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THE GENUS *OECLEUS* IN THE UNITED STATES (Homoptera: Fulgoridae)

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The genus *Oecleus* belongs to that division of the family *Cixidae* in which the end of the female abdomen is modified into a large transverse wax-forming plate to the lower margin of which the reduced pygofer and ovipositor are attached. The following key will enable one to readily determine the common genera.

KEY TO THE MORE COMMON GENERA OF THE CIXIDAE (WITH WAX PLATES)

- A. Vertex broad, nearly flat, face broad, cubitus (inner nervure of corium) forking near middle of clavus.
 - B. Mesonotum tricarinate..... *Cixius* Latr.
 - BB. Mesonotum 5-carinate..... *Oliarus* Stål.
- AA. Vertex a narrow trough between high carinae, face narrow; cubitus forking at or very near apex of clavus.
 - B. Vertex very narrow at the base, broadening apically, 5-carinae on mesonotum..... *Oecleus* Stål.
 - BB. Vertex broadest at the base, narrowing apically, 3 carinae on mesonotum..... *Oeclidius* Van D.

The three plates are arranged, numbered and named in the same order as the key and text, and are therefore self explanatory.

DISTRIBUTION

This genus is decidedly western in its development on this continent. Only one species is abundant along the Atlantic seaboard and another is here described from southern Florida. The remainder of the twenty-four enumerated are typically western, a few being found as far east as the plains region, but only two of these extending into the Mississippi Valley proper. None of the species has been taken as far north as Canada, but a number are distributed along the southern border and extend over into Mexico.

KEY TO THE SPECIES

- A. Head in profile acutely angled, or at least nearly right angled.
- B. Costal nervure of elytra broadened around the basal angle to more than three times its width at the nodal cell and often pustulate. Elytra usually broad and short, (except in *subreflexus*).
- C. Large broad-winged species females 3.5 by 8 mm. or longer.
 - D. Light tawny, or yellow. Vertex about right angled, nodal cell equal in length and breadth..... (S. W.) 1. *snowi*
- DD. Darker. Vertex acutely angled, nodal cell longer than wide.
 - E. Third anteapical shorter or only equal the fourth with two apical nervures, each with a single fork. Elytra with a slight tawny tinge..... (Ariz.) 2. *capitulatus*
- EE. Third anteapical longer than the fourth, giving off three apical veins or two veins that fork again. Elytra pale milky, (Ariz.) 3. *triplicatus*
- CC. Smaller species, females not over 6 mm.
 - F. Elytra broad and short, not more than one-half longer than wide. Elytra milky, not yellow.
 - G. Third anteapical cell shorter or only equalling the fourth. Nodal cell much longer than wide, the inner margin only broadly arched, (Ariz.) 4. *arnellus*
 - GG. Third anteapical cell much exceeding the fourth, nodal cell short and broad, the inner margin sharply arched, (Ariz. and Calif.) 5. *centronus*
 - FF. Elytra longer and narrower, nearly twice longer than wide. Species small, entirely pale yellow or with dark lines on mesonotum.
 - H. Elytra pale, unmarked, or with trace of dots towards apex, vertex narrow..... (S. W.) 6. *subreflexus*
 - HH. Elytra with black dots on veins and a black stigma. Vertex broadening in front..... (Nev.) 7. *sagittanus*
- BB. Costal nervure but little broadened at the base and following the angle of the elytra.
 - I. Elytra with ground color tawny or pale tawny, size small.
 - J. Mesonotum yellow with a pair of heavy black stripes outside the carinae..... (S. W.) 8. *planus*
 - JJ. Mesonotum pale brown with carinae light.
 - K. Elytra broad, golden yellow unmarked..... (Ariz.) 9. *pulchellatus*
 - KK. Elytra long and slender, nervures and markings smoky, (S. Calif.) 10. *cabazonus*
 - II. Elytra with the ground color subhyaline or milky (occasionally smoky).
 - L. Large straw-colored species, females 6-8 mm., with long, narrow acute vertices, and long narrow elytra.
 - M. Mesonotum with five light stripes on the carinae, nodal cell but little longer than broad, strongly arched..... (S. W.) 11. *lineatus*
 - MM. Mesonotum with a broad median white stripe and a pair of narrow yellow ones on the lateral carinae, nodal cell twice longer than wide, scarcely arched..... (S. W.) 12. *nolinus*
 - LL. Species smaller or darker or both.
 - N. Head in profile acutely angled, vertex extending beyond the eyes more than its width at apex.
 - O. Elytra smoky with heavy smoky or black markings. Large, with an extremely long vertex..... (Ariz.) 13. *perpictus*
 - OO. Elytra hyaline with only the usual dots on nervures.
 - P. Vertex narrow at base, nodal cell longer than wide, elytra subhyaline, the nervures pale brown with faint dots, (Fla.) 14. *tamiamus*
 - PP. Vertex very wide at base, nodal cell twice as long as wide, elytra milky with the nervures alternate black and white, (West) 15. *excavatus*
 - NN. Head in profile a right angle or slightly acute, vertex not exceeding the eyes by more than its apical width.
 - Q. Mesonotum with 3 or 5 narrow light lines on the carinae.

- R. Elytra subhyaline, the claval areas and cross nervures smoky, nervures alternate dark and white, in dark specimens the mesonotum is black with three very narrow lines,
(West) 16. **venosus**
- RR. Elytra subhyaline with a tawny cast, the nervures pale brown, becoming darker towards apex, dots obscure... (East) 17. **borealis**
- QQ. Mesonotum black with two broad yellow lines between the carinae and two short ones outside..... (Ariz.) 18. **quadrilineatus**
- AA. Head in profile decidedly rounding, definitely less than a right angle with the vertex extending beyond the eye, less than its width.
- B. Face black, general body color dark. The mesonotum may be orange. the elytra subhyaline, females 6 mm. or over.
- C. Vertex very broad and short, not more than twice as long as its median width..... (S. W.) 19. **campestris**
- CC. Vertex narrower, especially at base, three or more times as long as its median width..... (Central and West) 20. **decens**
- BB. General body color pale or yellow, face usually yellow, species mostly small.
- D. Species broad and stout, females more than 4 mm. long.
- E. Elytra white, nervures concolorous with dark dots towards the apex..... (West) 21. **fulvidorsum**
- EE. Elytra tawny, nervures dotted throughout. Smoky dashes on the cross nerve and margins..... (Ariz.) 22. **monilipennis**
- DD. Species small, females 4 mm. or less.
- F. Nervures of elytra dotted throughout, face pale or orange,
(Ariz.) 23. **piperatus**
- FF. Nervures of elytra dark brown, the punctures obscured, face smoky..... (Ariz.) 24. **pigmy**

FOOD PLANTS

The nymphs of this genus of *Fulgoridae* are covered with a white wax and are either subterranean or hide in the protected parts of their food plants so that they are rarely seen, thus making accurate food plant determination difficult. The adults of the two common species, *borealis* of the Atlantic coast and *decens* of the Southwest and Mexico, are found on a wide variety of trees and shrubs and are either general feeders or else their larval food plants are low growing but widely distributed plants from which the adults fly up to the higher vegetation. Five species are known to feed on different salt bushes (*Atriplex*), one on *Salicornia* and one on *Dondia*—making seven feeding on *Chenopodiaceae*; five feed on different *Compositae*, two on relatives of the yuccas, one on currant, one on the desert Catalpa, and one on a grass, leaving seven species with food plants unknown.

