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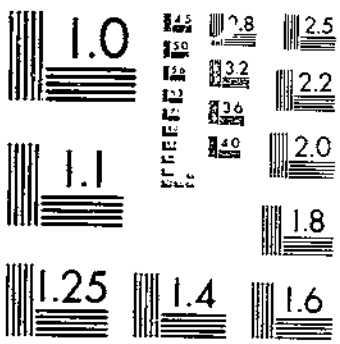
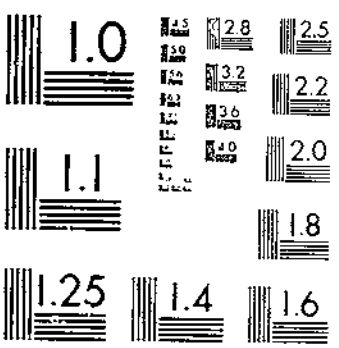


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



MICROCOPY RESOLUTION TEST CHART
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A Revision of the Genus

TRUPANEA

in America North of Mexico

(Diptera, Tephritidae)

TECHNICAL BULLETIN NO. 1214

Agricultural Research Service
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CONTENTS

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A Revision of the Genus TRUPANEA in America North of Mexico

(Diptera, Tephritidae)

By RICHARD H. FOOTE, *entomologist, Entomology Research Division, Agricultural Research Service*

The genus *Trupanea* Guettard is a group of small fruit fly species that have gray pollinose bodies, yellowish heads and legs, and wings with a distinctive starlike pattern. Males and females alike visit the flowers of a large number of plants of the family Compositae, and according to the scant biological literature treating this genus, the larvae inhabit ovaries of these flowers, thereby affecting to an unknown extent the production of seed. Apart from an occasional isolated rearing, no concerted effort has been made to study the biology of any of the species or to evaluate the host specificity. The genus is world-wide in distribution, but because of its apparent lack of economically important species, it has been neglected as a taxonomic study.

The genus *Trupanea* was erected without any included species by Guettard (*1762*).[1] Most authors, under the impression that Guettard first used it prior to 1758, have credited Schrank (*1795* or *1796*) with the name. However, Schrank in his publication assigned a single species, *stellata* Fuessly (as *radiata* Schrank 1795 or 1796), which automatically becomes the type by being the first species published in connection with the genus. The name was emended to *Trypanea* by Agassiz (*1846*), Bezzi (*1913*), and by many American entomological writers. The name *Urellia* Robineau-Desvoidy (*1830*) is a subjective synonym, since the first of the two included species, *calcitrupe* R.-D., designated as type by Coquillett (*1910*), is also a synonym of *stellata*. The common use of the name *Urellia* by European and American entomological writers is limited to the years prior to 1914, probably a result of Loew's (*1862, 1873*) adoption of it for European and American species.

The zoological concept of the genus has changed very little through the years, principally because of the very characteristic wing pattern. The keys to the tephritid genera by Loew (*1873*), Coquillett (*1899*), Williston (*1908*), Phillips (*1923*), and Curran (*1932, 1934*) reflect rather accurately the proper niche for this genus in the classification systems in use in those years. Keys to North American species of *Trupanea* have been published by Adams (*1904*), Phillips (*1923*), and Curran (*1932*). The most recent revision of the genus is by Malloch (*1942*).

Because wing characters are so easily seen and almost universally present, they have been used almost to the exclusion of other characters to place the species in conveniently handled groups and to identify

[1] The year in italics after the author's name is the key to the reference in Literature Cited, p. 26.

species. However, my past attempts at *Trupanea* identifications have met with only partial success because of considerable variation in the wing characters in some species—a fact not mentioned or insufficiently recognized in the past by authors. This revision incorporates my observations on intraspecific variation and is an attempt to remedy this situation. In addition, the photographs of wings and the recast keys should facilitate more accurate identification of the species.

Some species vary considerably in the presence or absence of an infuscation in the distal end of cell R. Since these species appear in two places in the keys to both males and females, no difficulty from this variation should be encountered in identifying specimens.

Passing reference to sexual dimorphism in the genus has been made in the literature. The differences between males and females are most obvious in nearly every species in the wing pattern. The male wing tends to have larger hyaline areas, with the dark markings correspondingly reduced, broken, or sometimes completely absent. *Trupanea bisetosa*, *femoralis*, *imperfecta*, *jonesi*, and *radifera* differ rather markedly in respect to this type of wing pattern. The wings of both males and females of these species are illustrated at the end of this bulletin. Many other species exhibit similar differences in the development of hyaline areas but to a less extent. The separate keys to females and males have been provided to avoid any difficulty that might arise on account of this dimorphism.

Information on hosts in each species discussion has been taken largely from pin labels and represents only those plants from which the adults were collected. It is not intended to be descriptive of the larval habitat, except where rearing is specifically indicated.

GENUS TRUPANEA GUETTARD

Trupanea Guettard, 1762, [Paris] Acad. Roy. des Sci., Hist., Avec Mém. Math. et Phys., 1756 (Mém.) : 171.—Schrank, 1795, Naturhist. und Ökon. Briefe Donaumoor : 147.—Coquillett, 1910, U.S. Natl. Mus. Proc. 37 : 618.—Cresson, 1914, Ent. News 25 : 279.—Curran, 1934, Fam. and Gen. N.A. Dipt. : 293.—Quisenberry, 1951, Kans. Ent. Soc. Jour. 24 : 58.

Urellia Robineau-Desvoidy, 1830, Essai Myod. 2 : 774.—Loew, 1873, Smithsn. Inst. Misc. Collect. 11 (256) : 328, 330, 332–333.—Coquillett, 1899, N.Y. Ent. Soc. Jour. 7 : 268.—Adams, 1904, Kans. Univ. Sci. Bul. 2 : 450.—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444) : 613.—Williston, 1908, Manual N.A. Dipt. (ed. 3) : 284.—Cresson, 1914, Ent. News 25 : 279.

Trypanea Agassiz, 1846, Nomen. Zool. 9–10 : 40.—Phillips, 1923, N.Y. Ent. Soc. Jour. 31 : 147.—Johnson, 1925, Occas. Papers Boston Soc. Nat. Hist. 7 (15) : 264.—Curran, 1932, Amer. Mus. Novitates No. 556 : 5.—Malloch, 1942, U.S. Natl. Mus. Proc. 92 : 1–18, fig. 1.

Trypeta (*Urellia*), Osten Sacken, 1878, Smithsn. Inst. Misc. Collect. 16 (270) : 194.

Urelia (sic!) Johnson, 1925, Occas. Papers Boston Soc. Nat. Hist. 7 (15) : 264.

Trupanea (*Trupanea*), Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401 : 52.

Diagnosis.—Head usually predominantly yellow or yellowish gray; anterior oral margin not markedly produced; proboscis not geniculate; two pairs upper fronto-orbitals; three pairs lower fronto-orbitals, anterior pair often shorter and weaker than others, but rarely lacking. Thorax and scutellum densely gray dusted; humerals and supra-alars present; one pair dorsocentrals, closer to suture than to line drawn through supra-alars; one pair scutellars, in addition some setae fringing posterior margin of scutellum. Wing with preapical dark mark

and rays radiating to wing margins from stigma to at least cell 2d M and sometimes to cell Cu_1; cell 1st A hardly drawn to point at its junction with vein Cu_2+2d A; veins r–m and m separated by distance along M_{1+2} approximately equal to length of vein r–m. Legs yellow, with femora sometimes slightly infuscated; males often with series of fine erect hairs on anterior or anteroventral surface of midfemur. Abdomen densely gray dusted; ovipositor and external male genitalia shining brown or black.

The characteristic subapical stellate marking of the wing (see figures), together with the absence of dark markings in the proximal posterior quarter of the wing disk, distinguishes species of *Trupanea* from those of all other North American tephritid genera except *Tephritis*. However, the definition of a discontinuity between these two genera poses a problem that is not easily solved. *Tephritis pura* (Lw.), *Tephritis subpura* (Johns.), *Tephritis stigmatica* (Coq.), *Tephritis labecula* Foote, and *Trupanea femoralis* form a group that, on the basis of wing pattern alone, connects *Trupanea* and *Tephritis* by perfectly intergrading steps. These species in the order named show progressively noticeable development of dark markings in the posterior proximal quarter of the wing disk. *Trupanea femoralis* (figs. 2 and 3) most closely resembles the *Trupanea*-like end of the intergrade with the lowest degree of such development, and *Tephritis pura* the other, with a relatively darkened field characteristic of most of the *Tephritis* species. The separation of the two genera on the basis of wing pattern alone then is not practicable.

Euarestoides and a part of the genus *Euaresta* have been relegated to the status of subgenera in the genus *Trupanea* by Benjamin (*1934*). It is evident that *Euarestoides* (Foote *1958*) has close affinities with *Trupanea* as defined herein, but we know little about the Neotropical species assignable to it. The genus *Euaresta* as defined by Quisenberry (*1950*) is a group of closely related species considerably removed from *Trupanea*, and the placement of some of its species in *Trupanea* would no longer reflect its true phylogenetic composition. Moreover, the relationship to *Trupanea* of the species in *Neotephritis* and *Paroxyna*, genera not mentioned by Benjamin in this connection, should be more fully evaluated before Benjamin's views are adopted.

