2 females.

Notes. — The distinctly triangular median lobe of the pygofer and the acute projection on the right margin of the shaft near the base provide the features which immediately distinguish this species from all of its congeners. Southern Arizona provides our only records for *rhion*. The specific name, a Greek noun in apposition, means peak or projection.



TEXT FIGS. 7-12.— Male genitalia. Figs. 7-9, *Oecleus rhion* n. sp., from type. Figs. 10-12, *Oecleus piperatus* B&K, specimen from Sacaton, Arizona. Figs. 7, 10, apex of pygofer, styles, and aedeagus in ventral view. Figs. 8, 11, complete lateral view. Figs. 9, 12, aedeagus in dorsal view.

Oecleus piperatus B&K

(Figs. 10-12)

Oecleus piperatus B&K, 1935:209.

Salient features. — Length of males 3.4-3.8 mm., females 3.8-4.3 mm. Ground color of head, thorax, and legs buff; vertex usually not closed basally and produced anteriorly for about distance equal to greatest width; disc of mesonotum with five longitudinal carinae, color of these not differing markedly from ground color, central three often variably obsolete; lateral portions of mesonotum flanking disc often darkened; clypeus and often frons buffy orange; forewings hyaline or milky hyaline with pustules on veins dark brown and distinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 10) lobately produced; aedeagal shaft with two processes (figs. 10, 12), right process longer and curved to left (Note: position of right process somewhat distorted in Fig. 10), left process shorter and projecting at nearly right angle to long axis of shaft; flagellum without processes (fig. 12); moderately stout, acute projection on right margin of shaft near middle (figs. 10, 12); anal flap in lateral view (fig. 11) without distinctive features.

Type. — Holotype female, Tucson, Arizona, 24 July 1930, E. D. Ball.

Specimens studied. — ARIZONA, Eloy, Sacaton, Phoenix, Tucson, Collection dates 4 May to 4 August. Total specimens studied: 23 males and 20 females.

Notes. — In well-marked specimens, the darkened portions of the mesonotum appear as a stripe on each side of the paler discal area; this is often a useful character for recognizing the species. The lobate median lobe of the pygofer and the acute projection on the right margin of the shaft near the middle distinguish this species from all others in the genus. Southcentral Arizona provides the only record for *piperatus*. All of the specimens studied were taken on *Atriplex linearis*.

Oecleus snowi Ball

(Figs. 13-15)

Oecleus snowi Ball, 1905:117.

Salient features. — Length of males 6-7 mm., females 7-8.5 mm. Ground color of head, thorax, and legs buff to tawny; vertex narrowed but usually not closed basally and produced anteriorly for more than greatest width; disc of mesonotum with five longitudinal carinae, color of these often paler than ground color, pair flanking central carina usually reduced or obsolete; intercarinal portions of mesonotum light or variably darkened; forewings smoky yellowish hyaline with pustules on veins dark brown and distinct.

Male genitalia. — Median lobe of pygofer in central view (fig. 13) spatulately produced at middle, with short angulation on each side of base; aedeagal shaft with one moderately short process on left margin (figs. 13, 15); flagellum with one long process nearly extending to base of shaft (figs. 13, 15); anal flap in lateral view (fig. 14) subquadrate distally.

Type. — Lectotype female, Bill Williams Fork, Arizona, F. H. Snow, here selected. This is one of the four cotype females with identical data mentioned in the original description. Of the original series, only the lectotype and one other specimen are still in the USNM.

Specimens studied. — ARIZONA, Baboquivari Mts., Bill Williams Fork, Chiricahua Mts., Nogales, Patagonia, Phoenix, Roosevelt Dam, Sabino Canyon, Safford, Santa Catalina Mts., Santa Cruz River, Santa Rita Mts., Tubac, Tucson, Wickenburg; CALIFORNIA, Ontario. Collection dates 12 April to 26 October. Total specimens studied: 27 males and 46 females.

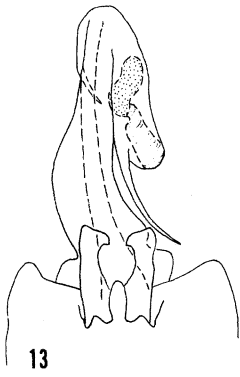
Notes. — The large size, light color, and single process on the aedeagal shaft provide the distinctive features of *snowi*. Arizona and southern California furnish the only state records. The food plant is recorded as *Baccharis glutinosa*.

***Oecleus vates* Kramer, n. sp.**

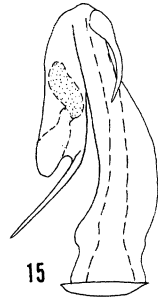
(Figs. 16-18)

Salient features. — Length of males 5.5-5.4 mm., females 5.5-5.8 mm. Ground color of head, thorax, and legs fuscus to black with all carinae paler; vertex narrowly open basally and produced anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, color of these yellowish brown and sharply contrasting with black ground color, central carina unusually narrow, those flanking central carina scarcely or not elevated with their bases and apices turned laterad and at times touching outer carina on each side; forewings hyaline with two narrow dark patches on commissural margin, one near middle and other at claval apices; each forewing with dark transverse band across proximal crossveins from claval apex to similarly darkened stigma, distal crossveins narrowly darkened,

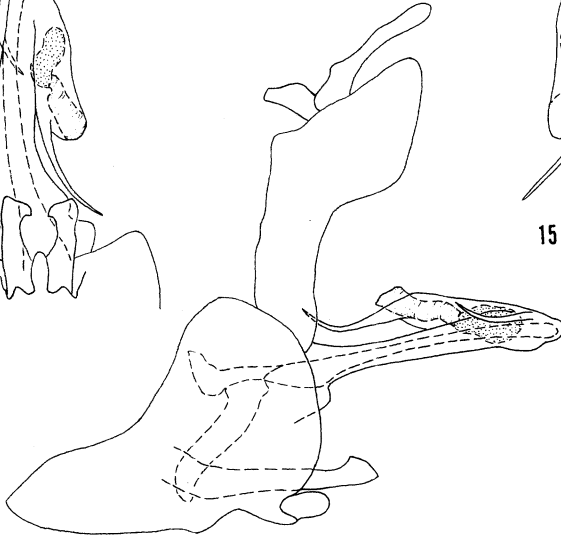
TEXT FIGS. 13-18. — Male genitalia. Figs. 13-15, *Oecleus snowi* Ball, specimen from Santa Rita Mts., Arizona. Figs. 16-18, *Oecleus vates* n. sp., from type. Figs. 13, 16, apex of pygofer, styles, and aedeagus in ventral view. Figs. 14, 17, complete lateral view. Figs. 15, 18, aedeagus in dorsal view.



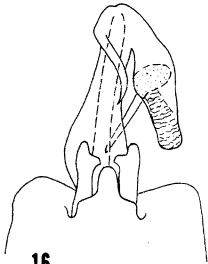
13



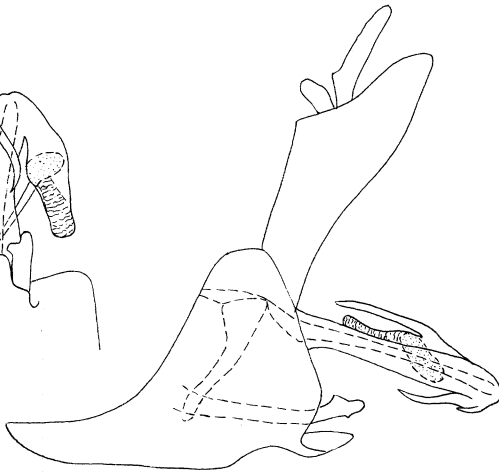
15



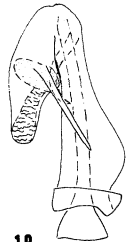
14



16



17



18

points where veins join margin of forewing variably darkened, pustules on veins distinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 16) lobately produced from subquadrate base; aedeagal shaft with one moderately long process on left margin (figs. 16, 18); flagellum with one long process extending beyond apex of flagellum (figs. 16, 18); anal flap in lateral view (fig. 17) slightly convex on ventral margin distally.

Type. — Holotype male (USNM 73669), Chiricahua Mts., Arizona, 26 July 1935, E. D. Ball.

Specimens studied. — ARIZONA, Chiricahua Mts. Collection date 26 July. Total specimens studied 6 males and 2 females.

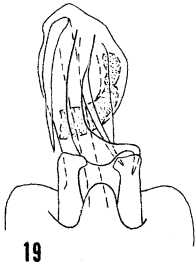
Notes. — The dark transverse band on the distal portion of each forewing will separate *vates* from its congeners. The maculation of the forewings and single processes on the shaft and flagellum make this a most distinctive species. Because they are not clearly elevated, the pale stripes which flank the central carina on the mesonotum should not be called carinae. Hence, the mesonotum is 3-carinate rather than 5-carinate. The specific name, a Latin noun in apposition, means prophet or soothsayer.

***Oecleus martharum* Kramer, n. sp.** (Figs. 2, 19-21)

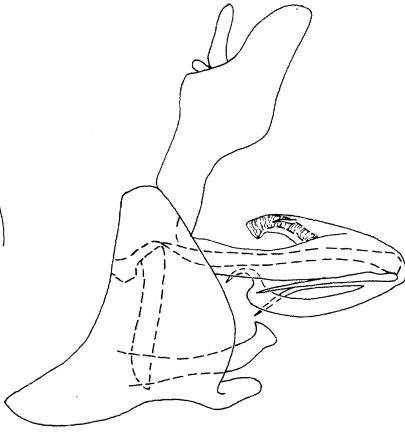
Salient features. — Length of males 4.5-5.2 mm., females 5-5.7 mm. Ground color of head, thorax, and legs buff to tan; vertex narrowed but usually not closed basally and produced anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae; pair flanking central carina often much reduced and highly obscure; in well-marked specimens, lateral carinae of mesonotal disc broadly margined with fuscus to black and thus prominent; mesepimeron and lateral surfaces of clypeus variably infuscate; intercarinal portions of clypeal disc variably buffy orange to brown; forewings hyaline with dark pustules on veins distinct; in well-marked specimens, forewings clouded with brown as in fig. 2.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 19) broadly and lobately produced; aedeagal shaft with three long processes (figs. 19-21), right and left process slender and sharply acute apically, mid-

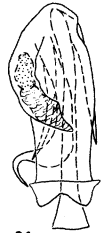
TEXT FIGS. 19-27. — Male genitalia. Figs. 19-21, *Oecleus martharum* n. sp., specimen from Richfield, Utah. Figs. 22-24, *Oecleus pigmy* B&K, specimen from Sacaton, Arizona. Figs. 25-27, *Oecleus monilipennis* Van Duzee, from paratype. Figs. 19, 22, 25, apex of pygofer, styles, and aedeagus in ventral view. Figs. 20, 23, 26, complete lateral view. Figs. 21, 24, 27, aedeagus in dorsal view.



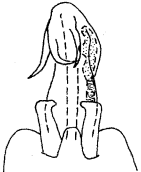
19



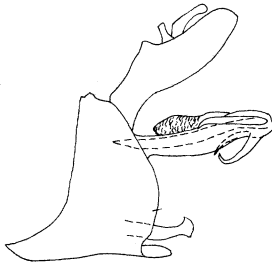
20



21



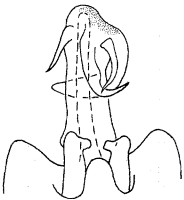
22



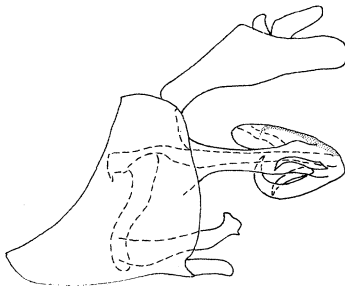
23



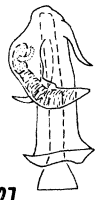
24



25



26



27

dle process longer and broader with moderately stout apical hook, all processes more than half length of shaft; flagellum with one minute process (fig. 20); anal flap in lateral view (fig. 20) convex at middle of ventral margin.

Type. — Holotype male (USNM 73670), Welton, Arizona, 27 March 1932, E. D. Ball.

Specimens studied. — ARIZONA, Phoenix, Sacaton, Tucson, Welton, Yuma; CALIFORNIA, Buttonwillow, Coalinga, Daggett, Derby Acres; Jacalitos Canyon, Westmorland; NEVADA, Glendale, Las Vegas, Overton; UTAH, Richfield, St. George. Collection dates 27 March to 25 August. Total specimens studied 37 males and 76 females.

Notes. — This is the species misidentified by B&K (1935:209) as *monilipennis* Van Duzee; see discussion under that species. In well-marked specimens, color pattern is useful in recognizing *martharum*. However, the diagnostic features are in the male genitalia and this species can be separated from all of its congeners at once by the three processes on the aedeagal shaft and the apical hook on the central process. Specimens have been taken on *Atriplex canescens*, *A. polycarpa*, *A. semibaccata*, and *Dondia* sp. The distribution is extensive in our southwestern states. The species is named for my wife and older daughter, both of whom are Martha.

Oecleus pigmy B&K

(Figs. 22-24)

Oecleus pigmy B&K, 1935:210.

Salient features. — Length of males 3.3-3.7 mm., females 3.5-4.1 mm. Ground color of head, thorax, and legs sordid stramineous to light brown with all carinae usually paler; vertex slightly narrowed but not closed basally and prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina usually much reduced and obscure; in heavily marked specimens, central and lateral carinae of mesonotal disc margined with brown and thus prominent; face and thoracic venter, carinae excepted, scarcely to heavily embrowned or infuscated; forewings hyaline with pustules on veins indistinct; veins varying from entirely dark brown, only dark brown beyond claval apices, to just few crossveins darkened.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 22) lobately produced; aedeagal shaft with three moderately short processes

(figs. 22, 24), left process gently curved to left or rarely straight with apex turned to right, middle process curved to right, right process gently curved to left or rarely straight, middle and right processes usually forming caliper-like structure; flagellum without distinct process (fig. 24); anal flap in lateral view (fig. 23) slightly convex on ventral margin.

Type. — Holotype female, Sacaton, Arizona, 2 April 1932, E. D. Ball.

Specimens studied. — ARIZONA, Phoenix, Sacaton, Tucson; CALIFORNIA, Cabazon, Chino, San Diego; COLORADO, Grand Junction; IDAHO, Bruneau; NEVADA, Overton; TEXAS, Culberson County; UTAH, Cedar, Santa Clara, St. George. Collection dates 14 April to 21 June. Total specimens studied 18 males and 22 females.

Notes. — The small size, comparatively dark brown veins of the forewings in well-marked specimens, the three processes on the aedeagal shaft, and the right and middle processes usually forming a caliperlike structure provide the features for distinguishing *pigmy*. Specimens have been taken on *Atripex linearis*, *A. confertifolia*, and *A. torreyii*. The distribution is extensive in our Southwest.

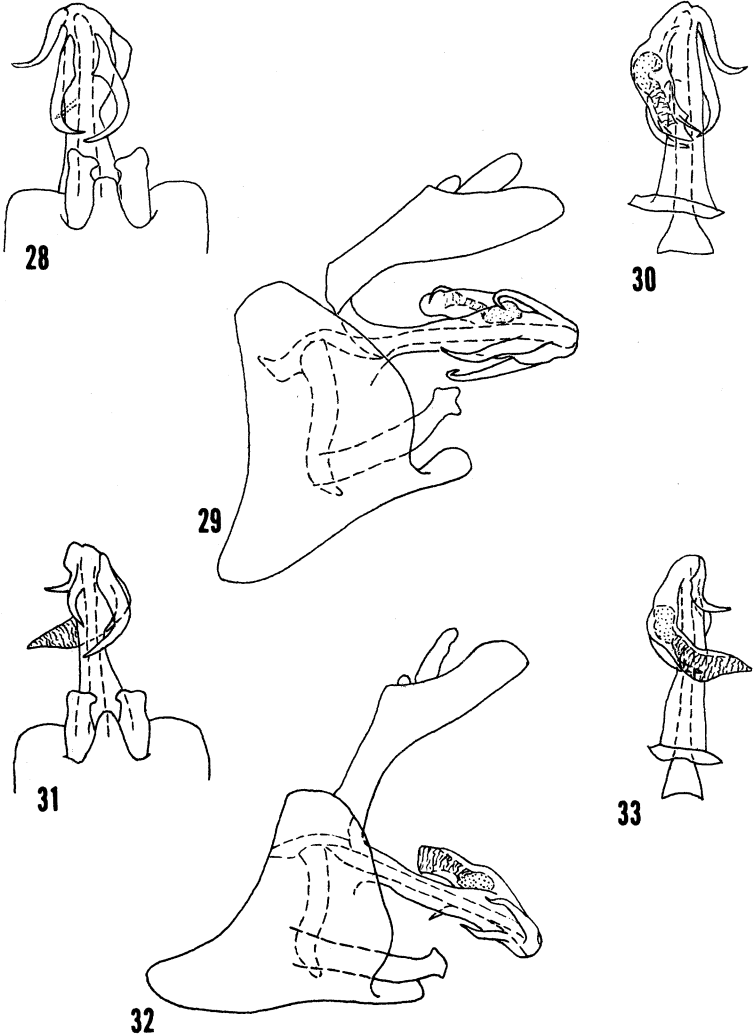
Oecleus monilipennis Van Duzee

(Figs. 25-27)

Oecleus monilipennis Van Duzee, 1923:190.