Genus *Oecleus* Stål

Oecleus Stål. Berl. Ent. Zeit. 6: 306, 1862.

Species of moderate size with membraneous elytra longer than abdomen, tectiform when closed but not overlapping and without granulations on clavus. Head very narrow, less than half as wide as

the pronotum. The vertex narrow especially at the base where it is truncate, appearing as a deep trough between the elevated lateral carinae. Front long and narrow. Pronotum roundly emarginate posteriorly, much shorter on median line than vertex. Mesonotum broad, 5-carinate. Elytra broad, nearly parallel margined, the cubitus running close to and parallel with the claval suture and only forking near the apex of clavus. Subcosta (+ R) and medius united for at least one-third the distance to the stigma. Apex of female abdomen terminating in a broad transverse wax plate from the ventral margin of which the reduced ovipositor extends.

Type of genus *Oecleus seminiger* Stål (from Mexico).

CHARACTERS USED IN CLASSIFICATION

The most important characters are found in the relative width and length of the vertex, whether it is parallel margined or expands apically, the relative projection beyond the eyes and the angle formed with the front, the width of the costal nervure around the basal angle, the size and shape of the stigma and the nodal cell, the relative length of the anteapical cells, the size and color of the setigerous punctures on the nervures, the shape of the projection on the apex of the male genital segment and the color especially of the face and elytra. The shape of the male genital styles which is one of the best of diagnostic characters in some of the allied genera is of little value here. They are all of one general pattern, club-shaped, covered with spines and with a definite chitinized hook apically. They are hinged so that they may move in and out and thus change their apparent length and they are usually covered with wax and thus obscured.

The types of the new species described are in the collection of the senior author, unless otherwise stated.

1. *Oecleus snowi* Ball

(Plate I, Fig. 1; Plate II, Fig. 1)

Oecleus snowi Ball. Proc. Biol. Soc. Wash. 18: 117, 1905.

Oecleus decens Fowl. Biol. Centr. Amer. Homop. 1: 90, Pl. 10, Fig. 6, 1904.
(Not Stål.)

Large broad-winged, pale lemon-yellow nearly twice as broad as *decens*, vertex right-angled, costal nervure broadly expanded basally. Length ♀ 8 mm, ♂ 6.5 mm., width 3 mm.

Vertex very narrow nearly parallel margined, converging posteriorly vertex and front in profile forming a right angle, the vertex projecting beyond the eye more than its width at apex. Front narrow with prominent lateral carinae, almost four times as wide between antennae as at apex, obtusely angulate above, in profile slightly convex. Elytra

very broad, two and one-half times as long as broad. Costal vein widening towards the basal angle where it leaves the margin forming a broad band four times its width at node. There are setigerous punctures on this vein but not between it and margin. Nodal cell almost as broad as long, inner margin strongly arched. Twelve apical cells. The second and third antepical cells extending beyond the first at least their width. Male genital segment deeply emarginate with a broad rectangular median projection, the posterior margin with two spines and a fingerlike median process.

Color bright straw yellow with brownish or smoky cast. Mesonotum and face tawny. Elytra subhyaline yellow, often with a smoky cast. Nervures concolorous with sparse black setigerous punctures. Usually the darkening on the mesonotum intensified against outer carinae.

Habitat: Specimens are at hand from Bill Williams Fork (Snow), Wickenburg, Phoenix, Safford (Ball), Tucson, Chiricahua Mts. (Nichols), and Nogales, Arizona, and Ontario, California (Ball). Van Duzee reports it from Potholes, California. Fowler lists and figures it as *decens* from Mexico. Feeds on the Water Wally (*Baccharis glutinosa*) growing in the dry washes of the western deserts. Hibernates as an adult and so occurs throughout the season. This large, broad-winged, yellow species is strikingly distinct and cannot be confused with any other.

2. *Oecleus capitulatus* Van D.

(Plate II, Fig. 2)

Oecleus capitulatus Van Duzee. Bul. Buf. Soc. Nat. Sci. 10: 495, 1912.

Resembles *snowi* in size and form, vertex longer. Smoky brown with subhyaline elytra. Length ♀ 7.5 mm., ♂ 6.5 mm., width 3.2 mm.

Vertex broadening anteriorly, projecting one-half farther beyond the eye than in *snowi*. Profile convex but lacking the obtuse angle, forming a slightly acute angle with face. Face slightly broader opposite antennae than in *snowi*. Elytra similar to *snowi*. The costa narrower at the basal angle with setigerous punctures along inner margin. Nodal cell longer than broad and inner margin less arched than in *snowi*. Apices of first three antepical cells usually a straight line. Male genitalia similar to *snowi* except that the basal projection narrows apically.

Color smoky brown, face darker, all carinae light. Elytra subhyaline with a definite smoky cast, nervures concolorous on basal half and usually dark smoky on the apical portion with numerous black setigerous punctures throughout. A pair of black lines on the middle of the sutural margin, another pair at apex of clavus and usually the scutellar margins are infusate. The stigma with the inner margin dark lined, inner margin of nodal cell often darkened.

Habitat: Found breeding in abundance in May and June on *Dasyllirion* (saw tooth yucca) growing on the slopes of the Santa Rita and Huachuca Mts. in Arizona (Ball).

3. **Oecleus triplicatus** Ball & Klgb., n. sp.

(Plate I, Fig. 3; Plate II, Fig. 3)

Similar to *capitulatus* but darker and lacking the brown shade on elytra. Elytra narrower, costal nervure less thickened and much less angled at the base, two extra apical nervures. Length ♀ 7.5 mm.; width 3 mm.

Vertex slightly wider than in *capitulatus*. In profile similar to *snowi*, front wider above and less constricted between the eyes. Elytra very long, three times as long as broad. Costa narrower than in *capitulatus*, nodal cell nearly three times as long as broad and strongly arched, third anteapical cell extended beyond the adjacent ones nearly its apical width and giving rise to two extra veinlets. Male pygofer deeply excavated with a short quadrangular projection bearing two acute spines on the lateral angles and a median fingerlike process.