According to most European entomological authors and Quisenberry (*1951*), this impasse is resolved by restricting the genus *Trupanea* to those stellate-winged species having only one pair of scutellars and three pairs of lower fronto-orbitals. I agree with Quisenberry that the tendency of wing patterns to be *Trupanea*-like in the species placed in *Tephritis* by this concept (e.g., *stigmatica* and *labecula*) is of only specific significance. *Tephritis stigmatica*, commonly regarded in the past as a *Trupanea* species with two pairs of scutellars, has already been included by Quisenberry (*1951*) in his revision of Nearctic *Tephritis* species, as have *Tephritis pura* and *subpura*.

On the basis of wing pattern, the species fall into the following groups:

A. Dark ray from stigma to cross vein as wide or nearly as wide as length of stigma—*conjuncta*, *femoralis*, *nigricornis*, and *bisetosa*

AA. This dark ray much narrower than length of stigma
  B. Two dark rays through cell 1st M_2—*dacetoptera*, *arizonensis*, *wheeleri*, *mevarna*, *texana*, and *ageratae*
  BB. Only one dark ray through cell 1st M_2
    C. Hyaline spot at base of cell R_5 indistinct—*actinoboli*, *californica*, and *vicina*
    CC. Hyaline spot at base of cell R_5 wide and extending completely across cell—*jonesi*, *pseudovicina*, *radifera*, *eclipta*, and *imperfecta*

In this outline no attempt was made to establish primitive or advanced conditions of the groups relative to one another. The major divisions are essentially the same as those used in the keys and were conceived primarily for convenience in identifying species.

KEY TO FEMALES [2]

1. Unbroken dark-brown area in distal anterior quarter of wing disk; proximal half of wing light brown ..... ***conjuncta*** (Adams) (p. 8)
   Wing with preapical dark area in distal third or half of cell R_3 and basal half of cell R_5, with narrow dark rays diverging from it to margins 2

2. Vein r–m connected to stigma by dark ray as wide or nearly as wide as length of stigma 3
   Dark ray connecting stigma with vein r–m much narrower than length of stigma, sometimes completely absent 4

3. Two dark rays partially or entirely across cell 1st M_2; vein Cu_1+2d A infuscated on most of its length ..... ***femoralis*** (Thoms.) (p. 8)
   Only one dark ray across cell 1st M_2, sometimes broken; vein Cu_1+2d A with a dark spot near center or entirely devoid of markings. ***nigricornis*** (Coq.) (p. 9) and ***bisetosa*** (Coq.) (p. 11)

4. Two dark rays through cell 1st M_2, proximal one sometimes broken in posterior half of cell and not attaining vein M_3+Cu_1 or broken in center of cell 5
   One dark ray through cell 1st M_2; in addition, sometimes a spot near middle of that cell and a dark spot in line with it on vein M_3+Cu_1, or with other markings within cell proximal to distal ray 10

5. Distal ray through cell 1st M_2 continuing to hind margin of wing; if broken in cell Cu_1, its continuation always marked by a dark marginal spot 6
   Distal ray through cell 1st M_2 only to vein M_3+Cu_1 and never beyond 8

6. Proximal ray ending at middle of cell 1st M_2; never with a dark spot in line with it on vein M_3+Cu_1 ..... ***dacetoptera*** Phillips (p. 11)
   Proximal ray extending completely across cell 1st M_2; if broken in that cell, always at least a spot on vein M_3+Cu_1 in line with it 7

7. Distance along vein M_3+Cu_1 between proximal and distal rays in cell 1st M_2 greater than distance between distal ray and vein m; dark mark on vein M_3+Cu_1 at middle of that vein ..... ***arizonensis*** Mall. (p. 12)
   Distance along vein M_3+Cu_1 between proximal and distal rays equal to or less than distance between distal ray and vein m; dark mark on vein M_3+Cu_1 distinctly apicad of middle ..... ***maculigera***, n. sp. (p. 13)

8. Elongate dark streak from base to middle, or beyond, of vein M_3+Cu_1. ***wheeleri*** Curr. (part) (p. 14)
   Base of vein M_3+Cu_1 entirely without infuscation, but a dark spot may be present near middle of that vein 9

[2] Female of *ageratae* Benj. not known.

9. Marginal light spot at apex of vein R_{2+3} centered in surrounding dark area: hyaline spot immediately distad of stigma rather pointed apically ..... *mevarna* (Walk.) (part) (p. 15)
This marginal light spot closer to tip of wing in surrounding dark area; hyaline spot distad of stigma broadly rounded apically. *texana* Mall. (p. 17)

10. Hyaline spot immediately anterior to vein m quadrate and attaining vein R_{1+2} along most of its width ..... *imperfecta* (Coq.) (p. 18)
Hyaline spot immediately anterior to vein m rounded anteriorly and rarely exceeding posterior two-thirds of cell R_5 11

11. Distal end of cell R completely hyaline, but occasionally a very narrow band of infuscation bordering vein r–m 12
Distal end of cell R definitely infuscated in addition to narrow band along vein r–m 18

12. Dark ray from stigma to vein r–m distinctly broken either in cell R_1 or cell R_3 13
Dark ray from stigma to vein r–m complete in cells R_1 and R_3, although it may be broken within stigma 14

13. Dark ray from stigma to vein r–m broken in cell R_1 and complete in cell R_3 ..... *radifera* (Coq.) (p. 18)
Dark ray from stigma to vein r–m complete in cell R_1 and broken in cell R_3 ..... *eclipta* Benj. (p. 19)

14. Infuscation at center of vein M_3+Cu_1 elongate, at least three times as long as wide ..... *jonesi* Curr. (p. 20)
Infuscation at center of vein M_3+Cu_1 subquadrate, triangular, or completely absent 15

15. Marginal light spot at apex of vein R_{2+3} very close to distal margin of dark area surrounding it ..... *californica* Mall. (part) (p. 21)
Marginal light spot at apex of vein R_{2+3} at or near middle of dark spot surrounding it 16

16. Proximal light spot in cell R_5 distinct, broadly based on vein M_{1+2}, and extending about two-thirds of way across cell R_5. *pseudovicina* Her. (p. 22)
Proximal light spot in cell R_5 lacking, indistinct, or extending clear across cell, never broadly based on vein M_{1+2} 17

17. Head distinctly higher than long in profile ..... *seignata*, n. sp. (part) (p. 22)
Head in profile at least as long as high or longer, *actinobola* (Lw.) (part) (p. 24)

18. Apex of cell R with dark even infuscation similar to that in base of cell R_5; proximal border sharply delimited ..... *vicina* (v. d. W.) (p. 25)
Apex of cell R with infuscation either in distinct spot surrounded at least in part distally by a lighter or hyaline area, or broad and lightly areolate; proximal border never sharply delimited 19

19. Vein M_3+Cu_1 with elongated infuscated streak from its base to its midpoint or slightly past ..... *wheeleri* Curr. (part) (p. 14)
Infuscation on vein M_3+Cu_1 in form of spot or entirely lacking 20

20. Brownish species with hyaline area immediately distad of stigma more or less acute apically ..... *mevarna* (Walk.) (part) (p. 15)
Grayish species with hyaline area at apex of stigma rounded broadly posteriorly or ending broadly along vein R_{4+5} 21

21. Infuscation in apex of cell R with distinct margins. *signata*, n. sp. (part) (p. 22)
Infuscation in apex of cell R indistinctly margined 22

22. Marginal hyaline spot at apex of vein R_{2+3} separated from next distal hyaline area by a dark ray about as wide as that covering vein m; Western United States ..... *californica* Mall. (part) (p. 21)
Marginal hyaline spot at apex of vein R_{2+3} separated from next distal hyaline area by a dark ray two times or more as wide as that covering vein m; entire United States ..... *actinobola* (Lw.) (part) (p. 24)

KEY TO MALES

1. An unbroken dark-brown area in distal anterior quarter of wing disk; proximal half of wing light brown ..... ***conjuncta*** (Adams) (p. 8)
   Wing with a preapical dark area in distal third or half of cell R_3 and basal half of cell R_5, with rays diverging from it to margins 2

2. Dark ray connecting stigma with vein r–m as wide or nearly as wide as length of stigma 3
   Dark ray connecting stigma with vein r–m much narrower than length of stigma, sometimes broken or completely absent 5

3. Two dark rays partially or entirely across cell 1st M_2; vein Cu_2+2d A infuscated on most of its length ..... ***femoralis*** (Thoms.) (p. 8)
   Only one dark ray across cell 1st M_2, sometimes broken; vein Cu_2+2d A with dark spot near center or entirely devoid of markings 4

4. Third antennal segment dark brown to black; apical Y-shaped mark incomplete; vein M_3+Cu_1 with dark spot at center. ***nigricornis*** (Coq.) (p. 9)
   Third antennal segment yellow, about same color as second; apical Y-shaped mark complete; vein M_3+Cu_1 completely devoid of markings ..... ***biselosa*** (Coq.) (p. 11)

5. Two dark rays through cell 1st M_2, the proximal one sometimes broken in posterior half of that cell and not attaining vein M_3+Cu_1 6
   One dark ray partially or entirely through cell 1st M_2; in addition, sometimes a spot in middle of that cell and a dark spot in line with it on vein M_3+Cu_1 12

6. Distal ray through cell 1st M_2 continuing to hind margin; if broken in cell Cu_1, its continuation always marked by a dark spot at hind margin 7
   Distal ray through cell 1st M_2 only to vein M_3+Cu_1 and never beyond 9

7. Proximal ray through cell 1st M_2 ending at middle of cell; vein M_3+Cu_1 never with a dark spot in line with it ..... ***dacetoptera*** Phillips (p. 11)
   Proximal ray extending completely across cell 1st M_2; if broken in that cell, always at least a dark spot on vein M_3+Cu_1 in line with it 8