Salient features. — Length of males 4.2-4.4 mm., females 4.5-5 mm. Ground color of head, thorax, and legs pale stramineous to tawny; vertex narrowed but not closed basally and prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina often obscure or obsolete; ground color of mesonotal disc darker than carinae, outer margins of lateral carinae usually distinctly darkened; mesepimeron, lateral surfaces of clypeus, and frontoclypeal suture variably embrowned or blackened; ground color of frons slightly darker than carinae; ground color of clypeus usually distinctly darker than carinae; forewings hyaline with dark pustules on veins usually distinct, veins pale or brownish, especially crossveins beyond claval apices.

Male genitalia. — Median lobe of pygofer in ventral vein view (fig. 25) lobately produced; aedeagal shaft with three processes (figs. 25, 27), central process usually more robust and slightly longer than other two, left process directed to left, middle process curved to right, right process curved to left, middle and right processes forming caliperlike structure; flagellum without



TEXT FIGS. 28-33. Male genitalia. Figs. 28-30, *Oecleus fulvidorsum* Ball, from lectotype. Figs. 31-33, *Oecleus balli* n. sp., from type. Figs. 28, 31, apex of pygofer, styles, and aedeagus in ventral view. Figs. 29, 32, complete lateral view. Figs. 30, 33, aedeagus in dorsal view.

distinct process (fig. 27); anal flap in lateral view (fig. 26) somewhat irregular on ventral margin.

Type. — Holotype male, Ceralbo Island, Gulf of California, 7 June 1921, E. P. Van Duzee. California Academy of Sciences No. 1083. "Ceralbo Island" is likely a misspelling of Cerralvo Island, a small island off the southeast coast of Lower California at the mouth of the Gulf of California.

Specimens studied. — NEW MEXICO, White Sands; NEVADA, Overton. MEXICO, Ceralbo Island in Gulf of California. Collection dates 8 May to 7 June. Total specimens studied 4 males and 2 females.

Notes. — This species can be recognized by the three processes on the aedeagal shaft, the right and middle process forming a caliperlike structure, and the middle process being much stouter than the right process. The type series was collected on *Atriplex* sp., and the species was reported as abundant everywhere on this plant on the islands of Ceralbo, Santa Cruz, San Esteban, Espiritu Santo, and Mejia. B&K (1935:209), without recourse to the concealed male genitalia, misidentified *monilipennis*. The species they called *monilipennis* is a new species, *martharum*. These two species are easily separated by the features noted in the key. Although our records for the United States are few, *monilipennis* is probably not a rare species in our southwestern states.

Oecleus fulvidorsum Ball

(Figs. 28-30)

Oecleus fulvidorsum Ball, 1902:157.

Salient features. — Length of males 4-5 mm., females 4.5-5.2 mm. Ground color of head, thorax, and legs stramineous to tawny; vertex narrowed but almost always open basally and prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina at times obscure; ground color of mesonotal disc same as or somewhat darker than carinae; mesepimeron embrowned or blackened; clypeus usually somewhat darker than frons; forewings hyaline, veins pale with dark pustules usually most prominent posterior to claval apices, sometimes crossveins distinctly brown.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 28) lobately produced; aedeagal shaft with three processes (figs. 28, 30), left process curved to left, middle process curved to right, right process curved

to left, middle and right processes forming caliperlike structure, middle and right processes subequal in size and length or middle process shorter; flagellum with variably distinct process (figs. 29, 30), sometimes process reduced to mere thickening along margin of flagellum and not clearly differentiated; anal flap in lateral view (fig. 29) somewhat convex on ventral margin.

Type. — Lectotype male, Grand Junction, Colorado, 9-27, here selected. This male is from the cotype series mentioned in the original description.

Specimens studied. — ARIZONA, Ajo Mts., Cochise, Fredonia, Gold Canyon, Sacaton, Tucson, Wilcox; CALIFORNIA, Buttonwillow, El Centro, Mojava, Palm Springs, Pozo Creek; COLORADO, Grand Junction, Mack, Palisade; UTAH, Elberta, Monroe, St. George, Thompsons. Collection dates 6 May to 27 September. Total specimens studied 36 males and 40 females.

Notes. — The three processes on the aedeagal shaft, the right and middle process forming a caliperlike structure, and the right and middle process of subequal stoutness provide the distinguishing features of this species. The food plant is *Atriplex canescens*. *O. fulvidorsum* is a common and widespread species in the Southwest.

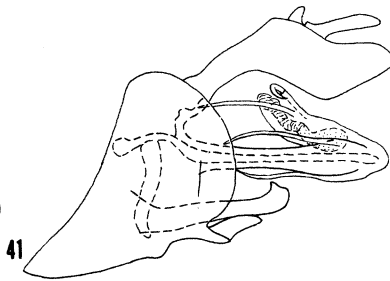
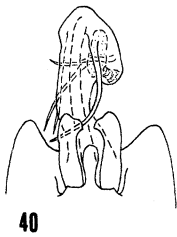
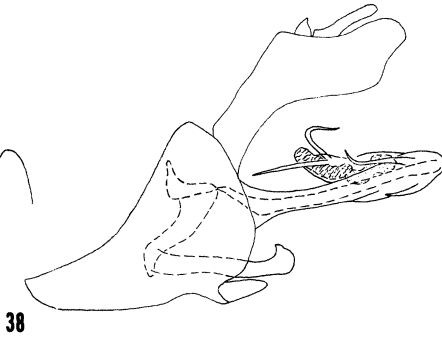
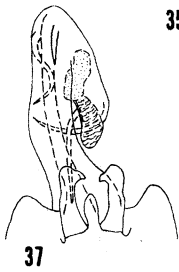
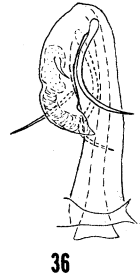
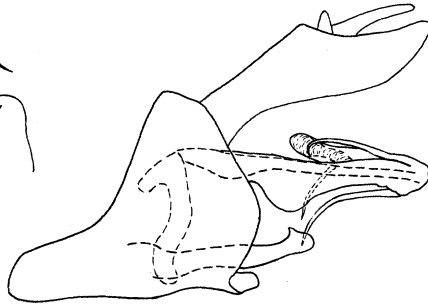
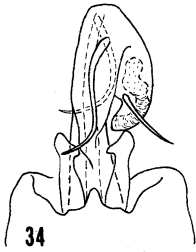
***Oecleus balli* Kramer, n. sp.**

(Figs. 31-33)

Salient features. — Length of males 3.9-4.7 mm., females 4.6-5.3 mm. Ground color of head, thorax, and legs stramineous to tawny; vertex narrowed but not closed basally and prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae; pair flanking central carina often obscure; ground color of mesonotal disc variably darker than carinae; mesepimeron variably darkened; clypeus often slightly darker than frons; forewings hyaline, veins pale with dark pustules often more prominent posterior to claval apices, crossveins variably brown.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 31) lobately produced; aedeagal shaft with three processes (figs. 31, 33), left

TEXT FIGS. 34-42. Male genitalia. Figs. 34-36, *Oecleus campestris* Ball, specimen from Arizona. Figs. 37-39, *Oecleus sagittanus* B&K, specimen from Overton, Nevada. Figs. 40-42, *Oecleus centronus* B&K, from allotype. Figs. 34, 37, 40, apex of pygofer, styles, and aedeagus in ventral view. Figs. 35, 38, 41, complete lateral view. Figs. 36, 39, 42, aedeagus in dorsal view.



process curved to left, middle process curved to right, right process curved to left, middle and right processes forming a caliperlike structure, left and middle processes subequal in size and length, right process much stouter and longer than other two; flagellum without distinct process (figs. 32, 33), but edge sometimes thickened suggesting one; anal flap in lateral view (fig. 32) not distinctive.

Type. — Holotype male (USNM 73671), Buckeye, Arizona, 31 May 1935, P. W. Oman.

Specimens studied. — ARIZONA, Buckeye, Camp Grant, Phoenix, Yuma; CALIFORNIA, Calexico, El Centro, Holtville, Ontario, Tehachapi; NEVADA, Overton, Tokio. Collection dates 12 May to 1 July. Total specimens studied 26 males and 37 females.

Notes. — The three processes on the aedeagal shaft, the right and middle processes forming a caliperlike structure, and the right and middle process of unequal stoutness provide the distinguishing features of this species. Specimens have been collected on *Pluchea sericea*, *Atriplex torreyii*, and *A. lentiformis*. This species, named for E. D. Ball, has been confused with *fulvidorsum* in the past. Both species are southwestern in distribution, but the recorded food plants are different. This difference in food plants, based on the somewhat limited data at hand, seems to provide additional evidence for the distinctness of the two species.

Oecleus campestris Ball

(Figs. 34-36)

Oecleus campestris Ball, 1902:156.

Salient features. — Length of males 4.7-5.3 mm., females 5-6.2 mm. Ground color of head, thorax, and legs pale brownish to almost fuscus with all carinae paler; vertex comparatively broad, basally somewhat narrowed but almost always clearly open, prolonged anteriorly for less than greatest width; disc of mesonotum fuscus to almost black with five pale longitudinal carinae, pair flanking central carina often less elevated than others and usually not reaching anterior or posterior margins; intercarinal portions of head and thoracic venter fuscus to nearly black; forewings hyaline, veins pale with distinct dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 34) produced as short lobe; aedeagal shaft with two processes (figs. 34, 36), left process moved to dorsal position and bowed to left, right process usually

somewhat undulated; flagellum with two processes (fig. 36), proximal process less than half length of distal one; anal flap in lateral view (fig. 35) convex on ventral margin distally; aedeagal shaft in lateral view (fig. 35) with large round bulge on ventral margin.

Type. — Lectotype male, Lamar, Colorado, 17 June 1900, here selected. This is one of the 24 specimens from which Ball described the species. He did not, however, include the collection date noted above.

Specimens studied. — ARIZONA, Arivaca, Baboquivari Mts., Benson, Chiricahua Mts., Huachuca Mts., Kirkland Junction, Mustang Mt., Phoenix, Santa Cruz River, Santa Rita Mts., Tucson, Turkey Creek; COLORADO, Lamar; NEW MEXICO, Las Cruces, Rodeo; TEXAS, Catarina, Presidio. Collection dates 26 April to 11 August. Total specimens studied 76 males and 80 females.

Notes. — This is one of the more easily recognized species in the genus; the large round ventral bulge on the aedeagal shaft in lateral view is unique. The entire original series was taken on *Artemisia filifolia*, and this is likely the chief food plant of *campestris*. Even though most records are from Arizona, *campestris* is probably equally common elsewhere in much of the Southwest.

Oecleus arnellus B&K

(Figs. 52-54)

Oecleus arnellus B&K, 1935:198.

Salient features. — Length of males 4.2-4.9 mm., females unknown. Ground color of head, thorax, and legs tawny; vertex comparatively broad, basally somewhat narrowed but open, prolonged anteriorly for less than greatest width; disc of mesonotum fuscus to nearly black with five pale longitudinal carinae, pair flanking central carina distinct or variably evanescent and for most of their length closer to central carina than lateral carinae; intercarinal portions of clypeus, frons, and vertex fuscus to black; lateral portions of head dorsally to ocelli, fuscus or infuscated; forewings hyaline, veins pale to brown with distinct dark pustules; portion of forewings from claval apex to midpoint of distal margin sometimes with brownish cloud.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 52) spatulately produced; aedeagal shaft with two processes (figs. 52, 54), left process shorter and usually stouter than right process; flagellum with one obvious process (figs. 52, 54), short second process highly obscure, embedded in membranous apical portion; anal flap in lateral view (fig. 53),

subtriangular, stout with ventral margin slightly convex; aedeagal shaft in lateral view (fig. 53) roundly expanded on dorsal margin distally.

Type. — Holotype male, Yarnell Heights, Arizona, 21 July 1929, E. D. Ball.

Specimens studied. — ARIZONA, Sunset Park, Yarnell Heights; NEVADA, Glendale; TEXAS, Spur; UTAH, Leeds, Marysville, St. George, Sevier, Santa Clara, Valley Junction. Collection dates 1 June to 21 July. Total specimens studied 13 males.

Notes. — The roundly expanded dorsal distal portion of the shaft in lateral view and the unequal lengths of the left and right processes serve to distinguish this species. The relative thickness of the left process is variable. The only recorded food plant is *Chrysothamnus speciosus*. Even though not often collected to date, *arnellus* is probably not a rare species in the Southwest.

Oecleus subreflexus Van Duzee

(Figs. 43-51)

Oecleus subreflexus Van Duzee, 1925:406.

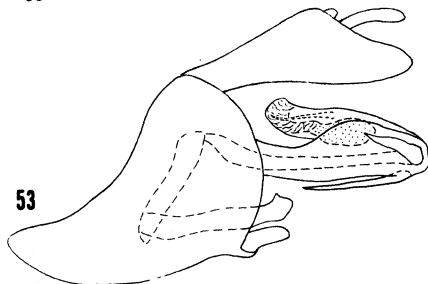
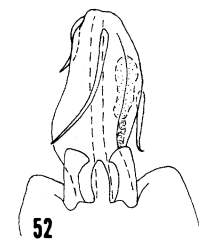
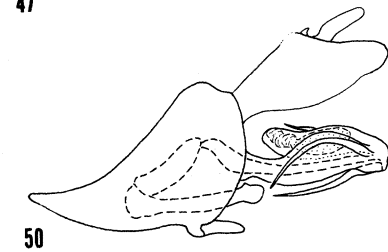
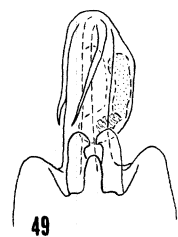
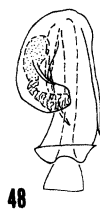
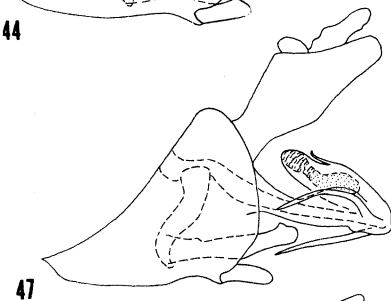
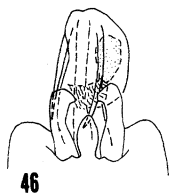
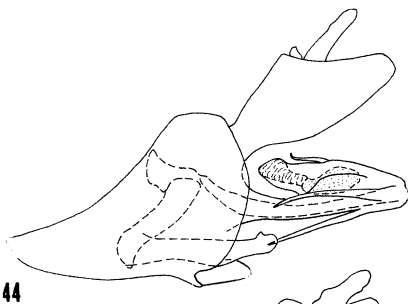
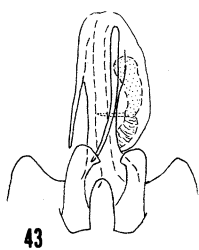
Oecleus cabazonus B&K, 1935:201. **N. Syn.**

Oecleus pulchellatus B&K, 1935:201. **N. Syn.**

Salient features. — Length of males 4-5.4 mm., females 4.7-6 mm. Ground color of head, thorax, and legs varying from tawny to brownish; vertex moderately broad, basally narrowed and often closed, prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina less distinct and not as straight as others; ground color of mesonotal disc varying from partly infuscated to entirely blackish with carinae paler; intercarinal portions of face and sides of head varying from tawny to dark brown; forewings hyaline, veins pale to brownish with pustules light and faint to dark and distinct; claval margin and inner apical cells of forewings at times clouded with brownish.

Male genitalia. — Median lobe of pygofer in ventral view (figs. 43, 46, 49) spatulately produced; aedeagal shaft with two processes (figs. 43, 46,

TEXT FIGS. 43-54. Male genitalia. Figs. 43-45, *Oecleus subreflexus* Van Duzee, specimen from Imperial, California. Figs. 46-48, *Oecleus subreflexus* Van Duzee, specimen from Phoenix, Arizona, type of *pulchellatus* B&K. Figs. 49-51, *Oecleus subreflexus* Van Duzee, specimen from Cabazon, California, allotype of *cabazonus* B&K. Figs. 52-54, *Oecleus arnellus* B&K, from type. Figs. 43, 46, 49, 52, apex of pygofer, styles, and aedeagus in ventral view. Figs. 44, 47, 50, 53, complete lateral view. Figs. 45, 48, 51, 54, aedeagus in dorsal view.