Color brown, face black, carinae testaceous, pronotum dark with light markings, mesonotum dark, carinae tawny. Elytra milky hyaline, nervures yellow, heavily punctured, and darkening apically. Stigma and inner curve of nodal cell darkened.

Holotype ♀ Huachuca Mts. June 15, 1930 and one paratype female Santa Rita May 30, 1930, taken by the senior author. Allotype and one paratype male Arizona. Cornell Univ., Lot 34 (Uhler collection) from the National Museum. Allotype and one paratype in National Museum.

4. **Oecleus arnellus** Ball & Klgb., n. sp.

(Plate II, Fig. 4)

Superficially resembling *decens* but very distinct in the broad, short elytra, heavy punctures, and the broad costa. Much broader and shorter with a broader vertex than any of the preceding species. Length ♂ 5 mm.; width ♂ 2.2 mm.

Vertex broad throughout, twice the width of *snowi*, front proportionately much broader. In profile front and vertex meeting in a right angle, the front rounding. Costal nervure not as broad as in *snowi*, but heavily setigerous around the angle, third anteapical cell broad and short about equalling the adjoining ones in length with a single nervure from each angle, both of which are forked. Veins heavily dotted with fuscous throughout; on the longitudinal nervures the dots are separated by less than twice their width. Male genital segment shallowly emarginate, with a very short, two spined produced portion and the usual fingerlike process.

Color—Black with the carinae light yellow, the pronotum straw color with four black dots, the elytra milky subhyaline with a touch of fulvous on the clavus and apical cells. Stigma rather large, black; the nervures thickly set with large, black punctures, the apical ones becoming fuscous before the margin, but not enlarged as in *centronus*.

Holotype ♂ and one paratype male Yarnell Heights, Arizona, July 21, 1929 (Ball). This is a very distinct species,

but may be very easily overlooked owing to its superficial resemblance to the *decens* group. Its broad, short elytra with the extremely heavy dots will at once distinguish it.

5. **Oecleus centronus** Ball & Klbg., n. sp.

(Plate I, Fig. 5; Plate II, Fig. 5)

Similar to *snowi* but smaller, broader. Elytra milky with two fulvous bands across the extremities of the anteapicals. Length ♀ 5 mm., width 2 mm.

Vertex narrower at base and wider at apex than in *snowi*. In profile face less angled above and face and vertex slightly more acutely angled. Costal nervure slightly less broadened, but elytra slightly more angled at the base than in *snowi*. Nodal cells almost as broad as long and strongly arched, second and third anteapicals long, second anteapical extending its apical width beyond the adjoining cells.

Body color pale straw, darkening on the tergum and along some of the carinae. Dark examples may have the mesonotum brown with the carinae light. Elytra milky subhyaline, a fuscous spot on the basal angle of the costa. A line on the sutural margin back of the middle and another at the apex, the stigma broadly fuscous, a smoky spot in the broad nodal cell opposite stigma and the tips of the apical veinlets fuscous. Claval areas fulvous and there is a pale fulvous band from apex of clavus across the cross-nervures to the spot in nodal cell. A fulvous or smoky cloud on the nervures at the apex of the second and third apical cells.

Holotype ♀ allotype ♂ and 16 paratypes, Buckeye, Arizona, April 16, 1933, swept from Samphire (*Salicornia* sp.) by the senior author. This species is easily recognized by the fulvous band across the elytra and the inflated costal nervure. It is no doubt the banded variety of *pellucens* mentioned by Fowler, but cannot be that species as the elytra are much broader and shorter. A single female of a larger, paler variety was taken at Calexico, California, June 10, 1931.

6. **Oecleus subreflexus** Van. D.

(Plate II, Fig. 6)

Oecleus subreflexus V. D. Proc. Cal. Acad. Sci., 4th Ser., 14: 406, 1924.

Oecleus decens Metcalf. Jour. Elis. Mitch. Sci. Soc. 38: 162, Figs. 297 and 587, 1923. (Not Stål.)

Small elongate, pale yellow with a tawny mesonotum. Length 5-6 mm., width 2 mm.

Vertex narrow, parallel margined; in profile vertex and face right angled, front broadly rounding. Elytra long, narrow, the apex angularly rounding; the veins setigerous but uncolored or only faintly dotted. Costal nervure broad around the angle but unarmed. Male genital segment shallowly excavated with a roundingly projecting base, tipped with the usual projection.

Color—Pale creamy throughout, mesonotum with a tawny cast and a slight darkening inside the outer carinae usually emphasized posteriorly.

Habitat: Collected from May to August at Yuma, Arizona, Calexico, Imperial, and Indio, California, on the giant salt bush (*Atriplex lentiformis*) by the senior author. Described from Potholes, California (V. D.) and collected at Overton, Nevada (Fox).

7. ***Oecleus sagittanus*** Ball & Klbg., n. sp.

(Plate II, Fig. 7)

Resembles *subreflexus* but longer and narrower with an acutely angled vertex. Pale straw, black dots on nervures.

Length ♀ 5.5 mm., ♂ 4.5 mm., width 1.8 mm.

Vertex very narrow at the base widening anteriorly; in profile similar to *centronus*, angle of vertex slightly more acute than *subreflexus*. Elytra almost three times as long as broad, nodal cell nearly twice as long as broad, moderately and uniformly arched. Male genital plate broadly but shallowly notched, a rounding or angular projection almost filling the notch and terminating in a long slender process. Costal nervure expanded towards the base.

Color—Straw, mesonotum soiled tawny, pronotum definitely lighter, face vertex and femora except apices black. Elytra milky hyaline, nervures pale, heavily dotted with setigerous punctures, stigma and tips of apical nervures broadly fuscous.

Holotype ♀ allotype ♂ and three paratypes Overton, Nevada, May 8, 1929, one paratype each Overton, July 7, Glendale, May 5, and Mesquite, July 6, all taken in Nevada by David E. Fox from the arrow weed (*Pluchea sericea*). Holotype and 4 paratypes returned to E. W. Davis from whom they were received. The spotted nervures, acute head and broad costa will readily separate this species from the other yellow forms.

8. ***Oecleus planus*** Ball & Klbg., n. sp.

(Plate II, Fig. 8)

Resembling *sagittanus* but shorter with a less acute head and narrow costal nervure, pale tawny, yellow with a pair of black stripes outside the outer carinae of the mesonotum. Length ♀ 5 mm., ♂ 4 mm., width 1.7 mm.

Vertex broad almost parallel margined, as broad in front as the distance it projects from the eyes; in profile about right angled with the front, front decidedly rounding especially in front of the eyes. Elytra broader and shorter proportionately than in *sagittanus* with the costal nervure not broadened before the base, the third anteapical but little longer than the adjoining cells. Male genitalia similar to *sagittanus*.