8. Distance along vein M_3+Cu_1 between proximal and distal rays in cell 1st M_2 greater than distance between distal ray and vein m; dark mark on vein M_3+Cu_1 at middle of that vein ..... ***arizonensis*** Mall. (p. 12)
   Distance along vein M_3+Cu_1 between proximal and distal rays equal to or less than distance between distal ray and vein m; dark mark on vein M_3+Cu_1 distinctly apicad of middle ..... ***maculigera***, n. sp. (p. 13)

9. Vein M_3+Cu_1 with elongate dark streak from base to middle or beyond. ***wheeleri*** Curr. (part) (p. 14)
   Base of vein M_3+Cu_1 entirely without infuscation, but a dark spot may be present at middle of that vein 10

10. Hyaline area immediately distad of stigma rather pointed posteriorly ..... ***mevarna*** (Walk.) (part) (p. 15)
    Hyaline area immediately distad of stigma distinctly rounded posteriorly or ending broadly on vein R_{4+5} 1

11. Marginal spot at apex of vein R_{2+3} near middle of dark area surrounding it ..... ***ageratae*** Benj. (p. 14)
    Marginal spot at apex of vein R_{2+3} distinctly closer to apical than proximal margin of dark area surrounding it ..... ***texana*** Mall. (p. 17)

12. Apex of cell R completely hyaline except for an occasional narrow band of infuscation along vein r–m 13
    Apex of cell R distinctly infuscated in addition to narrow band mentioned above 20

13. Apical Y-shaped mark incomplete or absent 14
    Apical Y-shaped mark complete 16

14. Dark ray from stigma to vein r–m complete in cells R_1 and R_2. ***imperfecta*** (Coq.) (p. 18)
Dark ray from stigma to vein r–m distinctly broken or completely absent in cells R_1 and R_2 ---- 15

15. Light spot immediately anterior to vein m large and occupying at least posterior half of cell R_5; dark area in tip of cell R_1 barely longer than adjacent hyaline spot at apex of vein R_{4+5} ---- ***radifera*** (Coq.) (p. 18)
Light spot immediately anterior to vein m small and occupying distinctly less than posterior half of cell R_5; dark area in apex of cell R_1 more than twice as long as adjacent hyaline spot ---- ***jonesi*** Curr. (p. 20)

16. Dark ray from stigma to vein r–m broken or absent in cell R_2; usually no spot on vein M_3+Cu_1 ---- ***eclipta*** Benj. (p. 19)
Dark ray from stigma to vein r–m complete in cells R_1 and R_2; usually a dark spot present on vein M_3+Cu_1 ---- 17

17. Proximal light spot in cell R_5 distinct, broadly based on vein M_{1+2}, and extending about two-thirds of way across cell ---- ***pseudovicina*** Her. (p. 22)
Proximal light spot in cell R_5 lacking, indistinct, or extending entirely across cell, never broadly based on vein M_{1+2} ---- 18

18. Marginal hyaline spot at apex of vein R_{2+3} very close to distal margin of dark area surrounding it ---- ***californica*** Mall. (part) (p. 21)
Marginal hyaline spot at apex of vein R_{2+3} at or near middle of dark area surrounding it ---- 19

19. Head in profile distinctly higher than long ---- ***signata***, n. sp. (part) (p. 22)
Head in profile subquadrate or longer than high. ***actinobola*** (Lw.) (part) (p. 24)

20. Apex of cell R with dark even infuscation similar to that in base of cell R_1, its proximal border sharply delimited ---- ***vicina*** (v. d. W.) (p. 25)
Apex of cell R with infuscation either in a distinct spot surrounded at least in part by a lighter or hyaline area, or broad and lightly areolate, the proximal border never sharply delimited ---- 21

21. Vein M_3+Cu_1 with elongate infuscated streak from its base to its midpoint or slightly past ---- ***wheeleri*** Curr. (part) (p. 14)
Infuscation on vein M_3+Cu_1 in form of a spot or entirely lacking ---- 22

22. Brownish species with hyaline area at apex of stigma more or less acute apically ---- ***mexarna*** (Walk.) (part) (p. 15)
Grayish species with hyaline area at apex of stigma rounded broadly posteriorly or ending broadly along vein R_{4+5} ---- 23

23. Infuscation in apex of cell R with distinct margin. ***signata***, n. sp. (part) (p. 22)
Infuscation in apex of cell R indistinctly margined ---- 24

24. Marginal hyaline spot at apex of vein R_{2+3} separated from next distal hyaline area by a dark ray about as wide as that covering vein m; Western United States ---- ***californica*** Mall. (part) (p. 21)
Marginal hyaline spot at apex of vein R_{2+3} separated from next distal hyaline area by a dark ray two times or more as wide as that covering vein m; entire United States ---- ***actinobola*** (Lw.) (part) (p. 24)

DESCRIPTIONS OF SPECIES

Trupanea conjuncta (Adams)

(Fig. 1)

Urellia conjuncta Adams, 1904, Kans. Univ. Sci. Bul. 2: 450, 451 (type loc. Bill Williams Fork, Ariz., holotype ♀, descr.).—Snow, 1904, ibid. 2: 345 (in list Dipt. Ariz.).

Trypanea conjuncta, Malloch, 1942, U.S. Natl. Mus. Proc. 92: 4, 12, fig. 1, a (short descr., fig. wing ♀).

Previously recorded distribution.—Bill Williams Fork and White Mountains, Ariz.

Material examined.—Holotype ♀ with the following labels: "Bill Williams Fork, Ariz." and "Type."

ARIZONA: 1 ♂, White Mountains, 7.VII.33, Parker Lot 106. CALIFORNIA: 1 ♀, Andreas Canyon near Palm Springs, 1.III.51, on *Encelia farinosa*, Timberlake.

Location of type.—University of Kansas, Lawrence.

Discussion.—This species will not be mistaken for any other North American *Trupanea* on account of its unusual wing pattern (fig. 1), which consists of an unbroken dark-brown area occupying the anterior distal quarter of the disk. This dark area is separated from the light-brown area in the anterior proximal half of the wing by several hyaline spots and by a very narrow dark ray from the stigma to near vein r-m (in this respect similar to *Euarestoides abstersa* (Lw.)). The heads of both sexes are subquadrate from the lateral aspect, the forefemora of the male are distinctly dilated, and the ovipositor sheath is approximately 1½ times as long as the two preceding abdominal tergites.

Trupanea femoralis (Thomson)

(Figs. 2 and 3)

Trypeta femoralis Thomson, 1868, Fregatten Eugenies Resa 6 (2): 582 (type loc. Calif., holotype ♂, descr.).—Loew, 1873, Smithsn. Inst. Misc. Collect. 11 (256): 342 (Thomson's orig. descr. reprinted).

Urellia femoralis, Loew, 1873, ibid. 11 (256): 336, 339 (transfers to *Urellia*).—Osten Sacken, 1878, ibid. 16 (270): 195 (Calif.).—Adams, 1904, Kans. Univ. Sci. Bul. 2: 450 (in key N.A. spp.).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 613 (in list N.A. spp., refs., distr.).

Urellia occidentalis Adams, 1904, Kans. Univ. Sci. Bul. 2: 450 (in key N.A. spp., descr.). NEW SYNONYMY.

Trypanea occidentalis, Malloch, 1942, U.S. Natl. Mus. Proc. 92: 17 (short descr.).

Trypanea femoralis, Malloch, 1942, ibid. 92: 3, 10, fig. 1, i (short descr. ♂, fig. wing).

Previously recorded distribution.—California.

Material examined.—Male holotype with the following labels: "California," "Kinb.," "Typus," "Trypeta femoralis Thoms.," and "402-57." One ♂, two ♀♀, various localities in California (cotype series of *occidentalis* Adams—see below for lectotype designation).

CALIFORNIA: 42 ♂♂, 61 ♀♀, 57 localities throughout State, January through December. Among these localities the larvae have been reared to adults from the flowers of *Aplopappus venetus*, *Aster spinosus*, and *Heterotheca grandiflora*. Adults have been collected

from the following plants: *Amaranthus graecizans*, *Aplopappus linearifolius*, *Atriplex polycarpa*, *A. semibaccata*, *Bassia hyssopifolia*, *Centromodia pungens*, *Erodium cicutarium*, *Franseria acanthocarpa*, *Hemizonia* sp., *Layia platyglossa*, and *Monolopia major*. They have also been captured in traps baited for the walnut husk fly (*Rhagoletis completa* Cress.) and the melon fly (*Dacus cucurbitae* Coq.).

Location of types.—Of *femoralis*—Naturhistorisches Museum, Vienna; of lectotype of *occidentalis*—University of Kansas, Lawrence.

Discussion.—The type series of *occidentalis* consists of one male and two females from California and one male from Wyoming. The California female with the labels "L. S. Jr. U., Lot 61, sub.," "Type," and in red, "cotype, Urellia occidentalis Adams" is hereby selected as the lectotype of *occidentalis*. The three California specimens fall without question within the range of variation of the California material of *femoralis* examined in this study, whereas the Wyoming male is obviously *Tephritis labecula* (Foote *1959*).