49), these long and subequal in length; flagellum with one obvious process (figs. 45, 48, 51), short second process embedded in membranous apical portion and highly obscure; anal flap in lateral view (figs. 44, 47, 50) subtriangular, stout, with ventral margin convex.

Types. — Holotype male, Potholes, California, 13 April 1923, E. P. Van Duzee. California Academy of Sciences No. 1775. Holotype female of *cabazonus* B&K, Cabazon, California, 20 June 1909, E. D. Ball. Holotype male of *pulchellatus* B&K, Sacaton, Arizona, 23 June 1929, E. D. Ball.

Specimens studied. — ARIZONA, Littlefield, Phoenix, Sacaton, Yuma; CALIFORNIA, Cabazon, Imperial, Indio, Keen Camp, Morongo Valley, Olancho, Potholes; NEVADA, Bunker, Glendale, Overton, Riverside; UTAH, St. George. Collection dates 13 April to 25 August. Total specimens studied 26 males and 44 females.

Notes. — The roundly expanded dorsal distal portion of the shaft in lateral view and the subequal lengths of the left and right processes provide the diagnostic features of *subreflexus*. Larger specimens are characteristically paler in color with the left process in lateral view fairly straight (fig. 44), typical *subreflexus*, but this form grades to a somewhat smaller and darker form in which the left process in lateral view (fig. 50) is bowed downward, *cabazonus*. An intermediate condition is found in a third form, *pulchellatus*, where the color is light or pale, size small, and the left process in lateral view is bowed downward (fig. 47). Specimens of *subreflexus* have been taken on: *Atriplex lentiformis*, *Chilopsis linearis*, *Chrysothamnus speciosus*, *Franseria eriocentra*, *Hymenoclea salsola*, and *Pluchea sericea*.

Oecleus sagittanus B&K

(Figs. 37-39)

Oecleus sagittanus B&K, 1935:200.

Salient features. — Length of males 4.4-4.8 mm., females 5.4-5.8 mm. Ground color of head, thorax, and legs stramineous to tawny; vertex basally narrowed and usually closed, prolonged anteriorly for more than greatest width; disc of mesonotum with five longitudinal carinae; pair flanking central carina less elevated and not reaching anterior or posterior margins; ground color of mesonotal disc varying from almost entirely infuscated to only anterior half infuscated with carinae always paler; face with carinae pale and intercarinal portions infuscated to black, sides of head and thoracic

venter variably infuscated, all femora much darker than rest of legs; forewings hyaline, veins pale with distinct dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 37) spatulately produced; aedeagal shaft with two processes (figs. 37, 39), right process short and fairly straight, left process longer and typically bowed to left; flagellum with two long processes (figs. 37, 39), process on inner margin straight, process on outer margin recurved; anal flap in lateral view (fig. 38) with slight indentation on distal edge.

Type. — Holotype female, Overton, Nevada, 8 May 1929, David E. Fox.

Specimens studied. — CALIFORNIA, Daggett; NEVADA, Bunker, Glendale, Overton, Riverside; UTAH, Dixie, Leeds, Parowan, St. George, Toquerville, Virgin. Collection dates 20 April to 18 July. Total specimens studied 27 males and 29 females.

Notes. — This species can be recognized by the following combination of characters: the short right process of the aedeagal shaft, the single straight and single recurved processes of the flagellum, and the slight indentation on the distal edge of the anal flap. *Pluchea sericea* is the plant from which most of the specimens were taken, but a few were collected on *Cyperus* sp. and sugar beets. *O. sagittanus* appears to be a moderately common southwestern species.

Oecleus centronus B&K

(Figs. 40-42)

Oecleus centronus B&K, 1935:199.

Salient features. — Length of males 4.8-5.1 mm., females 5.1-6 mm. Ground color of head, thorax, and legs stramineous to tawny; vertex basally narrowed and usually closed, prolonged anteriorly for more than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina not reaching anterior or posterior margins; ground color of mesonotal disc varying from almost entirely infuscated to only anterior three-fourths or two-thirds infuscated with carinae always paler; face with carinae pale and intercarinal portions infuscated to black, sides of head infuscated to nearly black, especially basally; lateral portions of pronotum conspicuously pale; thoracic venter and all femora infuscated to black; forewings hyaline, embrowned on edges touching mesonotum, veins pale with distinct dark pustules.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 40) spatulately produced; aedeagal shaft with two long processes of subequal

length (figs. 40, 42); flagellum with two long processes (figs. 40-42), process on inner margin straight, process on outer margin recurved; anal flap in lateral view (fig. 41) straight on distal margin or edge.

Type. — Holotype female, Buckeye, Arizona, 16 April 1933, E. D. Ball.

Specimens studied. — ARIZONA, Buckeye. Collection date 16 April. Total specimens studied 6 males and 14 females.

Notes. — This species can be recognized by the following combination of characters: the subequally long pair of processes on the aedeagal shaft, the single straight and single recurved process of the flagellum, and the straight distal margin of the anal flap. In addition to the features noted in the key to separate *centronus* and *sagittanus*, the embrowning of the forewings on the edges touching the mesonotum will help to distinguish *centronus* from *sagittanus*, the species to which it is most closely related. All of the specimens studied were taken on *Salicornia* sp. in Buckeye, Arizona.

Oecleus nolinus B&K

(Figs. 55-60)

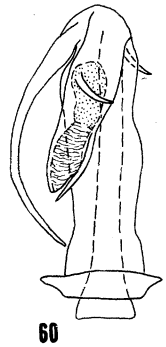
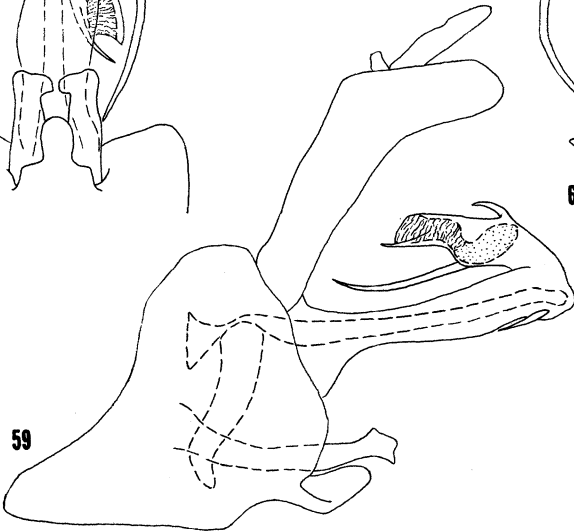
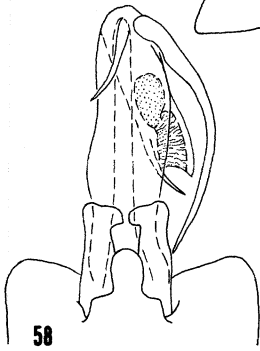
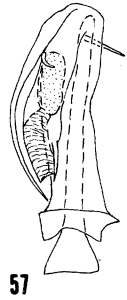
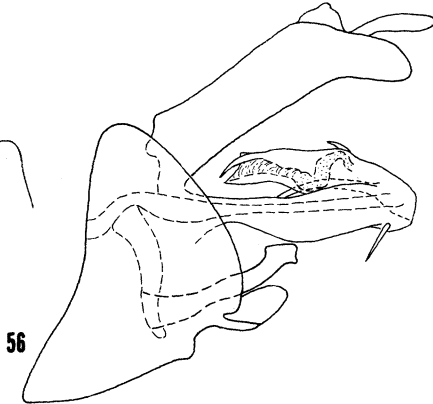
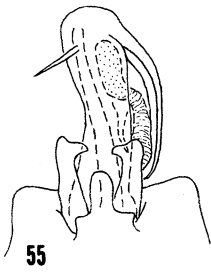
Oecleus nolinus B&K, 1935:203.

Oecleus texanus Ball, 1937:181. **N. Syn.**

Salient features. — Length of males 4.5-7.2 mm., females 4.8-7.5 mm. Ground color of head, thorax, and legs tawny; vertex basally narrowed and often closed, prolonged anteriorly for more than greatest width; disc of mesonotum with three pale longitudinal carinae on ground color of fuscus to black, central carina narrowly or broadly pale; in some specimens exceedingly faint traces of carina on either side of central carina, these not conspicuously paler than ground color; head and thoracic venter with intercarinal portions black; forewings hyaline, veins varying from mainly pale to brown beyond claval apices, dark pustules on veins distinct.

Male genitalia. — Median lobe of pygofer in ventral view (figs. 55, 58) moderately broad and spatulately produced; aedeagal shaft with two processes (figs. 55, 58), right process bowed beyond outer margin of flagellum and almost reaching base of shaft, left process less than half as long and

TEXT FIGS. 55-60. Male genitalia. Figs. 55-57, *Oecleus nolinus* B&K, allotype from Tucson, Arizona. Figs. 58-60, *Oecleus nolinus* B&K, specimen from Dona Ana County, New Mexico. Figs. 55, 58, apex of pygofer, styles, and aedeagus in ventral view. Figs. 56, 59, complete lateral view. Figs. 57, 60, aedeagus in dorsal view.



directed to left; flagellum with two processes (figs. 57, 60), proximal one shorter than distal one, their bases widely separated; anal flap in lateral view (figs. 56, 59) elongated with distal edge rounded.

Type. — Holotype female, Tucson, Arizona, 13 July 1929, E. D. Ball. Holotype female of *texanus* Ball, Leverton, Texas, 5 May 1934, E. D. Ball.

Specimens studied. — ARIZONA, Atascosa Mts., Baboquivari Mts., Bisbee, Chiricahua Mts., Cochise, Granite Dells, Mustang Mt., Patagonia, Quinlan Mts., Santa Catalina Mts., Santa Rita Mts., Tinajas Atlas, Tucson, Willcox, Williams; NEW MEXICO, Carlsbad Caverns, Dona Ana County, Organ, White Sands; TEXAS, Brownfield, Davis Mts., Leverton, Marfa. Collection dates 18 April to 25 July. Total specimens studied 78 males and 97 females.

Notes. — The exceedingly long right process of the aedeagal shaft which is bowed beyond the outer margin of the flagellum and nearly touches the base, the short left process, and the elongated and apically rounded anal flap provide the distinguishing features of *nolinus*. Size varies more in this species than in most of its congeners, but characters of the male genitalia unite these various forms. This southwestern species has been collected on *Nolina microcarpa*, *Yucca glauca*, and *Yucca elata*.

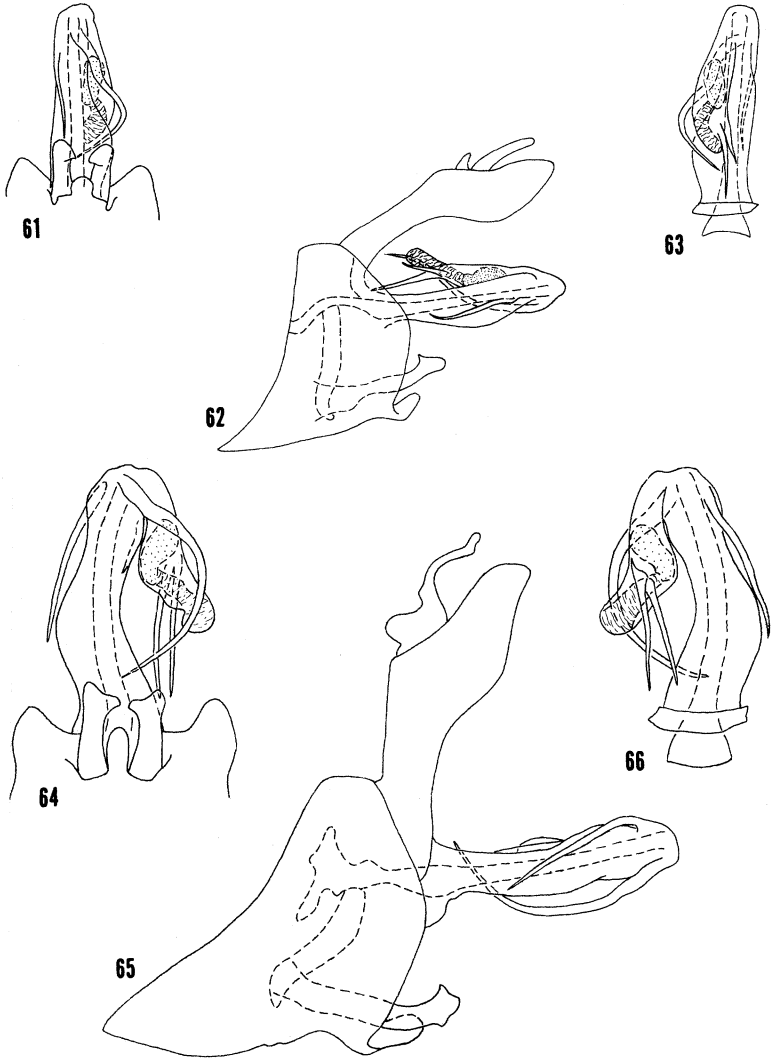
Oecleus planus B&K

(Figs. 61-63)

Oecleus planus B&K, 1935:200.

Salient features. — Length of males 4.2-4.5 mm., females 4.6-5.1 mm. Ground color of head, thorax, and legs stramineous to tawny; vertex narrowed and nearly closed basally, prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, central three carinae less well developed than outer pair; ground color of mesonotum pale with three central carinae similarly pale, outer carina on each side strongly margined with black laterally; head and thoracic venter variably washed with reddish brown in females, and darker brown in males; forewings hyaline or vaguely yellowish hyaline, except for occasional distal crossvein, veins pale, pustules on veins pale and highly obscure.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 61) broad and roundly produced at middle; aedeagal shaft with two processes (figs. 61, 63), right process longer and somewhat undulated before bending to left in distal half, left process shorter and nearly straight; flagellum with



TEXT FIGS. 61-66. Male genitalia. Figs. 61-63, *Oecleus planus* B&K, specimen from Glendale, Nevada. Figs. 64-66, *Oecleus lyra* n. sp., specimen from Huachuca Mts., Arizona. Figs. 61, 64, apex of pygofer, styles, and aedeagus in ventral view. Figs. 62, 65, complete lateral view. Figs. 63, 66, aedeagus in dorsal view.

two processes (fig. 63), those on inner margin and touching each other, outer process about twice length of inner process; anal flap in lateral view (fig. 62) with basal half narrowed, ventral margin convex distally.

Type. — Holotype female, Cabazon, California, 30 June 1909, E. D. Ball.

Specimens studied. — CALIFORNIA, Cabazon; NEVADA, Glendale, Las Vegas. Collection dates 5 May to 6 July. Total specimens studied 3 males and 10 females.

Notes. — The entirely pale mesonotum margined with black laterally and the oddly shaped right process of the aedeagal shaft together distinguish *planus*. The development of the central three carinae of the mesonotum is highly variable. In some specimens, they are quite distinct; but in others, they are most obscure. Except for the holotype without plant association, all specimens were taken on *Chrysothamnus panniculatus* in Nevada.

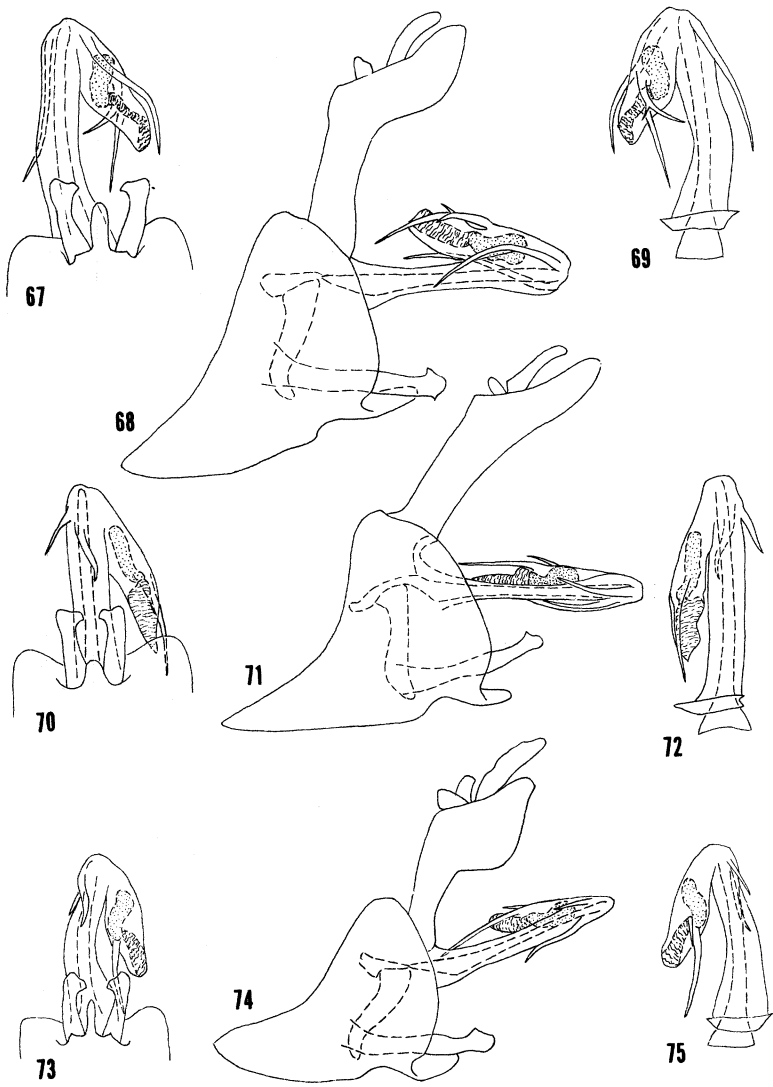
Oecleus lyra Kramer, n. sp.