Color—Face and mesonotum pale orange with a tawny cast, the latter with a pair of heavy black stripes just outside the outer carinae, pronotum creamy with two black spots. Elytra pale tawny subhyaline, nervures pale and weakly setigerous but lacking the black spots. A few smoky lines on the cross-nervures and smoky dots on the apical margin.

Holotype ♀ Cabazon, California, June 30, 1909 (Ball). Allotype ♂ taken June 8, paratype females June 8 and July 6, 1929, at Las Vegas, Nevada. Paratype ♂ Glendale, Nevada, May 5, 1929, all recorded as swept from rabbit brush (*Chrysothamnus panniculatus*) by David E. Fox. Allotype and two paratypes returned to E. W. Davis who sent them for determination. The heavy black lines on the mesonotum and the pale elytra will at once separate this from all other species in this group.

9. *Oecleus pulchellatus* Ball & Klgb., n. sp.

(Plate I, Fig. 9; Plate II, Fig. 9)

Small, pale, golden yellow resembling *centronus* in form but lacking the broad costa. Length ♂ 4 to 5 mm., width 1.8 mm.

Vertex narrow, almost parallel; in profile slightly acutely angled with the front, front broadly evenly rounding. Elytra short, broad as in *centronus* the nodal cell much narrower; the third and fourth anteapicals about equal posteriorly, two of the four examples have an additional apical nervure. Male genitalia similar to that in *sagittanus*.

Color—Pale golden yellow, the mesonotum tinged with orange and with a pair of smoky lines between the outer carinae, nervures of elytra concolorous, the setigerous punctures scarcely marked.

Holotype ♂ and two paratype males June 23, 1929, Sacaton, one paratype Phoenix, Ariz. July 10, 1930, all collected by the senior author swept from alkaline areas where *Dondia* and similar plants grew. A strikingly distinct little species in its total lack of ornamentation. It is closely related to *minima* of Fowler but the vertex is longer and not widened apically and the elytra are more broadly rounding than in that species.

10. *Oecleus cabazonus* Ball & Klgb., n. sp.

(Plate II, Fig. 10)

Similar to *planus* in form with a longer vertex. Pale, mesonotum chestnut with tawny carinae. Length 4–5 mm., width 1.7 mm.

Vertex moderately broad, parallel; in profile right-angled with the rounding face. Elytra long, narrow, nodal cell long and narrow very slightly arched.

Color—Face tawny, the carinae lighter, pronotum pale with two and sometimes four dark spots. Mesonotum pale brown, the carinae tawny, elytra milky subhyaline with tawny margins and a tawny line

on the claval suture. The nervures are concolorous with the milky membrane and extremely closely set with tawny punctures throughout.

Holotype ♀ allotype ♂ and 10 paratypes, Cabazon, California, June 20, 1909. Swept from the desert willow (*Chilopsis linearis*) by the senior author. This species is near *subreflexus* of the same region but may be distinguished by the longer and narrow form, the narrow costa and the numerous dots on the nervures.

11. *Oecleus lineatus* Ball

(Plate I, Fig. 11; Plate II, Fig. 11)

Oecleus lineatus Ball. Can. Ent. 34: 154, 1902.

Oecleus concinnus Fowl. Biol. Centr.-Amer. Homop., 1: 91, Table X, Fig. 12, 1904.

Oecleus pellucens Van Duzee. Bul. Buffalo Soc. Nat. Sci., 10: 495, 1912. (Not Fowler.)

Long, narrow, straw-colored with at least five light stripes on the mesonotum and a long acutely angled vertex. Length 5 to 8 mm., width 2.6 mm.

Vertex extremely long and narrow only slightly widening anteriorly; in profile acutely angled with the long almost straight front. Elytra extremely long and narrow, the nodal cell only slightly longer than broad, the inner margin strongly arched. Male genital segment with a broad almost square projection following the emargination and equalling the pygofer, the process extending beyond.

Color—Front black, the carinae tawny, pronotum pale, mesonotum orange, the five carinae light, often slightly margined with fuscous. Elytra milky subhyaline, nervures closely but minutely dotted with fuscous. The stigma narrow tawny.

Habitat: The senior author has collected this species in abundance from the spiny aster (*Lygodesmia spinosa*) in June and July in the Imperial Valley, California, and from many places in the Gila River drainage in Arizona, including Yuma, Wickenburg to Apache Junction, Phoenix and Sacaton, and one example is at hand from Wells, Nevada, another from Brownsville, Texas (Snow). Fowler's description and drawings of *O. concinnus* from Mexico fit this species in every particular and the habitat given is within the range of its food plant. On examination the material Van Duzee listed as *pellucens* from Arizona proved to be typical *lineatus*. It could not be *pellucens*, because the vertex of that species is shown as short and broadening anteriorly, while the vertex in *lineatus* is long and parallel margined, but even more definite is the broad costa shown in *pellucens* which allies it with the *snowi* group and definitely excludes it from this one.

12. **Oecleus nolinus** Ball & Klgb., n. sp.

(Plate I, Fig. 12; Plate II, Fig. 12)

Resembling *lineatus* but smaller with a broad white line on the mesonotum and a long narrow nodal cell. Length 6 to 7 mm., width 2.2 mm.

Vertex no longer than in *lineatus* but broader and in profile slightly more acute at the apex with the front very broadly rounding throughout. Elytra extremely long, narrow with the nodal cell narrow, twice as long as broad. Male genitalia similar to *lineatus*.

Color—Face black, carinae light, mesonotum testaceous with a broad white median stripe and a pair of narrow tawny stripes on the outer carinae, margined with smoky. Elytra straw-colored, the veins sparsely dotted with small dark points, the apical veinlets with smoky terminations, stigma scarcely marked.

Holotype ♀, allotype ♂ and 16 paratypes from the east slope of the Santa Rita Mountains (labelled Tucson), Arizona, May 23, 1929, one paratype, July 13, 1929, and three, June 15, 1930, from Williams, all taken by the senior author on bear grass (*Nolina microcarpa*). Closely related to *lineatus* but the broad white line on the mesonotum and narrow nodal cell of this species will at once distinguish it.

13. **Oecleus perpictus** Van Duzee

(Plate I, Fig. 13; Plate III, Fig. 13)

Oecleus perpictus Van Duzee. Pan.-Pacific Ent., 5: 173, 1929.

Long, narrow, with an acute vertex and heavily maculate elytra. Length 5-6.5 mm., width 1.9 mm.

Vertex margins touching at the base and gradually widening, but not as wide at apex as the distance beyond the eyes. In profile the vertex very acute and the face almost flat. Elytra are long, narrow with a narrow costal nerve and costal area, the nodal cell nearly twice as long as wide, the interior margin moderately arched. Third anteapical exceeds the second by more than its apical width, thus shortening the apical cells. Male genital segment roundly projecting from the base of the shallow emargination with a broad triangular projection.