The wing of the male holotype differs from that of the Desert Springs, Calif., specimen shown in figure 2 in possessing only a very small remnant of the apical Y-shaped mark, a slightly larger hyaline spot at the apex of vein R_{2+3}, and a more distinct hyaline area on each side of vein r–m. In addition, the dark rays in cell 1st M_2 are complete from vein M_{1+2} to a point about halfway across the cell, where they disappear. Considerable variation in the pattern in cell 1st M_2 was observed in the males studied, but in every specimen at least the presence of both rays was indicated, and the dark ray connecting the subapical dark area to the stigma leaves the apical half to two-thirds of the stigma almost completely hyaline along the costa. The male possesses a patch of long, dark, erect setae on the middle half of the anterior surface of the midfemur. These are usually arranged in three irregular rows; the most ventral is the longest and stoutest.

The wing of the female (fig. 3) is similar to that of the male, but the apical Y-shaped mark is always present, the hyaline areas on each side of vein r–m are reduced, and the two rays through cell 1st M_2 are nearly always complete. The heads of both sexes are higher than long from the lateral aspect. The ovipositor sheath is about as long as the three preceding abdominal tergites, and its basal half is covered with short, stout, yellow setae.

The reader is referred to the discussion (p. 3) of the generic limits of *Trupanea* regarding the separation of *femoralis* from the species closely related to it, and to an article by Foote (*1959*) for a description of *Tephritis labecula*, the wing pattern of which is very similar to that of *femoralis*.

Trupanea nigricornis (Coquillett)

(Fig. 4)

Urellia nigricornis Coquillett, 1899, N.Y. Ent. Soc. Jour. 7: 266 (type loc. Colo., holotype ♀, descr.).—Snow, 1904, Kans. Univ. Sci. Bul. 2: 345 (in list Dipt. Ariz.).—Adams, 1904, Ibid. 2: 450 (in key N.A. spp.).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 614 (in list N.A. spp., distr.).

Trypanea nigricornis, Curran, 1932, Amer. Mus. Novitates No. 556: 6 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 3, 5, 10, fig. 1, f (short descr., fig. wing ♀).

Previously recorded distribution.—Arizona and Colorado.

Material examined.—Males only. Male holotype with the following labels: "Colo., 1684," "Collection Coquillett," "Type No. 4411, U.S.N.M." and "Trypanea nigricornis Coq."

ARIZONA: 8, Atacosa Mountain, Bill Williams Fork, Boulder Dam, Chiricahua Mountains, 15 miles west of Gila Bend, Lee Siding (Pedregosa Mountains), Tusayan, 6.VI to 8.AII. (CALIFORNIA: 59, 31 localities throughout State, January through December. COLORADO: 3, 7 miles south of Glade Park, Meeker, 22.VI to 21.VII. IDAHO: 9, Albion, Burleigh, Castleford, Conant, Hollister (Mountain Home), Murtaugh (Oakley), 10.VI to 2.IX. NEVADA: 8, Austin, Glendale, Reno, Wells, 6.V to 23.X. NEW MEXICO: 7, Fort Wingate, Nogal, Santa Rosa, 23.VI to 1.VIII. OREGON: 1, Harney County, 29.VI.53. UTAH: 63, 19 localities throughout State, May through September. WYOMING: 3, Green River, Yellowstone National Park, 2.VII to 12.VIII.

Females of "*nigricornis-bisetosa*" have been taken in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming.

Adults have been collected from *Artemisia tridentata*, *Atriplex rosea*, *Baccharis pilularis*, *Beta vulgaris*, *Chrysothamnus paniculatus*, *C. speciosus*, *Croton longipes*, *Encelia farinosa*, *Franseria* sp., *Melilotus* sp., *Pluchea sericea*, *Salsola kali* var. *tenuifolia*, *Senecio douglasii*, *Stanleya* sp., and *Taraxacum* sp.

Location of type.—U.S. National Museum, Washington, D.C.

Discussion.—Males of this species may be recognized easily by the very dark-yellow to black third antennal segment; the distinctly quadrate nature of the infuscated spot posterior to the stigma, in which vein R_{4+5} is infuscated to a point directly below the major bend of the subcosta; the presence of a distinct dark spot in the center of vein M_3+Cu_1; and the absence of the posterior arm of the apical Y-shaped mark. The wing of the Nevada specimen shown in figure 4 differs from that of the Colorado type only by the slightly smaller hyaline spot at the anterior end of vein m and by the presence of the minute light spot at the apex of vein R_{2+3}. Differences from *bisetosa*, its closest relative, are discussed under that species.

Although males of *nigricornis* and *bisetosa* can always be separated according to the characters given above and under *bisetosa*, I have failed to discover any satisfactory means for associating females with the males of either of these species. A large series of females from California and other localities in the Southwestern United States were examined. Every possible intergrade between black and yellow was found in the third antennal segment, the character used by Malloch (*1942*) in his key to females. Furthermore, each of the other characters useful in distinguishing males of *nigricornis* from those of *bisetosa* breaks down; consequently, a separation of the large series into two distinct groups, each of which might be assignable to one or the other species on the basis of more than a single character, has been unsuccessful repeatedly. Variations in the female wing pattern of *bisetosa* are discussed under that species.

Trupanea bisetosa (Coquillett)

(Figs. 5 and 6)

Urellia bisetosa Coquillett, 1899, N.Y. Ent. Soc. Jour. 7: 266 (type loc. Las Cruces, N. Mex., brief descr.).—Snow, 1904, Kans. Univ. Sci. Bul. 2: 345 (in list Dipt. Ariz.).—Adams, 1904, ibid. 2: 450 (in key N.A. spp.).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 613 (in list N.A. spp., distr.).

Trypanea bisetosa, Curran, 1932, Amer. Mus. Novitates No. 556: 6 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 4, 5, 12, fig. 1, o, p (brief descr., fig. wings ♂ and ♀).

Previously recorded distribution.—Arizona, New Mexico, and Utah. Some of these records may apply to *nigricornis*, since identifications may have been based on females alone.

Material examined.—Female holotype with the following labels: "Las Cruces, N.M.," "Ckll. 4846, on Bigelovia," "U.S.N.M. Acc. 30623." "Type No. 4410, U.S.N.M.," and "Urellia bisetosa Coq."

The following localities are based on males only. ARIZONA: 1, 5 miles east of Kingman, 1.VII.52. CALIFORNIA: 36, 33 localities throughout State, February through December. COLORADO: 1, Glenwood Springs, 5.VIII.20. IDAHO: 1, Hammett, 12.VIII.40. NEVADA: 1, Fallon, 12.VIII.40. NEW MEXICO: 1, Bernalillo County, VI.96. TEXAS: 1, El Paso, 8.VII.48. UTAH: 1, Leamington, 7.VII.54. WYOMING: 1, Teton, 19.VII.36.

Adults have been collected from *Baccharis sergiloides*, *Croton californicus*, *Encelia californica*, *E. farinosa*, *Helianthus annuus*, *H.* sp., *Melilotus* sp., and *Senecio* sp.

Females of "*nigricornis-bisetosa*" have been taken in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming.

Location of type.—U.S. National Museum.

Discussion.—The holotype of *bisetosa* is taken to be a female from Las Cruces, N. Mex., labeled as stated above by Coquillett, although he failed to publish a designation in his original description.

As a consequence of my inability to definitely associate females with males known to be *nigricornis*, I have illustrated the wing of a Santa Paula, Calif., female. The pattern of the holotype wing differs from that of this specimen only in having the dark ray through cell 1st M_2 complete to vein M_3+Cu_1 and vein R_5 infuscated somewhat more proximally.

The wing of the *bisetosa* male (fig. 6) differs significantly from that of the *nigricornis* male, because the infuscated spot posterior to the stigma is somewhat slanted toward vein m, so that the infuscation of vein R_{4+5} begins well distad of the major bend in the subcosta. There is no trace of a dark spot in the center of vein M_3+Cu_1, and the apical Y-shaped marking is uninterrupted. In addition, the distance along vein M_{1+2} between veins r–m and m is about equal to the length of vein r–m in *bisetosa* and distinctly longer in *nigricornis*.

Trupanea dacetoptera Phillips

(Fig. 7)

Trypanea dacetoptera Phillips, 1923, N.Y. Ent. Soc. Jour. 31: 148, fig. 59 (type loc. Karner, N.Y., holotype ♀, descr., fig. wing).—Johnson, 1925, Occas. Papers Boston Soc. Nat. Hist. 7 (15): 265 (in list Dipt. N. Eng.).—Curran, 1932, Amer. Mus. Novitates No. 556: 6 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 4, 5, 14, fig. 1, t (short descr., fig. wing ♀).

Trupanea (*Trupanea*) *dacetoptera*, Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401: 54, fig. 38, A–G (descr., hosts, distr., fig. wings ♂ and ♀).

Previously recorded distribution.—Connecticut, Florida, Maine, Massachusetts, New Hampshire, New York, and Rhode Island.

Material examined.—DISTRICT OF COLUMBIA: 2 ♂♂, Rock Creek Park, 15.VI.13. FLORIDA: 21 ♂♂, 12 ♀♀, Orlando, 29.IX to 23.XI, 1929 and 1930. MARYLAND: 1 ♀, Chesapeake Beach, 2.VII.24. MICHIGAN: 2 ♂♂, Cheboygan and Livingston Counties, 6.VI to 20.VI. NEW HAMPSHIRE: 1 ♀, White Mountains. NEW JERSEY: 1 ♂, 2 ♀♀, Cape May, Morgan, 31.VII to 11.IX. NEW YORK: 1 ♂, 1 ♀, Babylon (L.I.), Ithaca, 24.V. NORTH CAROLINA: 1 ♀, Lake Toxaway. PENNSYLVANIA: 3 ♀♀, Germantown, Hazelton, Pleasanton, 5.VII to 11.VIII. SOUTH CAROLINA: 1 ♀, Clemson, 8.VIII.51. VIRGINIA: 1 ♂, 1 ♀, Difficult Run, 14.IX.13. WEST VIRGINIA: 1 ♀, French Creek (Upshur County), 19 to 24.IX.38.