(Figs. 64-66)

Salient features. — Length of males 6.5-7.5 mm., females 7.5-8.5 mm. Ground color of head, thorax, and legs tawny; vertex narrowed and nearly closed basally, prolonged anteriorly for almost twice greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina often obscure or less well elevated than others; ground color of mesonotum variably infuscated to blackish with carinae paler; head and thoracic venter with intercarinal portions variably infuscated; forewings hyaline with veins pale or variably brown beyond claval apices, dark pustules on veins distinct, at times forewings with narrow brownish cloud on inner margin just behind claval apices.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 64) spatulately produced; aedeagal shaft with two processes (figs. 64, 65), right process crescentic and extending beyond outer margin of flagellum, left process shorter and straighter; flagellum with two long processes (figs. 64, 66), these equal or subequal in length and extending beyond flagellar apex; anal flap in lateral view (fig. 65) convex on ventral margin distally.

TEXT FIGS. 67-75. Male genitalia. Figs. 67-69, *Oecleus troxanon* n. sp., from type. Figs. 70-72, *Oecleus perpictus* Van Duzee, specimen from Santa Catalina Mts., Arizona. Figs. 73-75, *Oecleus chrisjohni* n. sp., from type. Figs. 67, 70, 73, apex of pygofer, styles, and aedeagus in ventral view. Figs. 68, 71, 74, complete lateral view. Figs. 69, 72, 75, aedeagus in dorsal view.



Type. — Holotype male (USNM 73672), Tucson, Arizona, 23 May 1932, E. D. Ball.

Specimens studied. — ARIZONA, Baboquivari Mts., Huachuca Mts., Patagonia, Santa Catalina Mts., Santa Rita Mts., Tucson. Collection dates 17 May to 24 June. Total specimens studied 35 males and 49 females.

Notes. — The long sickle-shaped right process of the aedeagal shaft crosses the two flagellar processes distally in dorsal or ventral view; this feature provides the distinctive character of the species and its specific name, a Greek and Latin noun in apposition, meaning lyre. *O. lyra* has been confused in the past with *capitulatus*, a less commonly collected species which is also known only from Arizona. Most of the specimens studied were taken on *Dasyliirion* sp.

Oecleus troxanon Kramer, n. sp.

(Figs. 67-69)

Salient features. — Length of males 4.5-5 mm., females 5.8-6.2 mm. Ground color of head, thorax, and legs tawny; vertex narrowed but open basally, prolonged anteriorly for distance about equal to greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina distinct but not as elevated as others; ground color of mesonotum black, making paler carinae prominent, lateral portions of mesonotum touching disc also black; head, femora, and thoracic venter with intercarinal portions black; forewings hyaline with veins pale anterior to claval apices, more distal veins mainly brown, dark pustules on veins highly distinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 67) spatulately produced; aedeagal shaft with two processes (figs. 67, 69), right process somewhat undulated and extending beyond outer margin of flagellum distally, left process about as long but not undulated; flagellum with two processes (figs. 67, 69), proximal one with minute branch near middle, distal one longer and straighter; anal flap in lateral view (fig. 68) convex on ventral margin distally.

Type. — Holotype male (USNM 73673), Kanab, Utah, 27 June 1935, E. D. Ball.

Specimens studied. — UTAH, Kanab. Collection date 27 June. Total specimens studied 5 males and 3 females.

Notes. — Even though somewhat difficult to see because of its small size, the short branch near the middle of the proximal flagel-

lar process in dorsal view provides the unique feature of this species. The male genitalia closely resemble those of *lyra*, but the right aedeagal process is not sickle-shaped and does not transect the unequally long flagellar processes in ventral or dorsal view. Further, *troxanon*, known only from Utah, is a smaller species with darker and more sharply defined pustules on the veins of the forewings. The specific name, a Greek noun in apposition, means chip or fragment.

***Oecleus perpictus* Van Duzee**

(Figs. 1, 70-72)

Oecleus perpictus Van Duzee, 1929:173.

Salient features.—Length of males 5.1-5.8 mm., females 6.2-6.5 mm. Ground color of head, thorax, and legs mainly tawny; vertex narrowed and almost closed basally, prolonged anteriorly for almost twice greatest width; disc of mesonotum black with three longitudinal carinae, central carina sometimes obsolete but central longitudinal portion always broadly stramineous to yellow orange, lateral carinae narrowly pale; head, femora, and thoracic venter with intercarinal portions largely black or blackened; forewings hyaline but clouded with brown pattern as in fig. 1, veins mainly brown with pustules darker and moderately distinct.

Male genitalia.—Medium lobe of pygofer in ventral view (fig. 70) subspatulately produced; aedeagal shaft with two moderately short processes (figs. 70, 72), right process usually obliquely directed to right, left process obliquely directed to left; flagellum with two processes (figs. 70, 72), more mesal process longer and extending beyond apex of flagellum; anal flap in lateral view (fig. 71) moderately slender and convex on ventral margin distally.

Type.—Holotype male, 22 miles north of Tucson, Arizona, 14 August 1929, J. O. Martin. California Academy of Sciences No. 2526.

Specimens studied.—ARIZONA, Baboquivari Mts., Benson, Huachuca Mts., Sabino Canyon, Santa Catalina Mts., Tucson, Yarnell Hts.; CALIFORNIA, Jacumba. Collection dates 18 May to 14 August. Total specimens studied 18 males and 10 females.

Notes.—The long vertex, pale middle portion of the mesonotum, and patterned forewings make *perpictus* the most clearly distinct species on the basis of easily observed external characters within *Oecleus*. Arizona and California provide the only state records, and *Muhlenbergia porteri* is the only recorded food plant.

Oecleus chrisjohni Kramer, n. sp.

(Figs. 73-75)

Salient features. — Length of male 5 mm., female 5.4 mm. Ground color of head, thorax, and legs tawny; vertex narrowed and nearly closed basally, prolonged anteriorly for distance about equal to greatest width; disc of mesonotum infuscated with five pale longitudinal carinae, pair flanking central carina questionably elevated and not reaching anterior margin, lateral portions of mesonotum mainly pale; head, femora, and thoracic venter with intercarinal portions mainly infuscated or blackened; forewings hyaline or vaguely brownish hyaline, veins pale with dark pustules distinct, points where veins join margins in distal portions with small brownish clouds.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 73) produced as narrow spatula from subquadrate base; aedeagal shaft with two moderately short processes (figs. 73, 75), both on left margin, right one longer; flagellum with two processes (figs. 73, 75), more mesad process about three times longer than other and extending beyond flagellar apex; anal flap in lateral view (fig. 74) subquadrately expanded in distal half.

Type. — Holotype male (USNM 73674), Tyler, Texas, 14 June 1938, Christenson No. 11698.

Specimens studied. — TEXAS, Tyler. Collection date 14 June. Number of specimens studied 1 male and 1 female.

Notes. — The long, narrowly spatulate median lobe of the pygofer and the two moderately short processes on the left margin of the shaft distinguish this species from all other *Oecleus* in our fauna. The species is named for my son Christopher John.

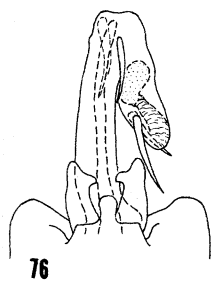
Oecleus lineatus Ball

(Figs. 76-78)

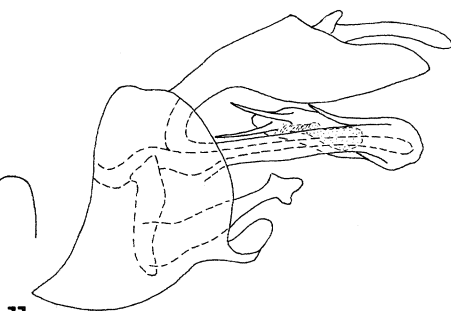
Oecleus lineatus Ball, 1902:154.

Salient features. — Length of males 5.1-5.8 mm., females 6.4-7.9 mm. Ground color of head, thorax, and legs tawny; vertex narrowed and almost closed basally, prolonged anteriorly for more than greatest width; disc of mesonotum with ground color partly or entirely blackened and with five pale longitudinal carinae, pair flanking central carina scarcely elevated and

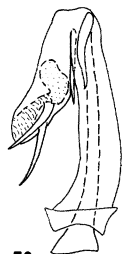
TEXT FIGS. 76-84. Male genitalia. Figs. 76-78, *Oecleus lineatus* Ball, from lectotype. Figs. 79-81, *Oecleus natatorius* Ball, allotype from Baboquivari Mts., Arizona. Figs. 82-84, *Oecleus acutus* Ball, from lectotype. Figs. 76, 79, 82, apex of pygofer, styles, and aedeagus in ventral view. Figs. 77, 80, 83, complete lateral view. Figs. 78, 81, 84, aedeagus in dorsal view.



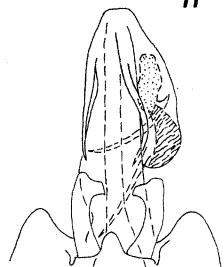
76



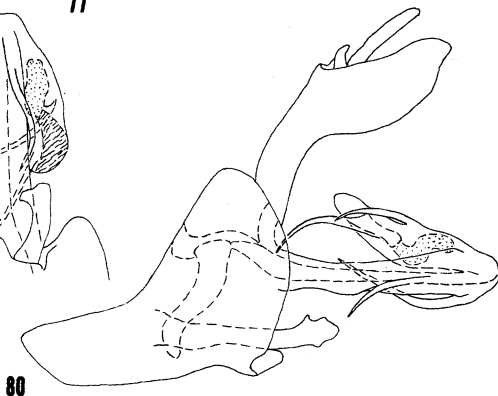
77



78



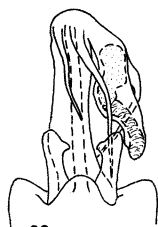
79



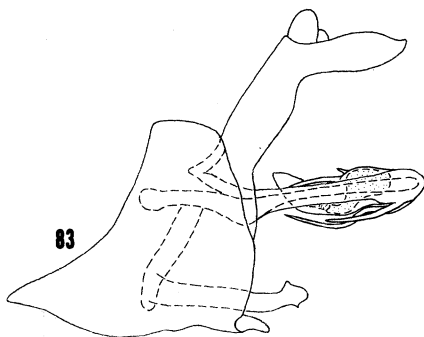
80



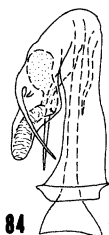
81



82



83



84

not reaching anterior margin, central carina lighter in color and more broadly pale than others; head, femora and thoracic venter with intercarinal portions infuscated or blackened; forewings hyaline or vaguely brownish hyaline, veins mainly pale with dark pustules distinct, at times distal crossveins embrowned.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 76) produced and rounded from quadrate base; aedeagal shaft with two processes (figs. 76, 78) both less than half length of shaft and about equal in length; flagellum with two processes of about equal length (figs. 76, 78), both project beyond flagellar apex; anal flap in lateral view (fig. 77) broadly expanded distally.

Type. — Lectotype male, Phoenix, Arizona, Kunze, here selected. This is one of the three specimens mentioned in the original description.

Specimens studied. — ARIZONA, Buckeye, Apache Junction, Phoenix, Sacaton, Tucson, Wickenburg, Yuma; CALIFORNIA, Imperial; NEVADA, Wells; TEXAS, Brownsville, Catarina, Presidio, Val Verde County. Collection dates 18 May to 3 October. Total specimens studied 60 males and 72 females.

Notes. — The well-produced vertex, the pale central portion of the mesonotum and the four equally long processes of the aedeagus provide the distinguishing features of *lineatus*. Within its range, southern California to southeastern Texas, *lineatus* has been taken on *Lygodesmia spinosa*, *Arctium* sp., *Solanum* sp., and alfalfa. *L. spinosa* is likely the major host plant.

Oecleus natatorius Ball

(Figs. 79-81)

Oecleus natatorius Ball, 1937:181.

Salient features. — Length of males 5.6-6.1 mm., females 6.5-6.8 mm. Ground color of head, thorax, and legs stramineous to pale tawny; vertex narrowed but usually open basally, prolonged anteriorly for distance about equal to greatest width; disc of mesonotum with ground color lightly to heavily infuscated and with five pale longitudinal carinae, pair flanking central carina distinct but at times less elevated, lateral portions of mesonotum mainly pale; head with intercarinal portions usually lightly infuscated; thoracic venter and legs mainly pale; forewings hyaline or pale yellowish hyaline, veins pale with dark pustules distinct only in distal areas beyond claval apices.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 79) lobately produced from quadrate base; aedeagal shaft with two processes

(figs. 79, 81), both about half length of shaft and subequal in length; flagellum with two processes (figs. 79-81), proximal one shorter and usually bent mesad, distal one nearly touching base of aedeagus; anal flap in lateral view (fig. 80) convex on ventral margin distally.

Type. — Holotype female, Brown's Canyon, Baboquivari Mts., Arizona, 26 July 1933, E. D. Ball.

Specimens studied. — ARIZONA, Baboquivari Mts., Sabino Canyon. Collection dates 26 July to 29 July. Total specimens studied 9 males and 6 females.

Notes. — In addition to the characters noted in the key to species, the predominantly pale color and the reduced number of dark pustules on the veins of the forewings serve to help recognize *natorius*. The holotype and most of the specimens studied were taken together on clumps of an unidentified grass growing in a damp wash. Arizona provides the only state record.

Oecleus acutus Ball

(Figs. 82-84)

Oecleus acutus Ball, 1902:157.

Salient features. — Length of male 5.2 mm., female unknown. Ground color of head, thorax, and legs stramineous; vertex tightly narrowed in basal half and broadened in distal half, prolonged anteriorly for more than greatest width; disc of mesonotum with five unusually straight carinae, pair flanking central carina closer to outer carinae than to it; ground color of mesonotum yellowish brown, central carina almost concolorous, others paler; most of head, and all of thoracic venter and legs pale, slight embrowning on intercarinal portions of vertex and extreme upper portion of frons; forewings hyaline or nearly so with pustules on veins faint.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 82) roundly produced from broad base; aedeagal shaft with two processes (figs. 82, 84), right process almost twice length of left one; flagellum with two processes (figs. 83, 84), outer one long and extending beyond flagellar apex, inner one minute; anal flap in lateral view (fig. 83) narrowed in distal half.

Type. — Lectotype male, Port-au-Prince, Haiti, Feb., R. J. Crew, here selected. The month was not originally included, but this omission is not unusual in Ball's early descriptions. Ball mentioned a second male with the same data, but the second specimen was not found in the USNM collection.

Specimens studied. — Known only from lectotype.

Notes. — In addition to the features used in the key to species, *acutus* can be recognized by the pale color, the tightly narrowed basal half of the vertex, the unusually straight mesonotal carinae with the outer two on each side being closer to each other than to the central carina, and the faint pustules on the veins of the forewings. As mentioned earlier, *acutus* is not known to occur in the United States. It is treated here because it is the only species of *Oecleus* known from the West Indies, and it seems proper to include *acutus* with this work.

***Oecleus capitulatus* Van Duzee**

(Figs. 88-90)

Oecleus capitulatus Van Duzee, 1912:495.