Color—Face black, lateral carinae white, median carinae only appearing at the base, mesonotum black with a broad creamy median stripe and a narrow testaceous line on the outer carinae. Elytra hyaline or slightly milky, the sutural margins narrowly ivory twice interrupted with black. A line on the suture an irregular area around the anterior end of the third anteapical and all of the nervures surrounding the inner seven apical cells broadly fuscous.

Habitat: Collected by the senior author from mesquite grass (*Muhlenbergia porteri*) at Yarnell Heights, Sabino Canyon, and the Baboquivari Mountains, Arizona. Males appearing in early July, the females late in the month and on into August.

14. **Oecleus tamiamus** Ball & Klgb., n. sp.

(Plate III, Fig. 14)

Resembling *acutus* Ball (from Haiti) in the extremely long and acute head but the vertex and front are much wider, tawny with milky elytra and brown shades between the carinae on the mesonotum. Length 4.5–5.5 mm., width 1.6 mm.

Vertex touching at the base broadening apically where it is two-thirds as wide as it extends beyond the eye. In profile acutely angular with the front rounding in above the eye. Elytra much shorter and broader than in *lineatus*, much as in *subreflexus* but costal area narrower, nodal cell half longer than wide the posterior one-half definitely arched, the third anteapical exceeding the adjoining ones by less than its apical width. Male genitalia resembling *sagittanus*.

Color—Face brown shading to black, the margins and median carinae which extend throughout, tawny; mesonotum with the lateral margins and carinae fulvous on a brown background. Elytra milky, subhyaline, the nervures pale and weakly setigerous with black punctures to the anteapical cells then strongly fuscous to the apex. Stigma rather broadly black, sutural margins white, twice interrupted with black.

Holotype ♀, allotype ♂, Childs, Florida, June 10, 1928, one paratype female Sebring, Florida, July 20, 1926, all taken by the senior author. The acute head alone will separate this species from all others in the region.

15. **Oecleus excavatus** Ball

(Plate III, Fig. 15)

Oecleus excavatus Ball. Can. Ent., 34: 155, 1902.

Resembling *venosus* in the broad vertex and heavy spotting but the vertex is much longer and more acutely angled than in that species and the mesonotum shows five carinae. Length 4.5–5 mm., width 1.6 mm.

Vertex almost as broad as in *campestris* but much longer, exceeding the eyes by its own width and forming an acute angle with the front. Mesonotum with the intermediate carinae weak and decidedly irregular, almost touching the lateral carinae anteriorly and the median carinae posteriorly. Elytra long and narrow, the nodal cell long and narrow, only about twice the width of the stigma. Connections between the branches of radius and medius (the ends of the third anteapical) faint or wanting. Male genital segment emarginate with a short broad acutely angled projection which bears a stout process.

Color—Face and below black, the carinae light, pronotum straw with dusky spots in the depressions. Mesonotum dark brown, the carinae and a pair of lateral lines tawny. Elytra milky, a pair of spots on suture, the stigma and the tips of apical nervures dark. Nervures white, heavily dotted with black. Two examples from Nevada are very dark, the mesonotum being black with only the carinae narrowly light.

Habitat: Originally collected in Wray, Lamar and Fort Collins, Colorado, in June and July and examples are at hand from Doyle, California, July 21 (Ball), Glendale, Nevada, May 5, (Fox) Bunkerville, Nevada, April 17 (Davis).

16. **Oecleus venosus** Van Duzee

(Plate III, Fig. 16)

Oecleus venosus Van Duzee. Bul. Buffalo Soc. Nat. Sci., 10: 96, 1912.

Oecleus nervosus V. D. Cat., p. 737, No. 2564, 1917 (error).

Resembling *excavatus* but with a decidedly shorter and somewhat narrower vertex, black with three carinae on the pale mesonotum and heavy dotting on nervures. Length 4.5 to 6 mm., width 2 mm.

Vertex decidedly narrower than in *excavatus*, almost parallel margined, extending less than its width beyond the eye; in profile right-angled with face which is strongly rounding above. Mesonotum with the intermediate carinae weak and inconspicuous. Elytra broad, relatively short, inclined to be flaring, the nodal cell strongly arched internally and nearly as wide as long. Third anteapical with nearly one-third of its length beyond junction of the adjacent cells. Male genitalia similar to *excavatus* but lacking the acute angles.

Color—Black below with only faint traces of pale on carinae. Pronotum dark with a few light spots. Mesonotum black with three carinae narrowly testaceous. Elytra with the clavus solidly smoky, a cloud in the stigmal cell and flecks on the cross-nervures and apical nervures.

Habitat: Common throughout California in June and July and specimens are at hand from Burns, Oregon (Wallace), Reno, Nevada (Ball), and Yarnell Heights, Arizona (Ball). This is a rather puzzling and variable species, intermediate in some characters between the long and short-headed groups but when typically colored can be distinguished by the three carinae.

17. **Oecleus borealis** Van Duzee

(Plate III, Fig. 17)

Oecleus borealis Van Duzee. Bul. Buffalo Soc. Natur. Sci., 10: 495, 1912.

A dark smoky species resembling *venosus* but slightly larger with all five carinae showing and the elytra uniformly pale smoky. Length 5-6 mm., width 1.8 mm.

Vertex slightly wider anteriorly than in *venosus*. In profile right angled with a more definite angle in the face. Elytra shorter and broader than in *venosus*, the nodal cell longer with a much smaller stigma. Male genitalia similar to *decens* in pattern but with the lateral spines enlarged to form a rectangular basal area.

Color—Dull smoky, face black, with light carinae, mesonotum tawny with black stripes inside the lateral margins and another pair inside the outer carinae. Occasionally all the disc is dark except the

carinae. Elytra smoky, nervures pale before the anteapicals, smoky beyond, and nervures finely dotted with brown which does not show on the smoky portion.

Habitat: Examples have been examined from the District of Columbia and many places in Florida (Ball), several places in Mississippi (Drake) and it has been reported from New York and New Jersey. It has been taken throughout the season and probably hibernates as an adult.

18. **Oecleus quadrilineatus** Van Duzee

(Plate III, Fig. 18)

Oecleus quadrilineatus Van Duzee. Bul. Buffalo Soc. Nat. Sci., 10: 496, 1912.

Large dark, resembling *borealis*, but larger with four broad yellow lines on the black mesonotum, nervures without punctures. Length 5.5–6.5 mm. Width 2.2 mm.

Vertex narrow at the base expanding apically where it is wider than its projection beyond the eyes, about equalling *borealis*. In profile about right angled with face which is slightly angled in front of the eyes. Elytra about as in *borealis*, the nodal cell broader and the stigma more prominent. Male genitalia similar to *borealis* but with the styles turned up into the cavity.