Larvae have been reared in Florida from *Chrysopsis microcephala* and *Gnaphalium obtusifolium*.

Location of type.—Cornell University, Ithaca.

Discussion.—The combination of the following characters in the female distinguishes *ducetoptera* from all other *Trupanea* species having the distal ray through cell 1st M_2 to the hind margin: Ray from stigma to vein r–m complete or nearly so; marginal hyaline spot at apex of vein R_{2+3} narrower than dark area just distal to it; distal dark ray through cell 1st M_2, if broken posterior to vein M_3+Cu_1, with definite dark spot marking its termination on hind margin of wing; proximal ray ending in middle of cell 1st M_2; and area in cell R from vein r–m to point proximad of apex of vein R, broadly infuscated. In many females distal ray in cell 1st M_2 and that covering vein m are fused; hyaline spot is left just below their origins. Proximal ray through cell 1st M_2 never attains vein M_3+Cu_1 and often bends distinctly proximad in that cell, in distinct contrast to that ray in *arizonensis*, in which it continues over vein M_3+Cu_1, or if it is broken in cell 1st M_2, it is continued beyond vein M_3+Cu_1. *T. ducetoptera* differs from *arizonensis* in its larger size, broad infuscation in apex of cell R, and absence in cell Cu_1 of continuation of proximal dark ray through cell 1st M_2, and other differences discussed under *arizonensis*.

The wing pattern in males closely resembles that in figure 7. The principal differences are the variable position of the hyaline spot at the apex of vein R_{2+3} and the variable extent of infuscation in the apex of cell R.

A study of the type of *polyclona* Lw. from Cuba in the Museum of Comparative Zoology, Harvard University, shows that it is certainly congeneric but resembles in no way any North American *Trupanea*.

Trupanea arizonensis Malloch

(Fig. 8)

Trupanea arizonensis Malloch, 1942, U.S. Natl. Mus. Proc. 92: 5, 15, fig. 1, v (type loc. Tucson, Ariz., holotype ♀, descr., fig. wing).

Previously recorded distribution.—Tucson, Ariz.

Material examined.—Holotype ♀, the topmost specimen on one pin with four females, each on a point, and with the following labels: "Tucson, Ariz., 25.II.34, Bryant 429" and "U.S.N.M. Type, top speci-

men." Paratypes, six ♀ ♂, same data as type, three on a pin with the holotype and three on another pin with the label "Paratypes."

ARIZONA: 2 ♀♀, 9 miles west of Onion Saddle (Chiricahua Mountains), Pinery Canyon, 12.VI to 10.IX. CALIFORNIA: 2 ♂♂, 1♀, Hunter's Spring (Riverside County), Redondo, 10.V to 18.VII. TEXAS: 1 ♀, Brownsville, 4.II.45.

Location of type.—U.S. National Museum.

Discussion.—*T. arizonensis* resembles *maculigera*, n. sp., in having the proximal dark ray through cell 1st M_2 continuing to at least vein M_3+Cu_1 and often beyond, and it is similar to *dacetoptera* in the position of the marginal hyaline spot at the apex of vein R_{2+3}. However, *arizonensis* readily can be distinguished from both these species by the angle at which the proximal dark ray extends through cell 1st M_2, resulting in a greater distance along vein M_3+Cu_1 between the proximal and distal rays than between the distal ray and that covering vein m. Males of this species are like the females in every important wing-pattern character.

Trupanea maculigera, new species

(Fig. 9)

Head.—Slightly higher than long from lateral aspect: width of cheek directly below eye about one-fifth eye height: apex of third antennal segment nearly attaining oral margin: width of frons at vertex equal to length of frons from vertex to lunule and 1½ times as wide as one eye.

Thorax.—Mesonotum light-gray pollinose, with number of slender, whitish setae covering surface, other bristles black: humerus, notopleuron, and upper border of mesopleuron yellow pollinose: pleural sclerites gray pollinose as mesonotum: scutellum concolorous with mesonotum, single pair of scutellars black. Legs entirely yellow; midfemur of male with three to five erect, anterior, yellowish bristles. Wing (fig. 9) with preapical dark area similar to that of most other species of genus: apical Y-shaped mark present and complete in both sexes: marginal hyaline spot at apex of vein R_{2+3} about same width as infuscated marginal area immediately apicad: dark ray connecting stigma to vein r–m distinctly narrower than length of stigma, especially in that cell, broadening somewhat posterior to stigma and fading to yellow brown along proximal edge of ray; cell R broadly infuscated apically, this dark area fading to yellow brown proximally; hyaline spot immediately anterior to vein m small, rounded, occupying posterior third of cell R_5 at that point: distal infuscated ray through cell 1st M_2 continuing over vein M_3+Cu_1 to margin, unbroken in type series, sometimes joined narrowly to dark ray over vein m, thus a small hyaline spot left near their bases; proximal dark ray in cell 1st M_2 extending unbroken halfway into cell, at which point it is joined by short dark spot lying parallel with long axis of cell 1st M_2; this proximal ray continuing unbroken in females across vein M_3+Cu_1 and extending well into cell Cu_1; in males ray across posterior half of cell 1st M_2 often broken: both sexes with distinct dark area along vein M_3+Cu_1 proximad of proximal ray and joining it on vein, this dark area of vein M_3+Cu_1 from three to six times as long as wide and sometimes extending almost to base of vein; proximal third of wing hyaline.

Abdomen.—Color, pollinosity, and setation as on mesothorax and scutellum; ovipositor sheath shining black, about as long as last two abdominal tergites, basal third to half covered with yellowish-white hairs; external male genitalia shining black.

Types and material examined.—Holotype: ♀, Otay, San Ysidro (Calif.), 4.XI.50, reared from galls in *Gnaphalium* sp., San Ysidro No. 1335. U.S. National Museum Type No. 64291. Paratypes: 1 ♂, 4 ♀ ♀, same data as holotype (U.S. National Museum); 1 ♀, Warner Springs (San Diego County, Calif.), 30.VIII.51 (lost).

Location of type.—U.S. National Museum.

Discussion.—The species is distinctive in having two infuscated rays through cell 1st M_2, the proximal to beyond vein M_1+Cu_1 and with transverse dark spots attached to it in the middle of cell 1st M_2 and along vein M_3+Cu_1, the distal extending to the wing margin. The species closely resembles *ducetoptera*, from which it may be separated by the position of the hyaline spot at the apex of vein R_{2+3}, the proximal dark ray through cell 1st M_2 crossing vein M_3+Cu_1, and by the presence of outstanding anterior midfemoral bristles in the male.

This species has been reared from the same host as that reported by Benjamin (*1934*) in Florida for *ducetoptera*. In spite of all similarities, I consider this to be a distinct species until intergrades have been discovered in the very wide geographical area separating *maculigera* and *ducetoptera*.

Trupanea ageratae Benjamin

(Fig. 10)

Trupanea (*Trupanea*) *ageratae* Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401: 56, fig. 40 (type loc. No Name Key, Fla., holotype ♂, descr., fig. wing).
Trypanea ageratae, Malloch, 1942, U.S. Natl. Mus. Proc. 92: 3, 8, fig. 1, c (fig. wing ♀).

Previously recorded distribution.—Florida.

Material examined.—Male holotype with the following labels: "Ferry Landing, No Name Key, Fla., 23.XI.30." "Bred from *Ageratum littorale*, D. J. Nicholson," "U.S.N.M. Type No. 54386," and Trupanea ageratae, type." This is the only specimen seen in this study.

Location of type.—U.S. National Museum.

Discussion.—The relationships of the holotype to *ducetoptera* and *mevarna* have been discussed adequately by Benjamin (*1934*). In his treatment no mention has been made of *texana*, which *ageratae* markedly resembles, or is any reference made to this relationship by Malloch (*1942*). The two species may be separated by their geographical distribution and by the characters given in the key. Further discussion of *ageratae* will be found under *texana*.

Trupanea wheeleri Curran

(Fig. 11)

Trupanea wheeleri Curran, 1932, Amer. Mus. Novitates No. 556: 6, 7, fig. 1 (type loc. San Diego, Calif., holotype ♂, descr., fig. wing, in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 6, 17 (brief descr.).

Previously recorded distribution.—San Diego, Calif.

Material examined.—Holotype ♀ with the following labels: "San Diego, Calif., II.23.97" and "Trypanea wheeleri Curran ♀ type." Two female paratypes, same data.

ARIZONA: 1 ♀, Chiricahua Mountains, 7.VIII.41. CALIFORNIA: 39 ♂ ♂, 103 ♀ ♀, 79 localities throughout State, every month of the year. Collected from species of *Aster*, *Baccharis*, *Chrysothamnus*, *Cirsium*, *Coreopsis*, *Encelia*, *Gutierrezia*, and from *Lepidospartum squamatum*. It has been reared from flowers of *Aplopappus venetus* and *Aster spinosus* and has been caught in traps baited for the melon fly in a wide variety of plants in this State. NEW MEXICO: 3 ♀ ♀, Alamagordo, 30.IV to 9.V.02. UTAH: 1 ♂, 1 ♀, Logan Canyon, Promontory, 26.V to 13.IX.

Location of type.—American Museum of Natural History.