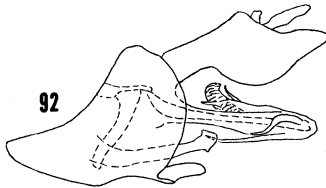
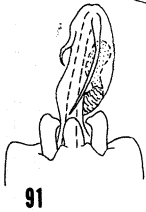
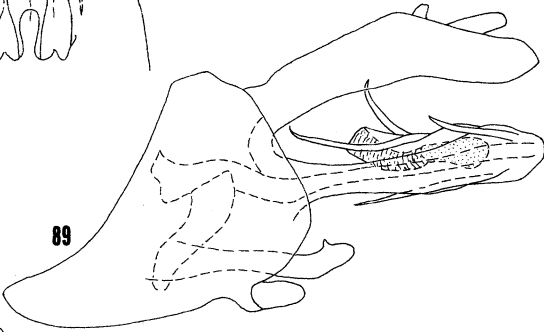
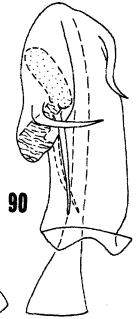
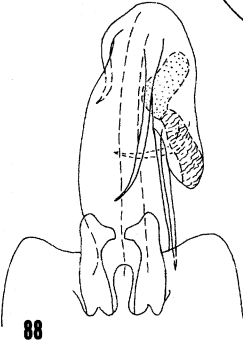
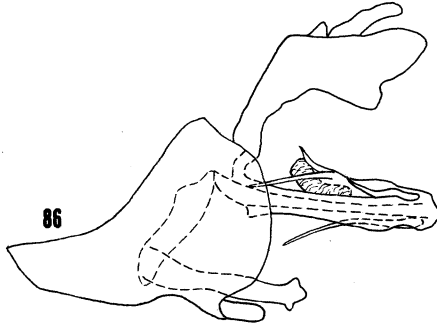
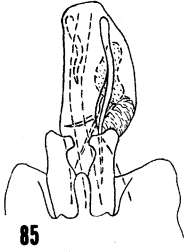
Oecleus triplicatus B&K, 1935:198. **N. Syn.**

Salient features. — Length of males 6.3-7 mm., females 7.2-7.8 mm. Ground color of head, thorax, and legs mainly tawny; vertex narrowed basally but not closed, prolonged anteriorly for more than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina broader, flatter, and not reaching anterior or posterior margins; ground color of mesonotal disc blackened with carinae paler, lateral portions of mesonotum largely blackened; intercarinal portions of head, thoracic venter, and legs infuscated to black; forewings hyaline with veins pale and dark pustules distinct, distal veins at times embrowned.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 88) spatulately produced with acute projection on each side at base; aedeagal shaft with two processes (figs. 88, 90), right process about twice length of left process, both slightly turned to left near apex; flagellum with two processes (figs. 88, 90), outer process usually sharply turned to left, inner process straight and extending beyond flagellar apex; anal flap in lateral view (fig. 89) elongated with distal margin nearly rounded.

Type. — Lectotype male, Huachuca Mts., Arizona, 15 July, here selected. According to the original description, the collector was H. G. Barber. There is no label with the lectotype indicating this. The lectotype is in the California Academy of Sciences.

TEXT FIGS. 85-93. Male genitalia. Figs. 85-87, *Oecleus excavatus* Ball, from lectotype. Figs. 88-90, *Oecleus capitulatus* Van Duzee, specimen from Arizona. Figs. 91-93, *Oecleus jenniferae* n. sp., from type. Figs. 85, 88, 91, apex of pygofer, styles, and aedeagus in ventral view. Figs. 86, 89, 92, complete lateral view. Figs. 87, 90, 93, aedeagus in dorsal view.



Holotype female of *triplicatus* B&K, Huachuca Mts., Arizona, 30 May 1930, E. D. Ball.

Specimens studied. — ARIZONA, Huachuca Mts., Santa Rita Mts. Collection dates 17 May to 15 July. Total specimens studied 4 males and 2 females.

Notes. — *O. capitulatus* can be recognized by the features noted in the key to species. It is an infrequently collected species, known only from Arizona, and without recorded host data.

***Oecleus jenniferae* Kramer, n. sp.** (Figs. 91-93)

Salient features. — Length of male 3.8 mm., female unknown. Ground color of head, thorax, and legs mainly tawny; vertex narrowed basally but not closed, prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina much closer to and nearly touching it posteriorly; ground color of mesonotal disc blackened with carinae paler, lateral portions of mesonotum bordering disc and pronotum blackened; intercarinal portions of head, thoracic venter, and legs infuscated to black; forewings hyaline with veins mainly pale and dark pustules distinct, distal margins locally suffused with brownish at vein endings.

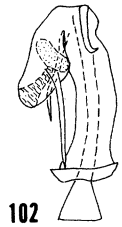
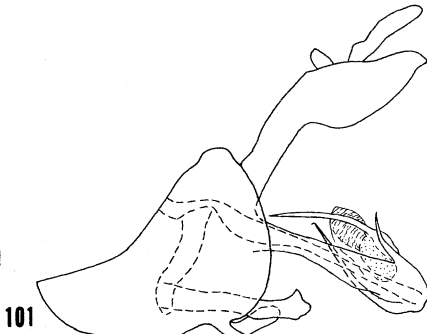
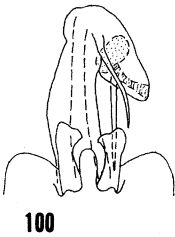
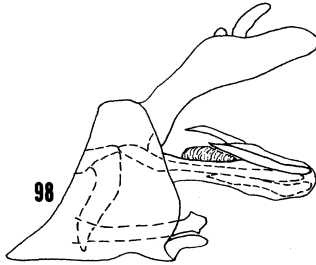
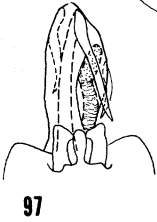
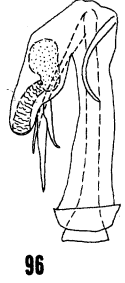
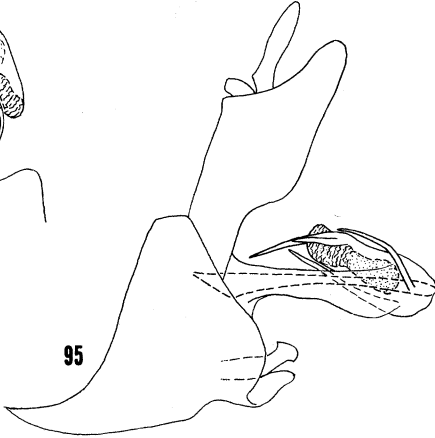
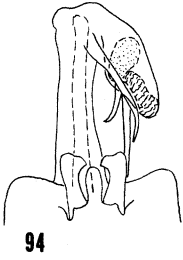
Male genitalia. — Median lobe of pygofer in ventral view (fig. 91) ovately produced from subtriangular base; aedeagal shaft with two processes (figs. 91, 93), right process about twice as long as left process and slightly bowed to left, left process short and bowed to right in distal half; flagellum with two processes (figs. 92, 93), both short with their bases separated; anal flap in lateral view (fig. 92) rounded and strongly convex on ventral margin distally.

Type. — Holotype male (USNM 73675), Turkey Creek, Arizona, 10 June 1933, P. W. Oman.

Specimens studied. — Known only from holotype.

Notes. — This is the smallest species of *Oecleus* known with two processes on both the aedeagal shaft and flagellum. The shape of the anal flap in lateral view and the shape of the median lobe of

TEXT FIGS. 94-102. Male genitalia. Figs. 94-96, *Oecleus palton* n. sp., from type. Figs. 97-99, *Oecleus glochin* n. sp., from type. Figs. 100-102, *Oecleus venosus* Van Duzee, specimen from Santa Cruz Mts., California. Figs. 94, 97, 100, apex of pygofer, styles, and aedeagus in ventral view. Figs. 95, 98, 101, complete lateral view. Figs. 96, 99, 102, aedeagus in dorsal view.



the pygofer in ventral view are distinctive. The species is named for my younger daughter Jennifer.

Oecleus excavatus Ball

(Figs. 85-87)

Oecleus excavatus Ball, 1902:155.

Salient features.—Length of males 4.6-5.4 mm., females 5.1-5.8 mm. Ground color of head, thorax, and legs mainly tawny; vertex unusually broad, narrowed but not closed basally, prolonged anteriorly for more than greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina closer to it in basal portion than in distal portion; ground color of mesonotum strongly blackened with carinae pale; intercarinal portions of head, thoracic venter, and legs strongly blackened or black; forewings hyaline, veins mainly pale with dark pustules distinct, at times distal crossveins embrowned.

Male genitalia.—Median lobe of pygofer in ventral view (fig. 85) spatulately produced with acute projection on each side near base; aedeagal shaft with two processes (figs. 85, 87), right process at least twice length of left process; flagellum with two processes (figs. 85, 87), outer process usually bent to left near base, inner process extending beyond flagellar apex; anal flap in lateral view (fig. 86) with lobe on ventral margin distally.

Type.—Lectotype male, Fort Collins, Colorado, 29 June 1900, here selected. The month was not originally included, but this omission is not unusual in Ball's early descriptions. The lectotype was the only male mentioned in the original description.

Specimens studied.—ARIZONA, Fredonia; CALIFORNIA, Doyle; COLORADO, Fort Collins, Wray; NEBRASKA, Dunning; NEW MEXICO, White Sands. Collection dates 7 June to 21 July. Total specimens studied 20 males and 5 females.

Notes.—The comparatively broad vertex and the lobe on the ventral margin of the anal flap provide the distinguishing features of *excavatus*. The shape of the lobe is subject to variation; it may be broader and rounder than illustrated. The plant associations of this southwestern species are unrecorded.

Oecleus palton Kramer, n. sp.

(Figs. 94-96)

Salient features.—Length of males 4.8-5.3 mm., females 5.8-6.2 mm. Ground color of head, thorax, and legs mainly tawny; vertex moderately broad, narrowed but not closed basally, prolonged anteriorly for less than greatest width; disc of mesonotum with five longitudinal carinae, pair flank-

ing central carina scarcely elevated; ground color of mesonotal disc strongly blackened except for posterior margin, only pair of carinae flanking central carina pale, lateral portions of mesonotum strongly blackened except at middle and posterior margin; intercarinal portions of head, thoracic venter, and femora deeply fuscus to black; forewings hyaline, veins brown, dark pustules fine and indistinct.

Male genitalia.—Median lobe of pygofer in ventral view (fig. 94) spatulately produced from quadrate base; aedeagal shaft with two processes (figs. 94, 96), right process longer than left process, right process obliquely directed to right, left process bowed to left; flagellum with two processes (figs. 94, 96), outer process longer than inner process, both extending beyond flagellar apex; anal flap in lateral view (fig. 95) stout and convex on ventral margin distally.

Type.—Holotype male (USNM 73676), Granite Dells, Arizona, 29 June 1933, P. W. Oman.

Specimens studied.—ARIZONA, Chiricahua Mts., Granite Dells. Collection dates 20 June to 17 July. Total specimens studied 28 males and 19 females.

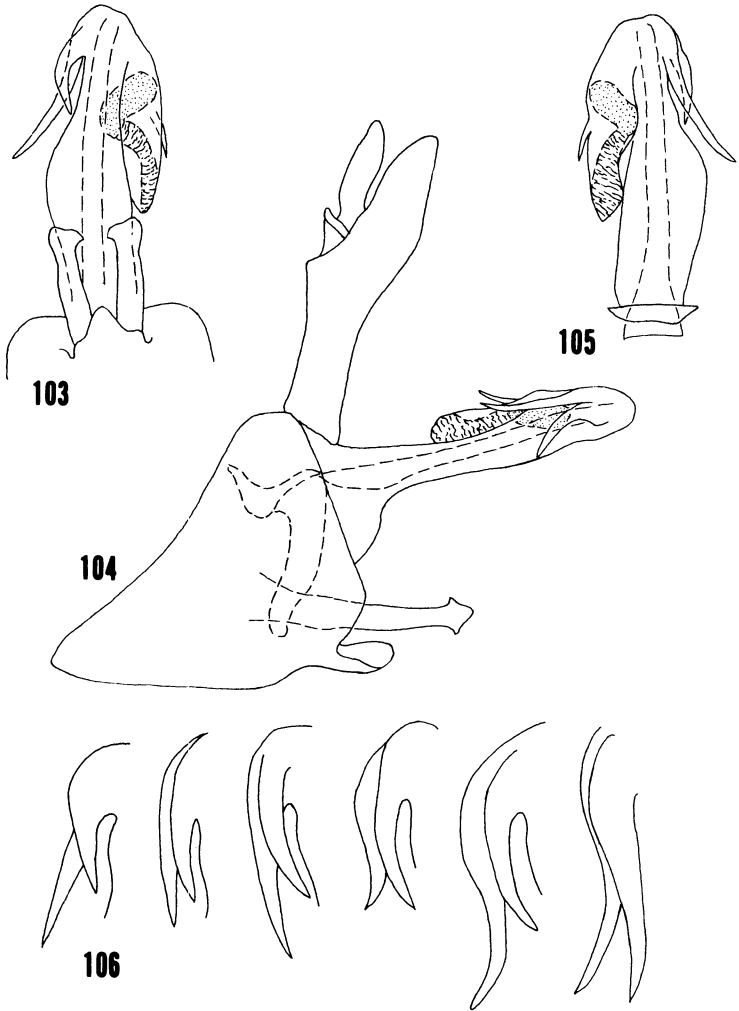
Notes.—This species and *quadrilineatus* have been confused in the past. Both have the central and lateral carinae of the mesonotal disc black, but they are easily separated on other characters. The aedeagal flagellum has two processes in *palton* and one in *quadrilineatus*. The anal flap in lateral view is comparatively massive or unusually stout in *palton* but slender in *quadrilineatus*. *O. palton* is known only from Arizona, where it has taken on *Ribes cereum*. The specific name, a Greek noun in apposition, means dart or javelin.

Oecleus glochin Kramer, n. sp.

(Figs. 97-99)

Salient features.—Length of males 4.2-4.4 mm., females 4.6-5.6 mm. Ground color of head, thorax, and legs deeply fuscus to black; vertex broad, slightly narrowed basally and open, prolonged anteriorly for distance about equal to greatest width; disc of mesonotum with five longitudinal carinae, only central three tawny, central carina extending from anterior margin to about half central length of mesonotum, pair flanking it about on middle half and touching neither anterior nor posterior margins, posterior margin of mesonotum partly tawny; carinate portions of head and thoracic venter fuscus to dark tawny; forewings milky hyaline, veins mainly pale with dark pustules large and exceedingly distinct, distal crossveins sometimes brown.

Male genitalia.—Median lobe of pygofer in ventral view (fig. 97)



TEXT FIGS. 103-106. Male genitalia. Figs. 103-105, *Oecleus cucullus* n. sp., from type. Fig. 103, apex of pygofer, styles, and aedeagus in ventral view. Fig. 104, complete lateral view. Fig. 105, aedeagus in dorsal view. Fig. 106, *Oecleus cucullus* n. sp., variations in aedeagal processes in ventral view.

spatulately produced from quadrate base; aedeagal shaft with two processes (figs. 97, 99), both more than half length of shaft, right process longer than left process; flagellum with one process (figs. 97, 99), process short and not reaching flagellar apex; anal flap in lateral view (fig. 98) moderately slender for entire length.

Type. — Holotype male (USNM 73677), Riverside, Nevada, 20 April 1930, David E. Fox.

Specimens studied. — NEVADA, Bunkerville, Glendale, Riverside; UTAH, St. George. Collection dates 17 April to 5 May. Total specimens studied 2 males and 3 females.

Notes. — The short and tawny central three carinae of the mesonotum, the large and dark pustules on the veins of the milky hyaline forewings, and the deeply fuscus to black ground color provide supplementary characters to those presented in the key to species. *O. glochin* has been collected on *Hymenoclea salsola*, *Sphaeralcea munroana*, and *Chrysothamnus tridentata* in Nevada and Utah. The specific name, a Greek noun in apposition, means point of an arrow.

Oecleus venosus Van Duzee

(Figs. 3, 100-102)

Oecleus venosus Van Duzee, 1912:496.

Oecleus nervosus Van Duzee, 1917:737 (error for *venosus*).

Salient features. — Length of males 4.2-5.2 mm., females 5.1-5.8 mm. Ground color of head, thorax, and legs deeply fuscus to black; vertex moderately broad, narrowed basally and open, prolonged anteriorly for distance subequal to greatest width; disc of mesonotum with five longitudinal carinae, pair flanking central carina often much reduced and sometimes entirely absent, central carina and lateral carinae tawny, pair flanking central carina when present tawny or partly tawny; carinate portions of head and thoracic venter tawny to fuscus; forewings essentially hyaline, at times claval areas brownish hyaline, veins mainly pale with dark pustules distinct, distal crossveins frequently embrowned or clouded with brown (fig. 3).

Male genitalia. — Median lobe of pygofer in ventral view (fig. 100) spatulately produced from subquadrate base; aedeagal shaft with two processes (figs. 100, 102), right process longer and obliquely directed to right, left process shorter and sometimes positioned so not visible in ventral view; flagellum with one process (figs. 100, 102), process long and straight or curved to left; anal flap in lateral view (fig. 101) convex on ventral margin distally, sometimes with slight indication of blunt apical hook.

Type. — Holotype female, Pasadena, California, 11 June 1910, Fordyce Grinnell, Jr. in California Academy of Sciences.