Color—Black with subhyaline elytra; face and below black with the carinae faintly testaceous; mesonotum black with four broad testaceous stripes the two outside the carinae short; nervures pale smoky becoming broader and darker apically very faintly and irregularly punctured; stigma large, dark.

Habitat: Eight examples were swept from golden currant (*Ribes cereum*) in Granite Dells on July 17, (Ball), one example was taken July 4 in the Chiricahua Mts. (Ball) and Van Duzee described it from the Huachuca Mts. All high mountain ranges in Arizona.

19. **Oecleus campestris** Ball

(Plate I, Fig. 19; Plate III, Fig. 19)

Oecleus campestris Ball. Can. Ent., 34: 156, 1902.

Resembling *decens* but with the vertex nearly twice as wide and the nervures dotted throughout. Black below, mesonotum lined with tawny, elytra milky. Length 5–6 mm. Width 1.9 mm.

Vertex broad, parallel margined, less than twice as long as its median width, scarcely exceeding the eyes in length. Pronotum very broad with a definite angulate emargination posteriorly. Mesonotum with five carinae, the intermediate ones weak and curving outward anteriorly. Elytra relatively broad and short, the costal nervure but little thickened, the nodal cell nearly twice longer than broad and but little arched. The third and fourth anteapicals of approximately equal length and only slightly exceeding the adjacent cells posteriorly. Male genitalia similar to *decens*.

Color—Face and below dark brown with all carinae pale. Pronotum straw colored with a few fuscous dashes. Mesonotum testaceous with the five carinae and two stripes on either side pale. Elytra milky subhyaline, nervures white, finely dotted with fuscous, often the apical nervures and the stigma smoky, sometimes a pair of smoky lines along the middle of the suture.

Habitat: Described from Lamar, Colorado, where it was taken in abundance by the senior author June 17 feeding on the sand binding sage (*Artemisia filifolia*). One example was taken at Roosevelt Dam, two on the slopes of the Santa Rita's, and six on the Chiricahua Mountains in Arizona. The broad short vertex will instantly separate this species from all related forms.

20. *Oecleus decens* Stål

(Plate I, Fig. 20; Plate III, Fig. 20)

Oecleus decens Stal. Ber. Ent. Zeit., 6: 307, 1862.

Oecleus obtusus Ball. Can. Ent., 34: 155, 1902.

Oecleus productus Metcalf. Jour. Elis. Mitch. Sci. Soc., 38: 184, 1920.

A large dark species resembling *campestris* but with a narrower vertex which is closed posteriorly and the nervures are obscurely pustulate. Length 5–7 mm., width 2 mm.

Vertex three times as long as its median width, closed posteriorly, scarcely exceeding the eye in length, in profile meeting the front in an obtuse angle, front again angled before the eyes. Mesonotum with the median carinae straight. Elytra, about as in *campestris*. Male genital segment with a very shallow emargination from the base of which projects a large triangular tooth with slight projections on the lateral margins.

Color—Face and below black, pronotum smoky with lighter margins, mesonotum dark testaceous with about nine fulvous lines, elytra milky with pale nervures finely but obscurely dotted, nervures on apical half smoky with the punctures scarcely visible. In dark specimens all nervures are smoky.

Habitat: Occurs in abundance on various trees and bushes throughout California, Arizona and adjacent Mexico, and examples are at hand from various places in Utah, Colorado, Nebraska, Kansas, Southern Illinois, Mississippi, Texas, and it has been reported from New Mexico (Van D.).

Stal described this species in 1862 from a female from Mexico, the only diagnostic characters being a length of 7 mm. General dark color with yellowish testaceous carinae and markings. The elytra "vitreis" the veins on basal part punctate, on apical part dark. No mention is made of the length of vertex. Early authorities determined the common southeastern species as *decens*, and with this in mind the

senior author described the western form as *obtusus* (1902). Fowler in the *Biologia* (1904) lists and figures as *decens* a large broad-winged yellow species with a long narrow vertex and the nervures granulated throughout. This from the enlarged costa and the male genitalia is no doubt *snowi* but cannot be *decens* of Stal in size, color, or granulations. Later with more material available Van Duzee determined that the distribution and characters of the southwestern form were much nearer to those of *decens* than that of the southeastern one and named the latter *borealis*. This has been accepted and followed by all except one of the later workers.

Metcalf in 1923 further complicated the situation by keying out and figuring a species with a long vertex as *decens*. The male genitalia and head characters shown resemble those of *subreflexus*, a small golden yellow species which cannot possibly be what Stal described. The figures are evidently inaccurate as they show acute lateral projections on the anal segment and forking carinae on the mesonotum, characters not found in the genus. He then describes *productus* from southern Illinois and Arizona. The authors have examined a paratype from Metropolis, Illinois, and found it to be a small pale example of *decens* with the apical nervures pale and the dots showing—a variation often found in Kansas, Mississippi and Texas specimens. The male genitalia of the paratype are of the typical broad triangular form with lateral points and not at all as shown in his figure which must have been from a distorted example.

21. *Oecleus fulvidorsum* Ball

(Plate III, Fig. 21)

Oecleus fulvidorsum Ball. Can. Ent., 34: 157, 1902.

Light creamy yellow with a milky elytra much narrower than in *decens*. Length 4–5 mm., width 1.7 mm.

Vertex very narrow at base slightly widening apically, short scarcely exceeding eyes. In profile joining the front at an obtuse angle so that the outline almost parallels the curve of the eyes. Elytra rather long and roundly compressed so as to give the insect a much narrower and more parallel appearance than *decens*. Venation simple, regular, with the nodal cell long and only slightly arched. Male genital segment with a long terminal tooth, one-third the width of emargination.

Color—Creamy throughout, the clypeus orange, mesonotum tawny with the carinae paler. Elytra creamy translucent, the nervures concolorous and obscure on the basal half, thickly dotted with fine fuscous points and tipped with smoky toward apex. Two pairs of short lines along the commissure in the darker examples.

Habitat: Taken by the senior author in many places in Colorado, California, Utah and Arizona on the winged salt bush (*Atriplex canescens*) from May to July. Examples have been examined from Nevada (Fox). Like its host this is a widely distributed and common insect. The uniform pale creamy shade alone will ordinarily distinguish it.

22. **Oecleus monilipennis** Van Duzee

(Plate III, Fig. 22)

Oecleus monilipennis Van Duzee. Calif. Acad. Sci., 12: 190, 1923.

Form and structure of *fulvidorsum* nearly. Pale tawny to smoky with a pair of black lines bordering the outer carinae of the mesonotum, the elytra heavily maculate. Length 4.5–5.5 mm., width 1.7 mm.

Vertex rather narrow almost parallel margined, in profile as in *fulvidorsum*. Elytra about as in *fulvidorsum* except that the apices are noticeably curved downward and the pustules are much heavier throughout. Male genitalia similar to *fulvidorsum* but the tooth much broader, as broad as long.