Discussion.—The elongate streak from the base to past the middle of vein M_3+Cu_1 distinguishes this species from all others with the apex of cell R definitely infuscated and from all North American species except *femoralis*, which has a broad dark ray from the stigma to vein r-m. In the long series available to me there is considerable variation in the completeness of the proximal dark ray across cell 1st M_2. Figure 11 shows one extreme, in which this ray is entirely absent, whereas other specimens have the ray complete, and all intermediates are present. Very often the two ends of the ray are discernible as outcroppings of the dark area around vein r-m and anterior extensions of the distal end of the elongate marking on vein M_3+Cu_1. Males are in all respects similar in wing pattern to females.

The wing of the type differs from that illustrated in having the anterior ray of the apical Y-shaped mark missing and more extensive markings near the apex of cell R. The proximal ray through cell 1st M_2 is complete in one wing of the holotype but almost completely missing in the other. In both paratypes the apical Y-shaped mark is complete, and in one there is a bridge between the distal ray through cell 1st M_2 and the ray covering vein m.

Trupanea mevarna (Walker)

(Fig. 12)

Trypeta mevarna Walker, 1849, List Dipt. Brit. Mus. 4: 1023 (type loc. Fla., holotoype ♀).—Osten Sacken, 1858, Smithsn. Inst. Misc. Collect. 3 (1): 79 (Fla.).—Loew, 1862, ibid. 6 (1): 59, 61, 96 (in list N.A. spp.).

Trypeta solaris Loew, 1862, ibid. 6 (1): 63, 84, pl. II, fig. 19 (type loc. Ga., holotype ♀, descr., fig. wing).—Loew, 1873, ibid. 11 (256): 325, pl. X, fig. 19 (Ga.).—Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401: 55.—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 14 (=*mevarna* Walk.).

Urellia solaris, Loew, 1873, Smithsn. Inst. Misc. Collect. 11 (256): 326, 330 (transf. to *Urellia*).—Johnson, 1895, Acad. Nat. Sci. Phila. Proc. 1895: 337 (Fla.).—Coquillett, 1899, N.Y. Ent. Soc. Jour. 7: 266 (=*mevarna* Walk.).—Johnson, 1900, *in* Smith, N.J. State Bd. Agr. Ann. Rpt. 27 (sup.): 688.—Johnson, 1909, Psyche 16: 114 (=*mevarna* Walk.).—Johnson, 1910, N.J. State Mus. Ann. Rpt. 1909: 803 (=*mevarna* Walk.).—Johnson, 1925, Occas. Papers Boston Soc. Nat. Hist. 7 (15): 264 (=*mevarna* Walk.).

Urellia mevarna, Loew, 1873, Smithsn. Inst. Misc. Collect. 11 (256): 337, 339 (transf. to *Urellia*).—Johnson, 1895, Acad. Nat. Sci. Phila. Proc. 1895: 338 (repeats Osten Sacken's notes).—Coquillett, 1899, N.Y. Ent. Soc. Jour. 7: 266 (*actinobola* Lw. and *solaris* Lw. as synonyms).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 614 (only Fla. ref. correct).—Johnson, 1909, Psyche 16: 114 (Mass., R.I., *solaris* Lw. as synonym).—Johnson, 1910, N.J.

State Mus. Ann. Rpt. 1909: 803 (in list Dipt. N.J., *solaris* Lw. a synonym).—Johnson, 1913. Amer. Mus. Nat. Hist. Bul. 32: 84 (in list Dipt. Fla.).

Trypeta (*Urellia*) *solaris*, Osten Sacken, 1878, Smithsn. Inst. Misc. Collect. 16 (270): 194 (refs., Ga.).

Trypeta (*Urellia*) *mevarna*, Osten Sacken, 1878, ibid. 16 (270): 195 (Fla.).

Trypanea solaris, Phillips, 1923. N.Y. Ent. Soc. Jour. 31: 148 (=*daphne* Wied. an error).

Trypanea mevarna, Phillips, 1923, ibid. 31: 148 (=*daphne* Wied.).—Johnson, 1925. Occas. Papers Boston Soc. Nat. Hist. 7 (15): 264 (in list Dipt. N. Eng., *solaris* Lw. a synonym).—Malloch. 1942. U.S. Natl. Mus. Proc. 92: 4, 6, 14, fig. 1, s (descr., fig. wing ♀).

Trupanea (*Trupanea*) *mevarna*, Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401: 54, fig. 39, A–L (descr., discuss., hosts, fig. wings ♂ and ♀, larva).

Previously recorded distribution.—Of *mevarna*—Arizona, California, Florida, Massachusetts, New Jersey, Oregon, Rhode Island, and Texas; of *solaris*—Guerrero (Mex.), "prob." California, Georgia, Kansas, and Oregon. No specimens recognized as *mevarna* were found in this study from localities other than the Eastern States. Any references indicating *mevarna* and *solaris* occur in western localities are without doubt based on misidentifications.

Material examined.—Holotype ♀ with the following labels: "Georgia," "Loew Colln.," "solaris Loew," and "Type 13223."

ALABAMA: 1 ♀, Birmingham, 8–9.VIII.16. FLORIDA: 11 ♂♂, 30 ♀♀, Benson Springs, Bonifay, Gainesville, 1 mile west of Malabar, Martin County, Orlando, Ponce de Leon, 6 miles northwest of Tavares, 11.V to 5.XI. Reared from the following species of *Chrysopsis* in this State—*graminifolia*, *graminifolia* var. *latifolia*, *microcephala*, and *oligantha*. GEORGIA: 1 ♂, 3 ♀♀, St. Simon's Island, southern Georgia, 22.V to 12.VI. NEW JERSEY: 1 ♂, Lucaston, 11.IX.10. NORTH CAROLINA: 1 ♂, collection of Coquillett. SOUTH CAROLINA: 1 ♂, 1 ♀, Clemson, Elloree, 14.VI to 18.VIII.

Location of types.—Of *mevarna*—British Museum (Natural History); of *solaris*—Museum of Comparative Zoology, Harvard University.

Discussion.—Several writers have considered *solaris* Loew a synonym of *mevarna*. After a careful examination of the type of *solaris* Loew at Harvard University, I have no doubt that it is conspecific with *mevarna* Walker. Phillips' (*1923*) unexplained synonymy of *mevarna* and *solaris* with *daphne* (Wied.) is in my opinion incorrect. Although I have not seen the type of *daphne* (from Montevideo, Uruguay), I agree with Benjamin (*1934*) that there are few, if any, species of *Trupanea* described from the Neotropical region that extend into the Nearctic. In spite of the marked similarity in wing pattern between occasional North and South American species, in my experience always other unrecorded differences of a specific level can be found upon a close comparison of specimens.

The wing pattern of most specimens of *mevarna* differs from that in figure 12 in having a more distinct dark mark in the stigma, a slightly less extensive infuscation in the apex of cell R, and the absence of most of the proximal dark ray in cell 1st M_2. The specimens examined in this study are extremely variable in the amount of infuscation within the stigma, in the apex of cell R, and in cell 1st M_2. The proximal dark ray through cell 1st M_2 is entirely lacking in some, whereas in others it is represented only by a spot indicating its ter-

mination on vein M_3+Cu_1; figure 12 shows the fullest development encountered in this study. As pointed out by Benjamin (*1934, p. 55*), *mevarna* is most closely related to *dacetoptera*, from which it may be separated by the termination of the distal ray through cell 1st M_2 at vein M_3+Cu_1, by the more acutely pointed hyaline area immediately distad of the stigma, and by the more central position of the marginal hyaline spot at the apex of vein R_{2+3} in the surrounding dark area. The male wing pattern of *mevarna* is similar to that of the female in all important respects.

F. Van Emden, British Museum (Natural History), upon comparing females from Orlando, Fla., (fig. 12) with the Walker type in the British Museum, stated that the type has a dark infuscation in the apex of cell R, and it is almost fused with the dark area surrounding vein r–m. In addition, he reported that vein r–m is connected to the infuscated spot near the center of cell 1st M_2 by an uninterrupted dark ray.

Trupanea texana Malloch

(Fig. 13)

Trypanea texana Malloch (nec Hering). 1942, U.S. Natl. Mus. Proc. 92: 4, 5, 13, fig. 1, r (type loc. Arlington, Tex., holotype ♂, descr., fig. wing ♀).

Previously recorded distribution.—Arlington and Dallas, Tex.

Material examined.—Male holotype with the following labels: "Arlington, Texas, 12.XI.07," "Aphanost. skirrob.," "F. C. Bishopp, Collector," and "Type No. 54401, U.S.N.M." Paratypes: Dallas, Tex., 5 ♀♀, 24.IV.08; 1 ♀, 8.V.08.

ARIZONA: 1 ♂, 2 ♀♀, Arivaca, 18 miles northwest of Nogales, Rustler's Park, 5 to 26.VII. LOUISIANA: 1 ♀, Lake Charles, 9.VI.17. NEW MEXICO: 5 ♂♂, 1 ♀, Alamogordo, Las Cruces, 16 to 26.VI. OKLAHOMA: 2 ♀♀, Stillwater, 14 to 21.VI.54. TEXAS: 6 ♂♂, 11 ♀♀, Catarina, Coleman, El Paso, Giddinas, Juno, Kerrville, Tyler, Waco, 9.V to 8.VII.

The species has been swept from various unidentified grasses and mesquite.

Location of type.—U.S. National Museum.