Specimens studied. — CALIFORNIA, Auburn, Beaumont, Big Bar, Bray, Chico, Chino, Colfax, Doyle, Eureka, Glendora, Jaccumba, Keen Camp, Los Angeles, Mariposa, Mint Canyon, Mojave, Mt. St. Helena, Mt. Shasta Canyon, Niles Canyon, Ontario, Pasadena, Paynes Creek, Pine Valley, Salinas, San Jacinto Mts., Santa Cruz Mts., Santa Rose Mt., Three Rivers, Tia Juana, Weed, Westley; NEVADA, Ormsby County, Winnemucca; OREGON, Bend, Burns, Glass Butte, Medford, Merlin, Prineville. Collection dates 13 May to 24 July. Total specimens studied 82 males and 86 females.

Notes. — The features noted in the key to species will distinguish *venosus*. When studying the drawings of the male genitalia, these variations not illustrated should be kept in mind: the left process of the aedeagal shaft is usually visible in ventral view, the flagellar process is more often than not obliquely directed to the left in dorsal or ventral view, and the anal flap in lateral view is often rounded on its distal margin. *O. venosus* is apparently a common species in California, but there are a few additional records for the adjacent states of Nevada and Oregon. Plant associations are few; some specimens have been taken on misc. chaparral, peach, and *Salsola pestifera*, *Arctostaphylos* sp., and *Chrysothamnus nauseosus*.

Oecleus cucullus Kramer, n. sp.

(Figs. 103-106)

Salient features. — Length of males 4.8-6 mm., females 5.4-7.1 mm. Ground color of head and thorax deeply fuscus to black; vertex moderately broad, narrowed basally but usually open, prolonged anteriorly for distance less than greatest width; disc of mesonotum with five tawny longitudinal carinae; pair flanking central carina neither as elevated nor as straight as others and not reaching anterior or posterior margins; carinate portions of head and thoracic venter tawny; legs tawny but sometimes blackened; forewings hyaline, veins pale or brown, pustules on veins fine and faint.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 103) triangularly produced from quadrate base; aedeagal shaft with two processes (figs. 103, 105), both on left margin, relative lengths of processes variable (fig. 106), processes crossed or not but superimposed on

each other for half or more their common lengths; flagellum with one process (figs. 103, 105), process short and not reaching flagellar apex; anal flap in lateral view (fig. 104) slender and slightly convex on ventral margin distally.

Type. — Holotype male (USNM 73678), Sabino Canyon, Arizona, 28 June 1930, E. D. Ball.

Specimens studied. — ARIZONA, Bradshaw Mts., Granite Dells, Sabino Canyon, Santa Cruz River; CALIFORNIA, Jaccumba, Ontario, Pasadena, Riverside, Tia Juana; TEXAS, Alpine, Presidio; UTAH, Kanab, Monroe, St. George. Collection dates 4 June to 8 August. Total specimens studied 25 males and 14 females.

Notes. — The two aedeagal processes on the left margin of the shaft which are superimposed on each other, and the almost obsolete pustules on the veins of the forewings, provide the distinguishing features of *cucullus*. As noted above, the relative lengths of the aedeagal processes on the shaft are variable; these differences are considered to represent intraspecific variation. The species has a wide distribution in the West and Southwest, but the only recorded plants from which specimens were taken are *Artemisia dracunculoides* and *Chilopsis linearis*. The specific name, a Latin noun in apposition, means cap or hood.

Oecleus netron Kramer, n. sp.

(Figs. 107-109)

Salient features. — Length of males 5.5-6.2 mm., females 6.1-6.8 mm. Ground color of head and thorax deeply fuscus to black; vertex moderately broad, narrowed basally but open, prolonged anteriorly for about half greatest width; disc of mesonotum with five tawny longitudinal carinae, pair flanking central carina not reaching anterior or posterior margins and less straight than others, central three carinae at times partly blackened; carinate portions of head and thoracic venter tawny; legs mainly tawny, femora variably infuscated; forewings hyaline, veins brown, pustules on veins fine and faint.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 107) triangularly produced from quadrate base; aedeagal shaft with two processes (figs. 107, 109), both on left margin, straight, subequal in length, and crossed near their bases; flagellum with one process (figs. 107, 109), process of moderate length but not extending beyond flagellar apex; anal flap in lateral view (fig. 108) moderately stout and slightly convex on ventral margin distally.

Type. — Holotype male (USNM 73679), Yarnell Heights, Arizona, 29 June 1933, P. W. Oman.

Specimens studied. — ARIZONA, Glen Oaks, Granite Dells, Pinal Mts., Superior, Yarnell Heights. Collection dates 30 May to 19 July. Total specimens studied 5 males and 9 females.

Notes. — The two straight aedeagal processes on the left margin of the shaft which are crossed near their bases in ventral view, the almost obsolete pustules on the brown veins of the forewings, and the length of the males are the diagnostic features of *netron*. The species is known only from Arizona without plant associations. The specific name, a Greek noun in apposition, means spindle.

Oecleus netrion Kramer, n. sp.

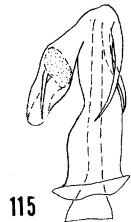
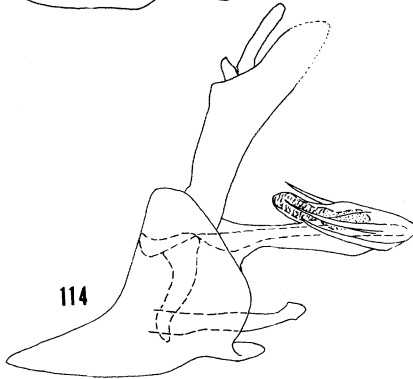
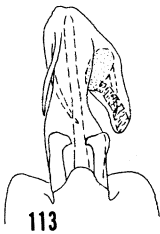
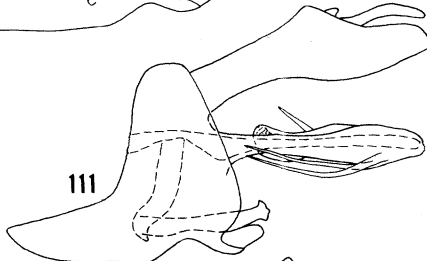
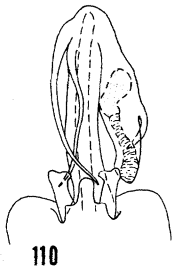
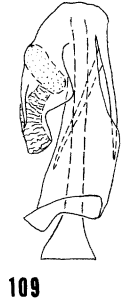
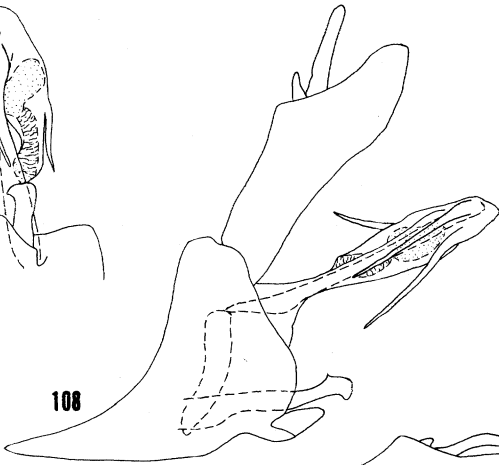
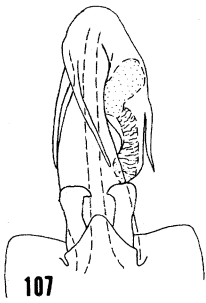
(Figs. 113-115)

Salient features. — Length of males 4.8-5.1 mm., females unknown. Ground color of head and thorax deeply fuscus to black; vertex moderately broad, narrowed basally but open, prolonged anteriorly for less than greatest width; disc of mesonotum with five tawny longitudinal carinae, pair flanking central carina somewhat sinuous at times and not reaching anterior or posterior margins, central carina sometimes blackened posteriorly; carinate portions of head and thoracic venter tawny; legs tawny and variably infuscated; forewings hyaline, veins mainly pale but often brownish distally beyond claval apices, dark pustules on veins small and fairly distinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 113) bluntly produced from quadrate base; aedeagal shaft with two processes (figs. 113, 115), both on left margin, straight, subequal in length, and crossed near their bases or not; flagellum with one process (figs. 113, 115), process of moderate length and usually nearly reaching flagellar apex; anal flap in lateral view (fig. 114) rather slender and slightly convex on ventral margin distally.

Type. — Holotype male (USNM 73680), Chico, California, 11 August 1912, E. D. Ball.

TEXT FIGS. 107-115. Male genitalia. Figs. 107-109, *Oecleus netron* n. sp., from type. Figs. 110-112, *Oecleus quadrilineatus* Van Duzee, specimen from Santa Rita Mts., Arizona. Figs. 113-115, *Oecleus netrion* n. sp., from type. Figs. 107, 110, 113, apex of pygofer, styles, and aedeagus in ventral view. Figs. 108, 111, 114, complete lateral view. Figs. 109, 112, 115, aedeagus in dorsal view.



Specimens studied. — CALIFORNIA, Chico, Eureka, Oroville, Redding, Weed. Collection dates 22 June to 11 August. Total specimens studied 8 males.

Notes. — The two straight processes on the left margin of the shaft which are crossed or not near their bases in ventral view, the fairly distinct pustules on the mainly pale veins of the forewings, and the length of the males furnish the diagnostic characters of *netrion*. The species is known only from California with mixed chaparral as the only recorded ecological datum. The specific name, a Greek noun in apposition, means little spindle.

Oecleus quadrilineatus Van Duzee (Figs. 110-112)

Oecleus quadrilineatus Van Duzee, 1912:496.

Salient features. — Length of males 4.1-5.1 mm., females 4.5-5.3 mm. Ground color of head and thorax deeply fuscus to black; vertex moderately broad, narrowed basally and sometimes closed, prolonged anteriorly for less than half greatest width; disc of mesonotum with five longitudinal carinae, only pair flanking central carina tawny, others black; carinate portions of head and thoracic venter tawny; legs tawny but infuscated; forewings hyaline, veins brown, dark pustules on veins small and not prominent.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 110) spatulately produced from quadrate base; aedeagal shaft with two processes (figs. 110, 112), both on left margin, long, and nearly touching base, right process usually somewhat sinuous and bowed to left, left process not sinuous and bowed to right; flagellum with one process (figs. 110, 112), process not extending beyond flagellar apex; anal flap in lateral view (fig. 111) slightly convex on ventral margin distally.

Type. — Lectotype male, Huachuca Mts., Arizona, July 1905 here selected. This specimen was previously labeled lectotype by Van Duzee, but the selection was unpublished. The original description states that the species was described from a pair of specimens collected by H. G. Barber. The collector's name is not with the other data on the lectotype, and the "05" looks more like "25". The lectotype is in the California Academy of Sciences.

Specimens studied. — ARIZONA, Baboquivari Mts., Cave Creek, Chiricahua Mts., Huachuca Mts., Nogales, Pinal Mts., Quinlan Mts., Santa Rita Mts., Yarnell Heights. Collection dates

22 May to 8 August. Total specimens studied 40 males and 37 females.

Notes. — The black central and lateral carinae of the mesonotal disc and the two long processes on the left margin of the aedeagal shaft separate *quadrilineatus* at once from its congeners. There are no recorded plant associations for this species which is known only from Arizona.

Oecleus borealis Van Duzee

(Figs. 116-118)

Oecleus borealis Van Duzee, 1912:495.

Oecleus bilineatus Caldwell, 1938:305. **N. Syn.**

Salient features. — Length of males 4.2-5.2 mm., females 4.9-5.5 mm. Ground color of head and thorax deeply fuscus to black; vertex moderately broad, narrowed basally and often closed, prolonged anteriorly for less than greatest width; disc of mesonotum with five tawny longitudinal carinae; carinate portions of head and thoracic venter tawny; legs tawny and variably infuscated; forewings hyaline, veins varying from mainly pale to brown, pustules on veins small and varying from partly distinct to mainly obscure.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 116) subtriangularly produced from quadrate base; aedeagal shaft with two processes (figs. 116, 118), both on left margin of shaft and both bowed to right, left process usually slightly longer than right process; flagellum with one process (figs. 116, 118), process usually extending beyond flagellar apex; anal flap in lateral view (fig. 117) not distinctive.

Type. — Lectotype male, Lakehurst, New Jersey, 28 May 1905, here selected. This is one of the cotypes mentioned from N.J. in the original description, but it has more data with it than Van Duzee published in 1912. The lectotype is in the California Academy of Sciences. *O. bilineatus* is synonymized with *borealis* on the basis of unpublished drawings of the male genitalia of the allotype made by Dr. Caldwell and by study of specimens with data identical to the holo- and allotype.

Specimens studied. — ALABAMA, Mobile; ARIZONA, Atascosa Mt.; FLORIDA, Crescent City, Hudson, Jacksonville, Lake Worth, St. Augustine, Sanford, Venice, GEORGIA, DeWitt, Thomasville, Tybee Island; ILLINOIS, Metropolis; KANSAS, Garnett, Medora; MARYLAND, Annapolis, Beltsville, Odenton; MICHIGAN, Roscommon County; MISSISSIPPI, Kosciusko,

Wiggins; NEW JERSEY, Lakehurst, Woodbine; NEW YORK, Hamburg, Yaphank; OHIO, Auglaize County, Hocking County; PENNSYLVANIA, Philadelphia; SOUTH CAROLINA, Charleston; TEXAS, Davis Mts., Marathon, Presidio. Collection dates 20 March to 31 August. Total specimens studied 95 males and 98 females.

Notes. — The two long slender processes, both of which are bowed to the right, on the left margin of the aedeagal shaft and the scarcely produced vertex distinguish *borealis* from its congeners. There is some variation in the details of the male genitalia. Specimens from western Texas have the processes of the aedeagal shaft more strongly bowed to the right with the ventral margin of the anal flap in lateral view convex distally. In some of the Florida specimens, the right process of the aedeagal shaft is much shorter than the left process. All of the variants agree with typical *borealis* in the scarcely produced vertex and the long flagellar process. *O. borealis* is one of the most common species collected in the eastern United States. It ranges from the Gulf States north to New York and west to Kansas and Texas. The single record for Arizona may be a case of mislabeling. Although not yet reported from Canada, *borealis* certainly occurs in Ontario. The northernmost record for the United States is Roscommon County in northcentral Michigan. Exact host records are few; but *borealis* has been taken on apple in New Jersey, hickory in Maryland, flowers of *Ceanothus americanus* in Virginia, and *Chilopsis linearis* in Texas. These data indicate that *borealis* is probably a general feeder.

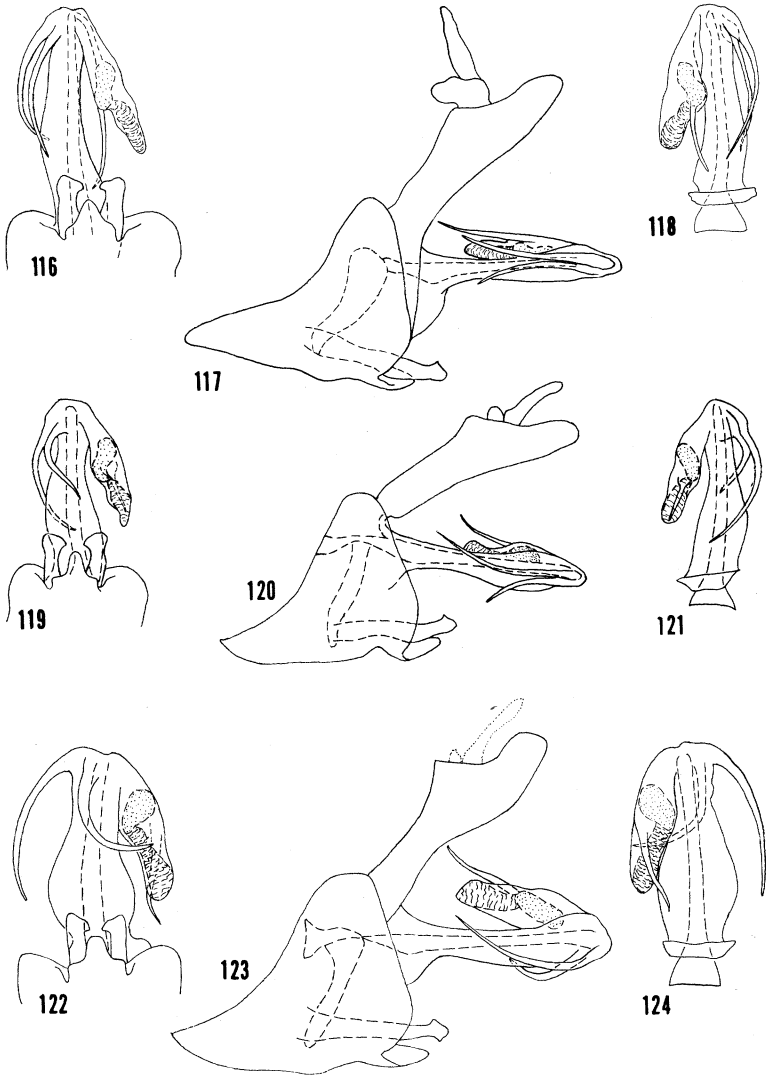
Oecleus tamiamus B&K

(Figs. 119-121)

Oecleus tamiamus B&K, 1935:204.