Color—Face pale or pale-smoky, the clypeus orange, the pronotum with four oblique stripes which are continued as oblique stripes margining the outer carinae of the tawny or orange mesonotum. Elytra smoky subhyaline with the white nervures studded with large heavy setigerous black punctures. The cross-nervures, the whole apical margin, the scutellar margin, and a pair of spots on the suture smoky to black. In light specimens the general color is more creamy with a single pair of mesonotal stripes and the spots on the elytra are much reduced.

Habitat: Taken by the senior author on *Atriplex polycarpa* at Tucson, Sacaton and Yuma, Arizona, St. George, Utah, and Port Libertad, Sonora, Mexico. Examples are at hand from Glendale, Nevada and Van Duzee described it from the Gulf of California region. This beautifully marked species is abundant especially in alkaline regions and when its food plant dries up may be found on the giant Atriplex or even on Sea blite (*Dondia*).

23. **Oecleus piperatus** Ball & Klgb., n. sp.

(Plate I, Fig. 23; Plate III, Fig. 23)

Smaller and more slender than *fulvidorsum*. Pale with two black lines on the orange mesonotum. Elytra milky and sparsely dotted. Length 3.5–4 mm., width 1.2 mm.

Vertex very narrow and almost parallel margined scarcely more than a line throughout. In profile definitely, but slightly obtusely angled with the rounding front. Elytra long and narrow, exceptionally narrow at the base. Male genitalia similar to *fulvidorsum* except the lateral margins shorter.

Color—Face pale shading to orange below, the vertex pale, pronotum pale with two oblique lines which are continued as narrow black stripes outside the carinae of the fulvous mesonotum. Elytra strongly milky, the nervures white with sparse but rather large and distinct black dots throughout. Four spots on the commissure, the tips of the apical nervures black.

Holotype ♀ allotype ♂ and 7 paratypes, Tucson, Arizona, July 24, 1930 and 12 paratypes Sacaton, Arizona, July 23, 1931, all taken by the senior author on *Atriplex linearis*. The small elongated form with the heavy dotting on the elytra is quite distinct in the group.

24. **Oecleus pigmy** Ball & Klgb., n. sp.

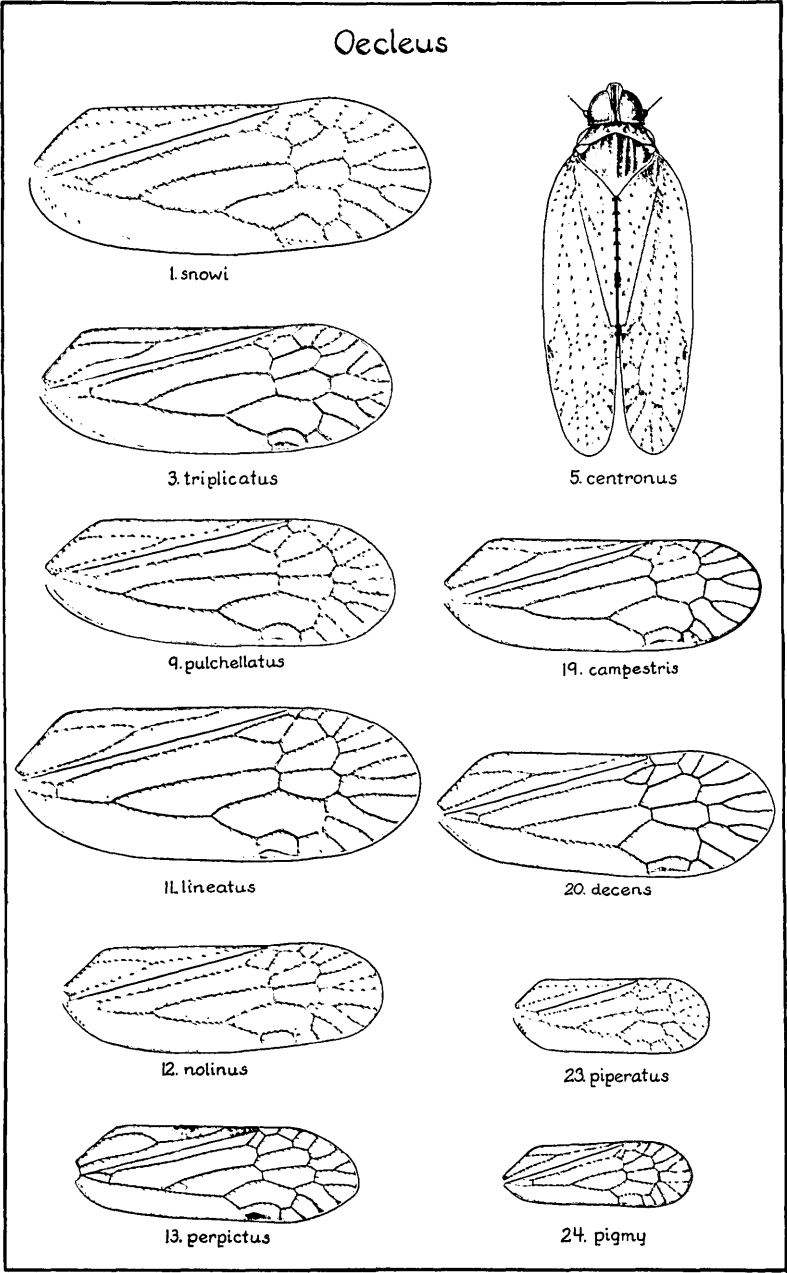
(Plate I, Fig. 24; Plate III, Fig. 24)

Form of *fulvidorsum* but little more than half the size, a short, stout slate-blue species with heavy black nervures. Length 3–3.5 mm., width 1.3 mm.