Discussion.—The type series of *texana* shows considerable variation in the posterior terminations of the dark rays through cell 1st M_2. Some specimens in this study have both rays entire as in *ageratae*, but in many, as well as in the entire type series, the proximal ray ends at the middle of cell 1st M_2, and numerous specimens have both these rays ending short of vein M_3+Cu_1. All specimens of *texana* in this study were distinguishable from the single male of *ageratae* by the position of the marginal hyaline spot at the apex of vein R_{2+3}; in the former it appears near the middle of the surrounding dark area, whereas in the latter it is closer to the wing apex. Furthermore, all specimens of *texana* have the two dark rays through cell 1st M_2 of equal width, and every wing shows the slight bulging near the apex of cell R_1 along the costa. The males have no erect anterior mid-femoral bristles.

Trupanea imperfecta (Coquillett)

(Figs. 14 and 15)

Urellia imperfecta Coquillett, 1902, N.Y. Ent. Soc. Jour. 10: 181 (type loc. Williams, Ariz., holotype ♂, descr.).—Adams, 1904, Kans. Univ. Sci. Bul. 2: 450 (in key N.A. spp.).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 614 (in list N.A. spp.).

Trypanea imperfecta, Curran, 1932, Amer. Mus. Novitates No. 556: 5 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 3, 5, 10, fig. 1, g–h (short descr., figs. wings ♂ and ♀).

Previously recorded distribution.—Williams, Ariz.

Material examined.—Male holotype with the following labels: "Williams, Ariz., 28.5," "H. S. Barber, Collector," "Type No. 6639, U.S.N.M.," and "Trypanea imperfecta Coq."

ARIZONA: 2 ♂♂, 1 ♀, Pinery Canyon, Tucson, Williams, 29.V to 26.VII. CALIFORNIA: 9 ♂♂, 17 ♀♀, 14 localities in southern half of State, February through December. NEVADA: 1 ♂, 1 ♀, Glendale, Nelson, 27.IV to 3.X.

The species has been swept from *Bebbia juncea* var. *aspera*, *Chrysothamnus paniculatus*, and *Encelia* sp., "apparently *frutescens* var. *actoni*."

Location of type.—U.S. National Museum.

Discussion.—The female is easily distinguished from those of all other *Trupanea* species by the quadrate hyaline spot immediately anterior to vein m. This spot in every specimen extends the full width of cell R_5 and is almost always connected to the hyaline area immediately anterior to it in cell R_3. Another unique character is the tendency toward disappearance in the female of the posterior arm of the apical Y-shaped spot as shown in figure 14.

The wing pattern in males is characterized by much larger hyaline areas, a somewhat more diffuse pattern resulting, with the usual *Trupanea*-like markings rather obscured. There is never more than a single dark spot near the apex of vein R_{4+5} to indicate the apical Y-shaped mark. The hyaline area at the center of cell R_5 is almost always present, and the dark ray through cell 1st M_2 is often broken. The amount of darkening on vein M_3+Cu_1 is variable. The male holotype has a complete ray through cell 1st M_2, and the spot in the center of cell R_5 is smaller than that shown in figure 15.

Trupanea radifera (Coquillett)

(Figs. 16 and 17)

Urellia radifera Coquillett, 1899, N.Y. Ent. Soc. Jour. 7: 267 (type loc. Tucson, Ariz., holotype ♂, descr.).

Trypanea radifera, Curran, 1932, Amer. Mus. Novitates No. 556: 5 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 3, 6, 11, fig. 1, j–k (short descr., fig. wings ♂ and ♀).

Trypanea hebes Curran, 1932, Amer. Mus. Novitates No. 556: 6, 9, fig. 7 (type loc. Buck Creek, Wyo., holotype ♀, descr., fig. wing ♀).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 11 (as synonym of *radifera*).

Previously recorded distribution.—Of *radifera*—Alberta (Canada) and Arizona, Colorado, Idaho, New Mexico, South Dakota, and Texas; of *hebes*—Wyoming.

Material examined.—Holotype ♀ with the following labels: "Buck Creek, Wyo., VIII.14.95," "W. M. Wheeler Collection," and "Trypanea hebes Curran ♀."

ARIZONA: 3 ♂♂, 6 ♀♀, Chiricahua Mountains, 15 miles west of Gila Bend, Littlefields, Tucson, 22.VII to 8.XII. CALIFORNIA: 13 ♂♂, 28 ♀♀, 25 localities throughout State, January through December. COLORADO: 1 ♂, 7 ♀♀, Fort Collins, Peaceful Valley, Tennessee Pass, Wilkerson Pass, 6.VII to 4.IX. IDAHO: 1 ♂, 2 ♀♀, Burley, Hollister, 10.VI to 21.VII. KANSAS: 1 ♂, Manhattan, 5.IX.39. NEBRASKA: 3 ♂♂, Arapaho, Ravenna, 4 to 10.VII.53. NEVADA: 1 ♀, Glendale, 5.VI.30. NEW MEXICO: 3 ♂♂, 7 ♀♀, 10 localities throughout State, 29.V to 14.X. SOUTH DAKOTA: 1 ♂, White River, 28.VIII.13. TEXAS: 4 ♂♂, 4 ♀♀, Brewster County, Clarendon, 13.VI to 31.VII. UTAH: 2 ♂♂, 2 ♀♀, Uintah County. WYOMING: 2 ♂♂, 4 ♀♀, Lance Creek, 28 miles south of Newcastle, Redbird, Teton County, 8.VI to 18.VIII.

Location of types.—Of *radifera*—U.S. National Museum specimen lost; of *hebes*—American Museum of Natural History.

Discussion.—*T. radifera* is a widespread western species belonging to the group in which the apex of cell R is entirely hyaline. The wing pattern in females is distinctive in that the dark ray from the stigma to vein r–m is always broken in cell R_1, but it may be complete through the stigma itself, unlike the condition shown in figure 16. There is always a distinct ray or partial ray through cell 1st M_2, and the dark mark in the center of vein M_3+Cu_1 varies from triangular to rectangular, but if rectangular, it is never more than four times as long as wide. Females are easily separable from those of *eclipta* by their geographic distribution, the nature of the break in the dark ray from the stigma to vein r–m, and the presence of a dark spot on vein M_3+Cu_1. No males of *radifera* seen in this study possess a ray from vein R_1 to vein r–m; they are most easily distinguished from males of other species in this group by this character alone.

Trupanea eclipta Benjamin

(Fig. 18)

Trupanea (Trupanea) eclipta Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401: 57, fig. 42, A–K (type loc. Orlando, Fla., holotype ♂, descr., figs. wing ♂ and ♀, larva).

Previously recorded distribution.—Florida.

Material examined.—Holotype ♂ with the following labels: "Nov. 1, Orlando, Fla.," "bred from Eclipta alba," "D. J. Nicholson, Collector," and "Type No. 54383, U.S.N.M."

FLORIDA: 85 ♂♂, 97 ♀♀, Fort Pierce (Orlando), 16.VIII to 29.XII.

Location of type.—U.S. National Museum.

Discussion.—This species is easily distinguished from all other species in the group having the apex of cell R hyaline, by the break in the dark ray from the stigma to vein r–m, which occurs in cell R_5. The wing pattern of the *eclipta* male resembles that of the female in every important respect and may be easily distinguished from that of the very different *radifera* (fig. 17).

Trupanea jonesi Curran

(Figs. 19 and 20)

Trypanea jonesi Curran, 1932, Amer. Mus. Novitates No. 556: 6, fig. 6 (type loc. Corvallis, Oreg., holotype ♀, descr., fig. wing ♀, in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 6, 15, fig. 1, u (short descr., fig. wing ♀).

Trypanea microstigma Curran, 1932, Amer. Mus. Novitates No. 556: 6, 7, fig. 8 (type loc. Crater Lake, Oreg., holotype ♀, descr., fig. wing, in key N.A. spp.).— Malloch, 1942, U.S. Natl. Mus. Proc. 92: 3, 6, 11, fig. 1, l–m (short descr., figs. wings ♂ and ♀). NEW SYNONYMY.

Previously recorded distribution.—Of *jonesi*—California, Nevada, Oregon, and Wyoming; of *microstigma*—California, Idaho, Nevada, and Oregon.

Material examined.—Holotype ♀ with the following labels: "Corvallis. Ore., Aug. 10, 1931." "reared fr. Aster douglasii Lindl." "S. C. Jones, Coll.," and "Trypanea jonesi Curran. ♀, type." Holotype ♀ with the following labels: "Crater Lake, Ore., So. Rim, 7100'. July 29, 1930." "H. H. Scullen, Coll.," and "Trypanea microstigma Curran, type."

ARIZONA: 1 ♀, Lee Siding, 27.VIII.37. CALIFORNIA: 55 ♂♂, 232 ♀♀, 107 localities throughout State, every month of the year. COLORADO: 2 ♂♂, 1 ♀, 7 miles south of Glade Park, Longmont, Ukiah Grade, 10.V to 14.IX. IDAHO: 1 ♂, 21 ♀♀, 14 localities throughout State, 2.VII to 14.IX. MONTANA: 1 ♀, Glacier National Park, 26.VII.36. NEVADA: 25 ♂♂, 26 ♀♀, Austin, Carson City, Ely, Glendale, Ormsby County, Wells, 14.II to 13.VIII. NEW MEXICO: 5 ♀♀, Alamogordo, Santa Rosa, 9.IV to 28.VI. OREGON: 4 ♀♀, Devils Lake, Mount Hood, 12.VII to 8.VIII. TEXAS: 1 ♀, between La Tuna and Vinton, 29.VIII.37. UTAH: 34 ♂♂, 42 ♀♀, 10 localities throughout State, 12.V to 27.IX. WYOMING: 2 ♂♂, 5 ♀♀, Big Horn County, Dubois, Fort Bridger, Teton County, Yellowstone National Park, 18.VI to 6.IX.