Salient features. — Length of male 4.3 mm., female 5.4 mm. Ground color of head and thorax infuscated tawny; vertex moderately broad, narrowed basally and nearly closed, prolonged anteriorly for more than greatest width; disc of mesonotum with five tawny longitudinal carinae on infuscated ground color; carinate portions of head and thoracic venter

TEXT FIGS. 116-124. Male genitalia. Figs. 116-118, *Oecleus borealis* Van Duzee, specimen from Sanford, Florida. Figs. 119-121, *Oecleus*



tamiamus B&K, from allotype. Figs. 122-124, *Oecleus pontifex* n. sp., from type. Figs. 116, 119, 122, apex of pygofer, styles, and aedeagus in ventral view. Figs. 117, 120, 123, complete lateral view. Figs. 118, 121, 124, aedeagus in dorsal view.

tawny; frons nearly black; legs tawny and variably infuscated; forewings hyaline, veins mainly pale but brown beyond claval apices, pustules on veins small and fairly distinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 119) lobately produced from quadrate base; aedeagal shaft with two processes (figs. 119, 121), both on left margin of shaft and both bowed to right, left process about one-third longer than right process; flagellum with one process (figs. 119, 121), process about reaching flagellar apex; anal flap in lateral view (fig. 120) nearly straight on ventral margin.

Type. — Holotype female, Childs, Florida, 10 June 1928, E. D. Ball.

Specimens studied. — FLORIDA, Childs, Sebring. Collection dates 10 June to 20 July. Total specimens studied 1 male and 2 females. One female without wings.

Notes. — The two slender and moderately long processes, both of which are rather strongly bowed to the right, on the left margin of the aedeagal shaft and the well-produced vertex distinguish *tamiamus* from its congeners. On the basis of genitalia alone, *tamiamus* should be more than a variety of *borealis*. Some of the short-headed specimens of *borealis* have male genitalia nearly identical to those of *tamiamus*. Southcentral Florida provides our only records for this species, but the plant relationships are unknown.

Oecleus pontifex Kramer, n. sp.

(Figs. 122-124)

Salient features. — Length of males 4.6-4.9 mm., females 5.6 mm. Ground color of head, thorax and legs dark tawny; vertex narrowed basally and almost closed, prolonged anteriorly for less than half greatest width; mesonotum infuscated or blackened; disc of mesonotum with five pale longitudinal carinae; intercarinal portions of head and thoracic venter infuscated or blackened; legs sometimes lightly infuscated; forewings hyaline, veins light brown to brown, pustules on veins minute and highly obscure.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 122) lobately produced from quadrate base; aedeagal shaft with two processes (figs. 122, 124), right process bowed to right, left process slightly bowed to right and strongly projecting beyond left margin of shaft; flagellum with one process (figs. 122, 124), process long and extending beyond flagellar apex; anal flap in lateral view (fig. 123) slightly convex on ventral margin distally.

Type. — Holotype male (USNM 73681), Huachuca Mts., Arizona, 25 July 1905.

Specimens studied. — ARIZONA, Huachuca Mts. Collection dates 23 June to 25 June. Total specimens studied 4 males and 4 females.

Notes. — The long left process of the aedeagal shaft which projects much beyond the left margin of the shaft, the right process of the aedeagal shaft which is bowed to the right, and the rounded basal margins of the aedeagal shaft provide the distinctive characters of *pontifex*. A penciled label, without the collector's name, states that the specimens were beaten from willow along a wash on the desert. The specific name, a Latin noun in apposition, means high priest.

***Oecleus augur* Kramer, n. sp.**

(Figs. 125-127)

Salient features. — Length of males 5.3-6 mm., females 6.3-6.7 mm. Ground color of head, thorax, and legs tawny; vertex narrowed basally and sometimes closed, prolonged anteriorly for less than half greatest width; ground color of mesonotum varying from mainly pale to mainly infuscated or blackened; disc of mesonotum with five pale longitudinal carinae, rarely lateral pair blackened; intercarinal portions of head and thoracic venter infuscated or blackened; legs sometimes lightly infuscated; forewings hyaline, veins varying from light brown to brown, pustules on veins minute and usually highly obscure.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 125) lobately produced from quadrate base; aedeagal shaft with two processes (fig. 125, 127), right process about twice length of left process and bowed to left, left process slightly bowed to left; flagellum with one process (figs. 125, 127), process long and usually obliquely projecting beyond flagellar apex; anal flap in lateral view (fig. 126) barely or not convex on ventral margin distally.

Type. — Holotype male (USNM 73682), Superior, Arizona, 1 August 1929, E. D. Ball.

Specimens studied. — ARIZONA, Quinlan Mts., Sabino Canyon, Superior, Turkey Creek, Tucson; TEXAS, Ft. Davis. Collection dates 23 April to 22 September. Total specimens studied 18 males and 8 females.

Notes. — The coloration of this species is more variable than that of its congeners. The short left process of the aedeagal shaft

which is usually bowed to the left, the twice-longer right process of the aedeagal shaft which is bowed to the left, and the broadly rounded left margin of the aedeagal shaft provide the distinctive features of *augur*. One specimen from Tucson was taken on willow; this is the only recorded plant association. The specific name, a Latin noun in apposition, means diviner.

Oecleus epetrium Kramer, n. sp. (Figs. 128-130)

Salient features. — Length of males 4.8-5.3 mm., females 5.8-6.3 mm. Ground color of head, thorax, and legs tawny; vertex narrowed basally and nearly closed, prolonged anteriorly for slightly less than greatest width; disc of mesonotum with five pale longitudinal carinae on infuscated or blackened ground color, lateral portions of mesonotum irregularly darkened on edges; intercarinal portions of head and thoracic venter strongly infuscated or blackened; legs with femora variably infuscated; forewings hyaline, veins mainly pale, pustules on veins small and most distinct in areas beyond claval apices.

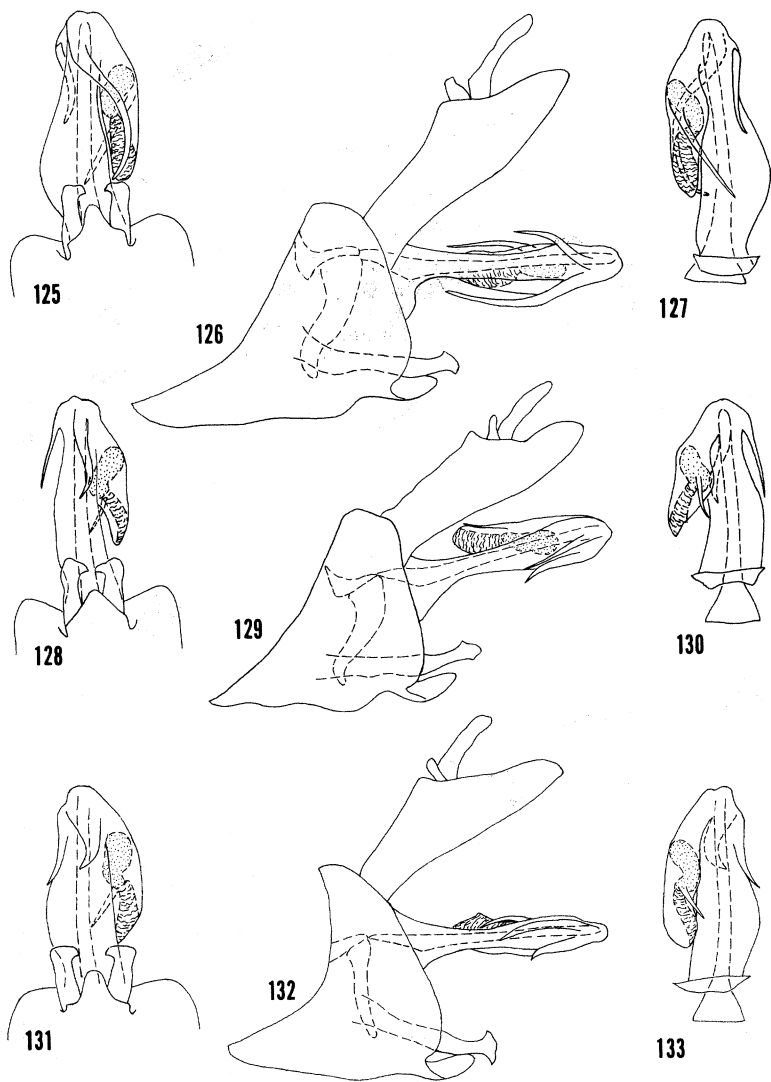
Male genitalia. — Median lobe of pygofer in ventral view (fig. 128) triangularly produced from quadrate base; aedeagal shaft with two processes (figs. 128, 130), both less than half length of shaft, right process slightly bowed to left, left process needlelike and obliquely projecting to left; flagellum with one process (figs. 128, 130), process not clearly projecting beyond flagellar apex; anal flap in lateral view (fig. 129) nearly straight on ventral margin distally.

Type. — Holotype male (USNM 73683), Kerrville, Texas, 4 June 1948, C. W. Sabrosky.

Specimens studied. — TEXAS Kerrville. Collection date 4 June. Total specimens studied 25 males and 19 females.

Notes. — The needlelike left process of the aedeagal shaft and the triangularly produced median lobe of the pygofer furnish the diagnostic features of *epetrium*. No plant associations are recorded. The specific name, a Greek noun in apposition, means needle.

TEXT FIGS. 125-133. Male genitalia. Figs. 125-127, *Oecleus augur* n. sp., from type. Figs. 128-130, *Oecleus epetrium* n. sp., from type. Figs. 131-133, *Oecleus patulus* n. sp., from type. Figs. 125, 128, 131, apex of pygofer, styles, and aedeagus in ventral view. Figs. 126, 129, 132, complete lateral view. Figs. 127, 130, 133, aedeagus in dorsal view.



Oecleus patulus Kramer, n. sp. (Figs. 131-133)

Salient features. — Length of male 5.8 mm., female unknown. Ground color of head and thorax pale tawny; vertex narrowed basally and nearly closed, prolonged anteriorly for about half greatest width; disc of mesonotum with five pale longitudinal carinae on infuscated ground color, lateral portions of mesonotum irregularly darkened on edges; intercarinal portions of head and thoracic venter infuscated; legs mainly stramineous; forewings hyaline, veins pale basally but clouded with brownish in areas beyond claval apices, pustules on veins fine and indistinct.

Male genitalia. — Median lobe of pygofer in ventral view (fig. 131) broad and lobately produced from quadrate base; aedeagal shaft with two processes (figs. 131, 133), both less than half length of shaft, right process broad at base and curved to left, left process appressed against and following left margin of shaft; flagellum with one process (figs. 131, 133), process obliquely directed to right and not reaching flagellar apex; anal flap in lateral view (fig. 132) nearly straight on ventral margin.

Type. — Holotype male (USNM 73684), Santa Cruz River, Arizona, 6 September 1937, E. D. Ball.

Specimens studied. — Known only from holotype.

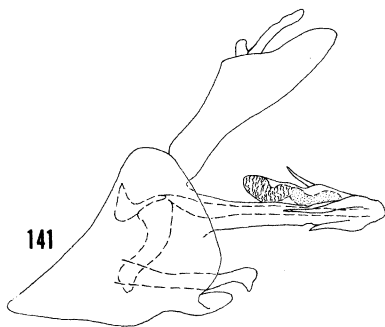
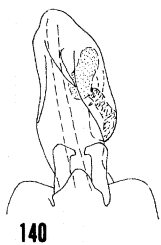
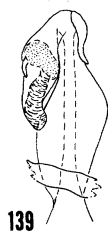
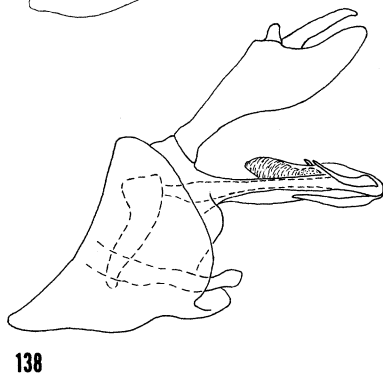
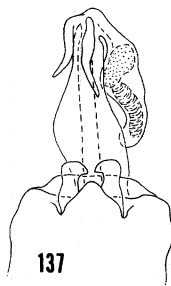
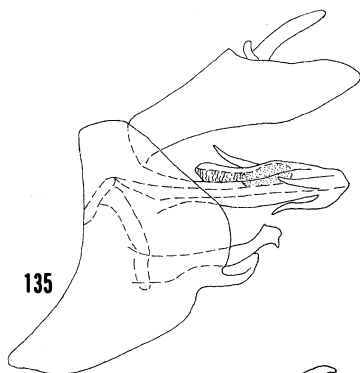
Notes. — The basally broad right process of the aedeagal shaft which is curved to the left distally and the left process of the aedeagal shaft which is appressed to the left margin supply the unique features of *patulus*. The brownish clouds on the distal veins and crossveins of the otherwise pale forewings may be a distinctive character; only a long series of specimens will clarify this speculation. The specific name, a Latin adjective, means broad.

Oecleus productus Metcalf (Figs. 134-148)

Oecleus productus Metcalf, 1923:184.

Salient features. — Length of males 4.2-5.8 mm., females 4.8-6 mm. Ground color of head and thorax tawny; vertex narrowed basally and sometimes closed, prolonged anteriorly for much less than greatest width; disc of mesonotum with five pale longitudinal carinae on variably infuscated or blackened ground color, lateral portions of mesonotum usually darkened on edges; intercarinal portions of head and thoracic venter deeply infuscated or blackened; legs mainly stramineous, femora sometimes darkened; forewings hyaline, veins pale or brownish, usually darker on por-

TEXT FIGS. 134-142. Male genitalia of *Oecleus productus* Metcalf. Figs. 134-136, specimen from Santa Cruz River, Arizona. Figs. 137-139,



specimen from DeWitt, Georgia. Figs. 140-142, specimen from Salt Lake City, Utah. Figs. 134, 137, 140, apex of pygofer, styles, and aedeagus in ventral view. Figs. 135, 138, 141, complete lateral view. Figs. 136, 139, 142, aedeagus in dorsal view.

tions beyond claval apices, pustules on veins small and usually obscure, most visible on veins before claval apices.

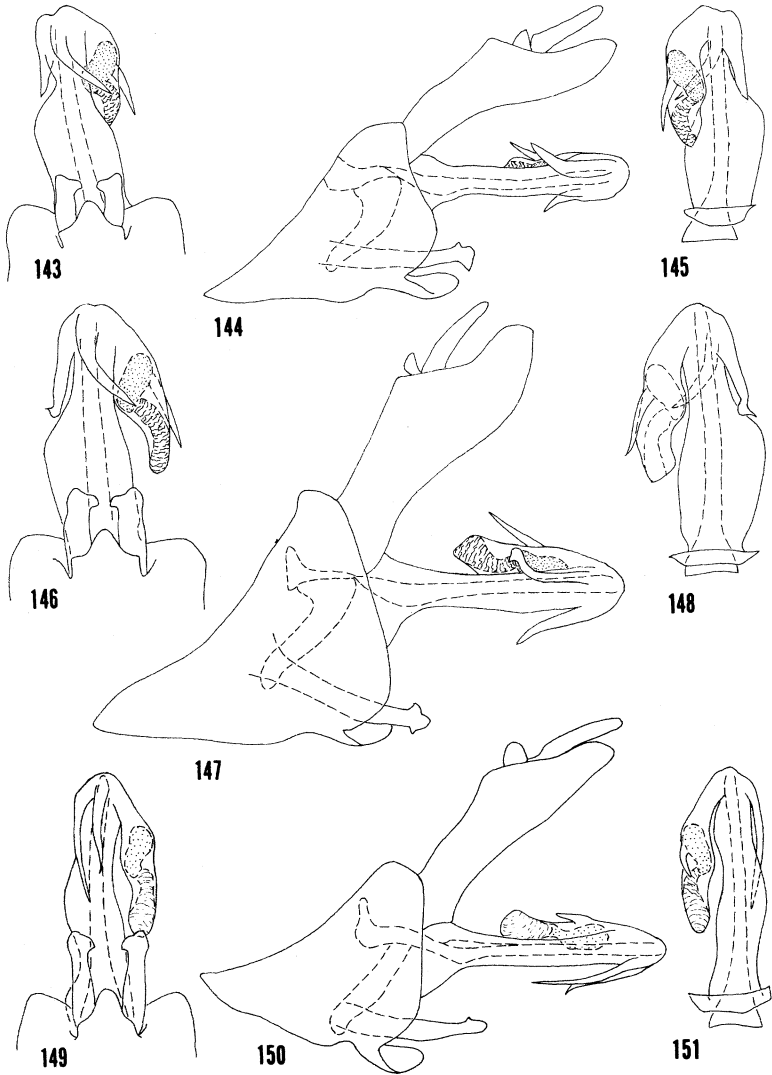
Male genitalia. — Median lobe of pygofer in ventral view (fig. 137) broad and triangularly produced from quadrate base; aedeagal shaft with two processes (figs. 137, 139), both less than half length of shaft, right process obliquely directed to right in distal half, left process gently bowed to left; flagellum with one process (fig. 139), process not projecting beyond flagellar apex; anal flap in lateral view (fig. 138) slightly convex on ventral margin distally.