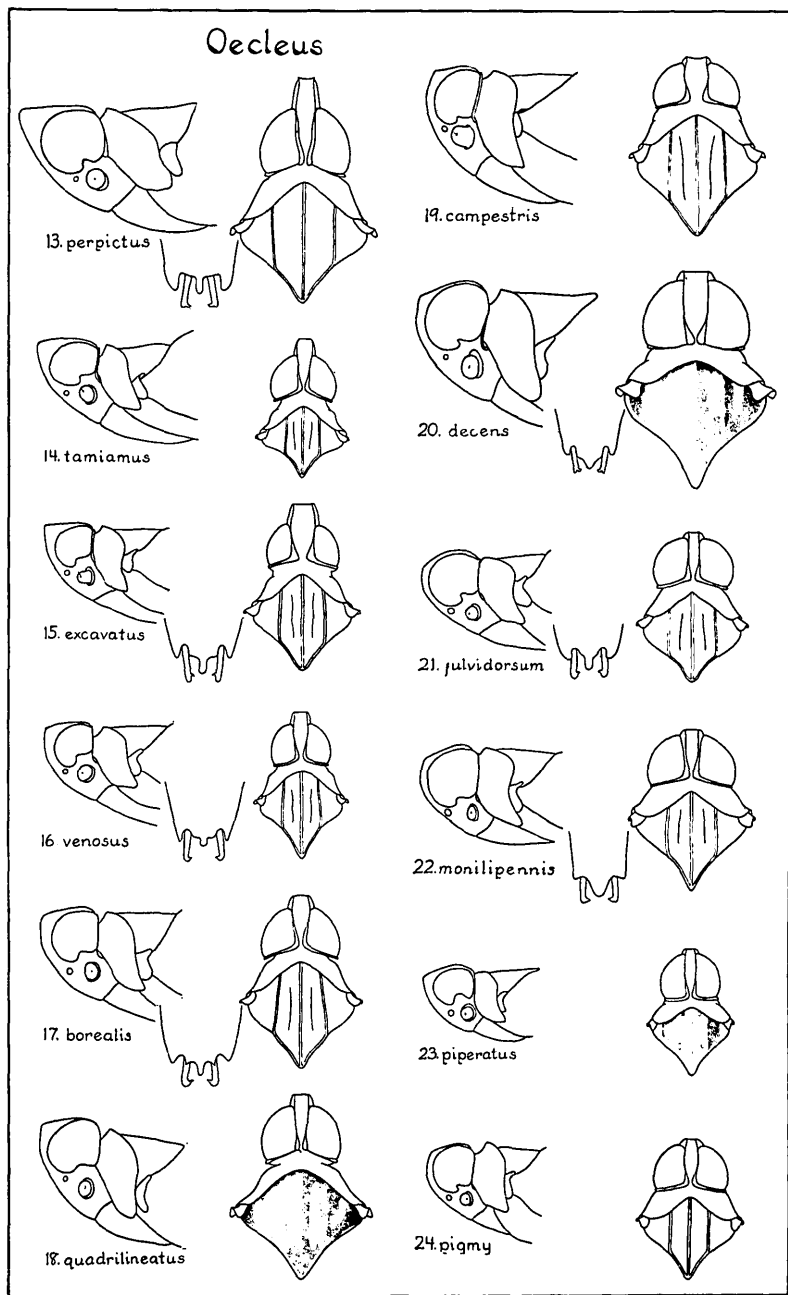
Vertex broadening anteriorly, only just exceeding the eyes; in profile but slightly deviating from the curve of the eyes. Mesonotum with three carinae emphasized and two reduced and irregular. Elytra about as in *fulvidorsum*, the posterior ends of the anteapical cells forming a parabola the nodal cell very narrow and little arched. Male genitalia intermediate in character between *fulvidorsum* and *monilipennis*.

Color—Face and below slaty with the carinae broadly light yellow, pronotum creamy with four faint spots. Mesonotum slaty with a fulvous tinge. The three major carinae broadly light, usually with faint lines between and outside. Elytra smoky with a milky blue overcast, the nervures broadly smoky brown the setiguous punctures masked.

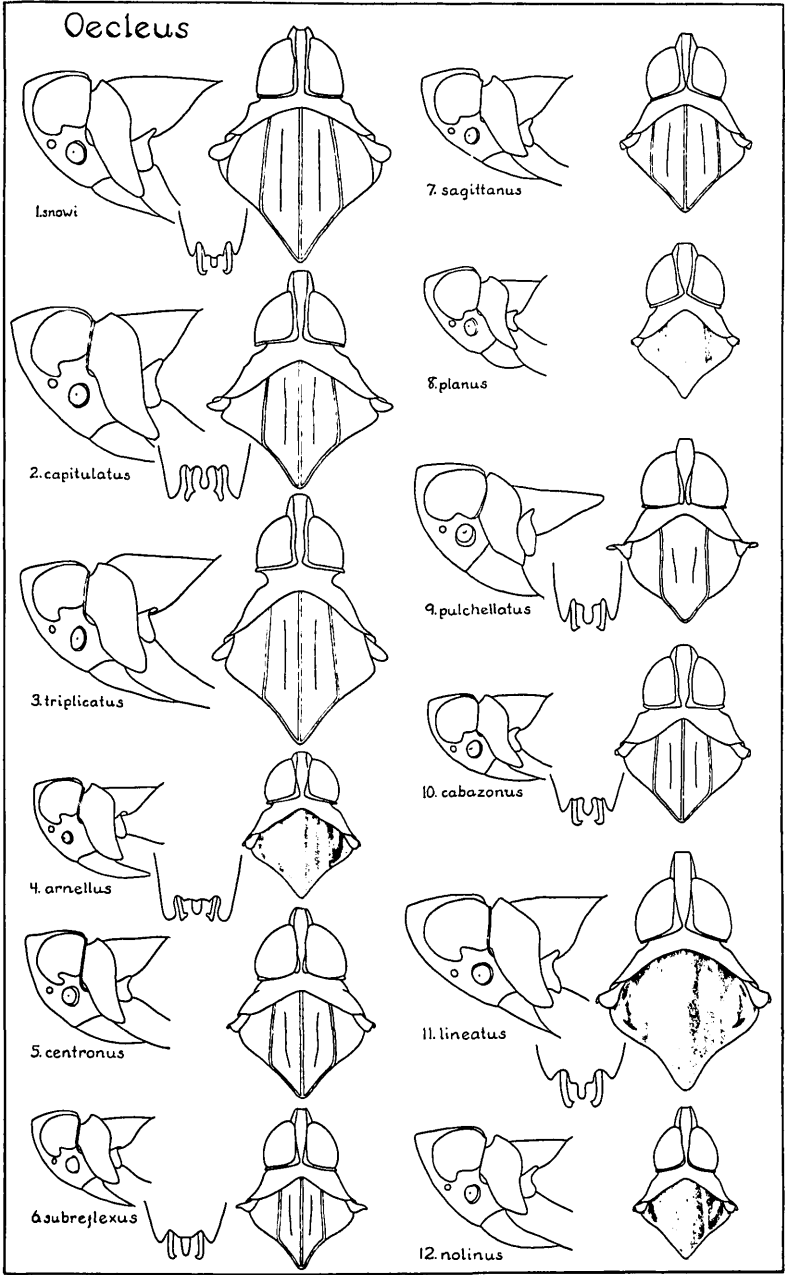
Holotype ♀, allotype ♂, and 16 paratypes taken by the senior author on the low shrubby salt bush (*Atriplex linearis*) at Sacaton, Arizona, April 2, 1932. Other examples are at hand from Idaho, Utah, Nevada, and Southern California.



Wing types in *Oecleus*



Structural characters in *Oecleus*



Structural characters in *Oecleus*