Type. — Holotype male, Dongola, Illinois, 23 August 1916 in collection of Illinois State Natural History Survey, Urbana, Illinois. A paratype in the USNM from Metropolis, Illinois proved to be *borealis*.

Specimens studied. — ARIZONA, Baboquivari Mts., Benson, Douglas, Ft. Huachuca, Nogales, Patagonia, Phoenix, Roosevelt Dam, Santa Catalina Mts., Santa Cruz River, Santa Rita Mts., Superior, Tinajas Altas, Tubac, Tucson, Wickenburg, Yarnell Hts.; CALIFORNIA, Indio, La Mesa; FLORIDA, Alachua County, Gainesville, Sanford; GEORGIA, Albany, Atlanta, DeWitt, Thomasville; ILLINOIS, Dongola; KANSAS, Garnett, Onega; MARYLAND, Piney Point; MISSISSIPPI, Vicksburg; MISSOURI, Warsaw; NEBRASKA, Stratton; NEW MEXICO, Organ; NEVADA, Las Vegas, Overton; TEXAS, Concan, Gillespie County, Kerrville, Tyler, Uvalde County; UTAH, Salt Lake City. Collection dates 30 April to 26 October. Total specimens studied 165 males and 153 females.

Notes. — The features noted in the key to species will serve to separate *productus* from its congeners. This species is known from localities in Florida to Maryland in the East and westward to northern Utah and southern California. Host records in the eastern states are limited to weeds and grasses; but in Nevada it has been taken on *Salsola pestifera* and in Arizona on creosote bush, sycamore, ash, *Hymenoclea* sp., and Compositae. It is obviously a general feeder. Even though these forms are not now considered to represent anything more than variations because of intergrades,

TEXT FIGS. 143-151. Male genitalia. Figs. 143-145, *Oecleus productus* Metcalf, specimen from Tucson, Arizona. Figs. 146-148, *Oecleus pro-*



ductus Metcalf, specimen from Indio, California. Figs. 149-151, *Oecleus obtusus* Ball, from lectotype. Figs. 143, 146, 149, apex of pygofer, styles, and aedeagus in ventral view. Figs. 144, 147, 150, complete lateral view. Figs. 145, 148, 151, aedeagus in dorsal view.

a key is presented below to separate the forms encountered in *productus*.

KEY TO FORMS OF PRODUCTUS

1. Left process of aedeagal shaft bowed to left and not reaching midpoint of bulge on left margin of shaft in ventral view 2
 Left process of aedeagal shaft either straight or reaching midpoint of bulge on left margin of shaft in ventral view 3
2. Left process of aedeagal shaft in ventral view of uniform width (fig. 137) typical form
 Left process of aedeagal shaft in ventral view bulging and wider near base (fig. 134) form-A
3. Left process of aedeagal shaft reaching midpoint of bulge on left margin of shaft in ventral view (fig. 140) form-B
 Left process not as above 4
4. Left process of aedeagal shaft aviccephaliform at apex in ventral view (fig. 146) form-C
 Left process of aedeagal shaft broadly tapered to apex in ventral view (fig. 143) form-D

The typical form occurs in the eastern states. The others are specimens from Santa Cruz River, Arizona (form-A), Salt Lake City, Utah (form-B), Indio, California (form-C), and Tucson, Arizona (form-D).

Oecleus obtusus Ball

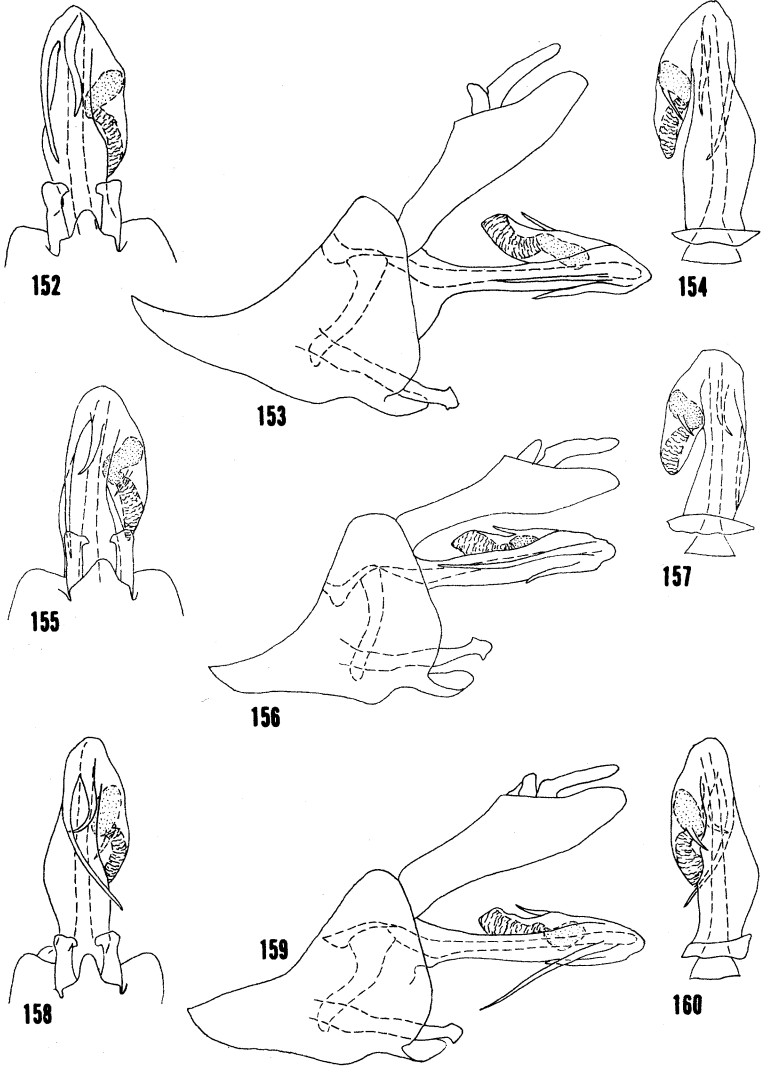
(Figs. 149-160)

Oecleus obtusus Ball, 1902:155.

Salient features.—Length of males 4.6-5.4 mm., females 5.3-6 mm. Ground color of head and thorax tawny; vertex narrowed basally and closed or nearly closed, prolonged anteriorly for less than half greatest width; disc of mesonotum with five pale longitudinal carinae on darker ground color varying from pale brown to black; lateral portions of mesonotum with edges usually darkened; intercarinal portions of head and thoracic venter lightly infuscated to black; legs stramineous and infuscated or not; forewings hyaline, veins pale or brownish, usually darker on portions beyond claval apices, pustules on veins small and inconspicuous, most distinct on veins before claval apices.

Male genitalia.—Median lobe of pygofer in ventral view (figs. 149, 155) produced as stout lobe from quadrate base; aedeagal shaft with two pro-

TEXT FIGS. 152-160. Male genitalia of *Oecleus obtusus* Ball. Figs. 152-154, specimen from Yosemite, California. Figs. 155-157, specimen



from Overton, Nevada. Figs. 158-160, specimen from Yuma, Arizona. Figs. 152, 155, 158, apex of pygofer, styles, and aedeagus in ventral view. Figs. 153, 156, 159, complete lateral view. Figs. 154, 157, 160, aedeagus in dorsal view.

cesses, (figs. 149, 158), right process shorter than left process, right process moderately straight or curved to left, left process straight or curved to right; flagellum with one process (figs. 151, 160), process falling far short of flagellar apex; anal flap in lateral view (figs. 150, 156) straight or barely convex on ventral margin distally.

Type. — Lectotype male, Fort Collins, Colorado, 1 August 1898, here selected. The collection date was not originally mentioned, but this omission is not unusual in Ball's early descriptions. The cotype series is a mixture of several species.

Specimens studied. — ARIZONA, Bill Williams Fork, Gold Canyon, Littlefield, Phoenix, Safford, Tucson, Yuma; CALIFORNIA, Bard, Big Bar, Caliente, Clear Lake, Death Valley, Fresno, Lebec, Palm Canyon, Three Rivers, Winters, Yosemite; COLORADO, Ft. Collins; NEVADA, Bunker, Overton; OREGON, Medford; TEXAS, Brown County; UTAH, Logan, Ogden, Provo Canyon, Salt Lake City; WASHINGTON, Pasco. Collection dates 26 April to 17 September. Total specimens studied 81 males and 49 females.

Notes. — The features noted in the key to species will serve to separate *obtusus* from its congeners. This species is known from central Texas and Colorado westward to California and southern Washington. Host records are few, but it has taken on *Pluchea sericea* in Nevada and *Salix* sp. in Utah. Even though there are some differences in the male genital structures, particularly the lengths and curvature of the processes of the aedeagal shaft, these differences are believed to represent intraspecific variation. A key is presented below to separate these forms of *obtusus*.

KEY TO FORMS OF OBTUSUS

1. Right process of aedeagal shaft fairly straight or slightly sinuous in ventral view (figs. 149, 152) 2
 Right process of aedeagal shaft curved to left in ventral view (figs. 155, 158) 3
2. Left process of aedeagal shaft just reaching midpoint of bulge on left margin of shaft in ventral view (fig. 149) form-A
 Left process of aedeagal shaft reaching beyond midpoint of bulge on left margin of shaft in ventral view (fig. 152) form-B
3. Left process of aedeagal shaft bowed to right beyond right margin of shaft in ventral view (fig. 158) form-C

Left process of aedeagal shaft straight and nearly touching base of shaft in ventral view (fig. 155) form-D

Specimens representing the forms above are from the following localities: Fort Collins, Colorado (form-A), Yosemite, California (form-B), Yuma, Arizona (form-C), and Overton, Nevada (form-D).

CHECKLIST OF UNITED STATES SPECIES OF OECLEUS WITH STATE RECORDS

1. *arnellus* B&K, 1935:198. Ariz., Nev., Tex., Utah.
2. *augur* Kramer, n. sp. Ariz., Tex.
3. *balli* Kramer, n. sp. Ariz., Cal., Nev.
4. *borealis* Van Duzee, 1912:495. Ala., Ariz., Fla., Ga., Ill., Kans., Md., Mich., Miss., N.J., N.Y., Ohio, Pa., S.C., Tex.
bilineatus Caldwell, 1938:305. n. syn.
5. *campestris* Ball, 1902:156. Ariz., Colo., N.M., Tex.
6. *capitulatus* Van Duzee, 1912:495. Ariz.
triplicatus B&K, 1935:198. n. syn.
7. *centronus* B&K, 1935:199. Ariz.
8. *chrisjohni* Kramer, n. sp. Tex.
9. *cucullus* Kramer, n. sp. Ariz., Cal., Tex., Utah.
10. *epetrior* Kramer, n. sp. Tex.
11. *excavatus* Ball, 1902:155. Ariz., Cal., Colo., Nebr., N.M.
12. *fulvidorsum* Ball, 1902:157. Ariz., Cal., Colo., Utah.
13. *glochii* Kramer, n. sp. Nev., Utah.
14. *jenniferae* Kramer, n. sp. Ariz.
15. *lineatus* Ball, 1902:154. Ariz., Cal., Nev., Tex.
16. *lyra* Kramer, n. sp. Ariz.
17. *martharum* Kramer, n. sp. Ariz., Cal., Nev., Utah.
18. *monilipennis* Van Duzee, 1923:190. Nev., N.M.
19. *natatorius* Ball, 1937:181. Ariz.
20. *netrior* Kramer, n. sp. Cal.
21. *netron* Kramer, n. sp. Ariz.
22. *nolinus* B&K, 1935:203. Ariz., N.M., Tex.
texanus Ball, 1937:181. n. syn.
23. *obtusus* Ball, 1902:155. Ariz., Cal., Colo., Nev., Oreg., Tex., Utah, Wash.
24. *palton* Kramer, n. sp. Ariz.
25. *patulus* Kramer, n. sp. Ariz.
26. *perpictus* Van Duzee, 1929:173. Ariz., Cal.
27. *pigmy* B&K, 1935:210. Ariz., Cal., Ida., Nev., Tex., Utah.
28. *piperatus* B&K, 1935:209. Ariz.

29. *planus* B&K, 1935:200. Cal., Nev.
30. *pontifex* Kramer, n. sp. Ariz.
31. *productus* Metcalf, 1923:184. Ariz., Cal., Fla., Ga., Ill., Md., Miss., Mo., Neb., N.M., Nev., Tex., Utah.
32. *quadrilineatus* Van Duzee, 1912:496. Ariz.
33. *rhion* Kramer, n. sp. Ariz.
34. *sagittanus* B&K, 1935:200. Cal., Nev., Utah.
35. *snowi* Ball, 1905:117. Ariz., Cal.
36. *subreflexus* Van Duzee, 1925:406. Ariz., Cal., Nev., Utah.
cabazonus B&K, 1935:201. n. syn.
pulchellatus B&K, 1935:201. n. syn.
37. *tamiamus* B&K, 1935:204. Fla.
38. *troxanon* Kramer, n. sp. Utah.
39. *vates* Kramer, n. sp. Ariz.
40. *venosus* Van Duzee, 1912:496. Cal., Nev., Oreg.
nervosus Van Duzee, 1917:737. (error for *venosus*).

DISTRIBUTIONAL NOTES

Arizona heads the list of states with 30 species, 15 of which are unrecorded elsewhere. California has 16 species, 1 of which is unrecorded elsewhere. Nevada has 13 species, all known elsewhere. Texas has 12 species, 2 of which are unrecorded elsewhere. Utah has 11 species, 1 of which is unrecorded elsewhere. New Mexico has 5 species, all known elsewhere. Colorado has 4 species, all known elsewhere. Florida has 3 species, 1 of which is unrecorded elsewhere. Georgia, Illinois, Maryland, Mississippi, Nebraska, and Oregon have 2 species, both known elsewhere. The rest of the states for which there are records of a single species, except Idaho, Missouri, Kansas, and Washington, are east of the Mississippi River.

ACKNOWLEDGMENTS

To Dr. Paul H. Arnaud, Department of Entomology, California Academy of Sciences, San Francisco, California for the loan of E. P. Van Duzee's types; Dr. W. J. Knight, British Museum (Nat. Hist.), London for the loan of W. W. Fowler's types; and to Dr. L. J. Stannard, Illinois State Natural History Survey, Urbana, Illinois for the loan of Z. P. Metcalf's type my sincere thanks are extended. Miss Linda Heath deserves special recognition for her fine illustrations which appear throughout this study.

LITERATURE CITED

- BALL, E. D. 1902. Some new North American Fulgoridae. Canadian Ent. 34:147-157.
- . 1905. Some new Homoptera from the South and Southwest. Proc. Biol. Soc. Washington 18:117-120.
- . 1937. Some new Fulgoridae from the Western United States. Bull. Brooklyn Ent. Soc. 32:171-183.
- and Klingenberg, P. 1935. The genus *Oecleus* in the United States (Homoptera: Fulgoridae). Ann. Ent. Soc. America 28:193-213.
- CALDWELL, J. S. 1938. New Texan Fulgoridae (Homoptera). Ohio Jour. Sci. 38(6):304-306.
- . 1944. Notes on *Oecleus* Stål (Homoptera: Cixiidae). Ent. News 8:174-176, 198-202.
- FOWLER, W. W. 1904. Order Rhynchota. Suborder Hemiptera-Homoptera. Biologia Centrali-Americana 1:77-124.
- METCALF, Z. P. 1923. A key to the Fulgoridae of Eastern North America with descriptions of new species. Jour. Elisha Mitchell Soc. 38: 139-230.
- STÅL, C. 1862. Novae vel minus cognitae Homopterorum formae et species. Berliner Ent. Zeit. 6:303-315.
- VAN DUZEE, E. P. 1912. Hemipterological gleanings. Bull. Buffalo Soc. Nat. Sci. 10:477-512.
- . 1917. Catalogue of the Hemiptera of America North of Mexico excepting the Aphididae, Coccidae, and Aleurodidae. Tech. Bull. California Agr. Exp. Sta. 2:1-902.
- . 1923. Expedition of the California Academy of Sciences to the Gulf of California in 1921. Proc. California Acad. Sci. (4) 12: 123-200.
- . 1925. New Hemiptera from Western North America. Proc. California Acad. Sci. (4) 14:391-425.
- . 1929. A new *Oecleus* (Fulgoridae) Pan-Pacific Ent. 5:173.