The species has been reared from *Coreopsis* sp. Adults have been collected from *Achillea* sp., *Agropyron cristatum*, *Aplopappus linearifolius*, *Atriplex polycarpa*, *Baccharis sergiloides*, *Baeria chrysostoma*, *Chrysothamnus nauseosus*, *Coreopsis calliopsidea*, *Croton californicus*, *Eriogonum* sp., *Erodium cicutarium*, *Layia platyglossa*, *Lepidospartum squamatum*, *Medicago sativa*, *Monolopia major*, *Phacelia* sp., *Pluchea sericea*, *Salsola kali* var. *pestifer*, *S. kali* var. *tenuifolia*, and *Wyethia* sp.

Location of types.—Of *jonesi* and *microstigma*—American Museum of Natural History.

Discussion.—A very close study of the Curran types of *jonesi* and *microstigma* based on structural characters leaves no doubt that the two are conspecific. This conclusion is verified by a further examination of a large number of specimens from California and other Western States. In that series there is every possible variation in the completeness of the dark ray through cell 1st M_2—entire in females of *jonesi* and completely broken in that cell in *microstigma*. The elongate nature of the dark spot on vein M_3+Cu_1 is a very constant feature of the wing pattern, and this, together with the unbroken dark ray from vein R_1 to vein r–m, distinguishes females from

all those species belonging to the group having the apex of cell R entirely hyaline. Males of *jonesi* also have an elongate streak on vein M_3+Cu_1 but lack the ray from vein R_1 to vein r-m, and the apical Y-shaped mark is always incomplete or completely absent. Females of *pseudovicina*, the closest relative, have a triangular infuscation on vein M_3+Cu_1, and the marginal hyaline spot at the apex of vein R_{2+3} is closer to the center of the surrounding dark area than in *jonesi*, whereas the wing pattern of the *pseudovicina* male differs in no important respects from that of the female.

Trupanea californica Malloch

(Fig. 21)

Trypanea californica Malloch, 1942, U.S. Natl. Mus. Proc. 92: 4, 6, 17 (type loc. Emerald River (Tahoe, Calif.), holotype ♂, descr.).
Trypanea microsetulosa Malloch, 1942, ibid. 92: 4, 6, 17 (type loc. Lakeside (Tahoe, Calif.), holotype ♂). NEW SYNONYMY.

Previously recorded distribution.—Of *californica*—Emerald River; of *microsetulosa*—Lakeside; both in Tahoe, Calif.

Material examined.—Holotype ♂ with the following labels: "Emerald R., Tahoe, Calif., June 30, '27," "J. M. Aldrich, Coll.," "Type No. 54399, U.S.N.M.," and "californica type." Paratypes of *californica*: 2 ♂♂, 1 ♀, same data as type; 1 ♀, Fallen Leaf, Calif., 6500′ elevation, 15.VII.17; 1 ♂, San Francisco, Calif., 12.X.19; 1 ♀, Kerrville, Tex., 30.V.04. Holotype ♂ with the following labels: "Lakeside, Tahoe, Calif.," "J. M. Aldrich, Coll., VI.1927," "Type No. 54400, U.S.N.M.," and "microsetulosa."

ARIZONA: 3 ♂♂, 5 ♀♀, Cochise County, 6 miles south of Dos Cabezos, Felton, Globe, Rustler's Peak, Santa Catalina Mountains, 15.V to 10.IX. CALIFORNIA: 57 ♂♂, 29 ♀♀, 45 localities throughout State, May to November. COLORADO: 1 ♀. NEVADA: 1 ♀, Austin, 12.VIII.40. NEW MEXICO: 18 ♂♂, 18 ♀♀, 16 localities throughout State, June to August. TEXAS: 7 ♂♂, 4 ♀♀, Brewster County, Enchanted Rock, Fort Stockton, Kerrville, Marfa, Van Horn, Waco, 1.IV to 27.X. WASHINGTON: 1 ♂, near La Connor, 28.VI.43.

Reared from larvae in flowers of *Gnaphalium* sp. in California and collected there and elsewhere from *Artemisia* sp., *Parthenium argentatum*, *Prunus emarginata*, seed cabbage (presumably *Brassica oleracea* var. *capitata*), and *Solanum eleagnifolium*.

Location of types.—Of *microsetulosa* and holotype and paratypes of *californica*—U.S. National Museum.

Discussion.—I am unable to find any differences between the holotypes of *californica* and *microsetulosa* other than the more extensively bristled vein R_{1+3} of the latter mentioned by Malloch (*1942*). Both holotypes are from the Tahoe region of California, as are several of the paratypes of *californica*. *T. californica* is easily distinguished from *actinobola* by the close proximity of the marginal hyaline spot at the apex of vein R_{2+3} to the distal margin of the surrounding dark area; a short ray is produced between that spot and the distal margin of about the same width as that lying upon vein m.

Trupanea pseudovicina Hering

(Fig. 22)

Trypanea texana Hering (nec Malloch), 1942, Siruna Seva, Folge 4: 29, fig. 18 (type loc. Dallas, Tex., holotype ♂, fig. wing).
Trypanea pseudovicina Hering, 1947, ibid. 6: 12 (new name for *texana* Hering, nec Malloch).

Previously recorded distribution.—Dallas, Tex.

Material examined.—ARIZONA: 5 ♂♂, 1 ♀, Florence Junction, Rillito, Santa Catalina Mountains, Sasaba, Tucson, 5.IV to 17.X. CALIFORNIA: 5 ♂♂, 6 ♀♀, China Flat (El Dorado County), 12 miles southeast of Ivanpah (San Bernardino County), Oasis Nature Area (Joshua Tree National Monument), Palm Springs (Riverside County), San Diego, San Ysidro, Santa Monica, Whitewater Canyon, Wood Lake (Tulare County), 2.I to 22.XII. NEW MEXICO: 2 ♀♀, Las Vegas Hot Springs, Socorro, 8.VIII. TEXAS: 1 ♀, Brewster County, 13 to 17.VI.08.

No host data are available, but the species has been caught in traps baited for the Mexican fruit fly (*Anastrepha ludens* (Loew)) and in rotary traps in California.

Location of type.—Not known.

Discussion.—Females of *pseudovicina* so closely resemble those of *jonesi* that at first glance they may be confused easily. The former species at the middle of vein M_3+Cu_1 has a triangular infuscation that is never elongated along that vein; the hyaline marginal spot at the apex of vein R_{2+3} is smaller and located closer to the center of the surrounding dark area; the ovipositor sheath is much shorter; and the head is slightly higher than long from the lateral aspect in contrast to that of *jonesi*, in which it is slightly longer than high. The wing pattern of the *pseudovicina* male differs in no important respect from that of the female, and therefore it may be distinguished easily from that of the *jonesi* male.

Trupanea signata, new species

(Fig. 23)

Head.—Distinctly higher than long from lateral aspect; antennae about three-fourths times as long as face, apex of third segment somewhat darker than remainder of segment, arista rather dark; front slightly grayish pollinose, at vertex 1½ times as wide as width of one eye, very slightly longer than width at vertex; three pairs lower fronto-orbitals, anterior pair distinctly weaker than other two and about one-half times as long as middle pair; ocellars strongly proclinate and distinctly longer than posterior pair of fronto-orbitals.

Thorax.—Mesothorax, scutellum, and pleural sclerites heavily and very dark-gray pollinose, disk of mesothorax and lateral surfaces of scutellum with short rather stout golden hairs, other bristles shining brownish black; humeri and extreme lateral margins of mesothorax with tendency to be yellowish, but never distinctly so. Legs entirely yellow with yellow to light-brown femoral and tibial setae. Wing pattern (fig. 23, holotype ♀) consisting of typical preapical dark-brown area; complete narrow ray from stigma to vein r–m, this ray

often lighter or almost completely absent within stigma; distinct well-defined dark spot in apex of cell R of variable size, but almost always separated from infuscation lying upon vein r–m by unbroken hyaline area so as to leave no connection between two dark areas; hyaline spot immediately distad of vein r–m narrow but always rather distinct and extending from two-thirds to completely across cell R_5; marginal hyaline spot at apex of vein R_{2+3} situated so as to leave dark ray between it and distal margin of surrounding dark area 1½ to 2 times as wide as dark ray covering vein m; one dark ray across cell 1st M_2, usually ending at vein M_3+Cu_1, but in some specimens short of that vein; and extremely short dark part of infuscation lying upon vein r–m extending posteriorly into cell 1st M_2 in direction of midpoint of vein M_3+Cu_1, at which point there is dark infuscation two to four times as long as wide lying on vein; basal half of wing completely hyaline, except for darkening of basal fourth of vein Cu_2+2d A.

Abdomen.—Color, pollinosity, and setation as on mesothorax and scutellum; ovipositor sheath brownish black to black, about 2¼ to 2½ times as long as two preceding abdominal tergites, covered dorsally with fine pale setae, which are somewhat longer and stouter on proximal half than on distal half; external male genitalia shining brownish black to black.

Types and material examined.—Holotype ♀ with the following labels: "Covina, L. A. Co., Calif., 22.V.51," "reared fr. Gnaphalium chilense," and "C. Henne, Collector." Paratypes as follows (all Calif., except where noted): 7 ♂♂, 2 ♀♀, same data as type (Los Angeles County Museum); 1 ♀, Berkeley, 26.V.07 (California Insect Survey); 1 ♀, Brookings, Oreg., 6–7.VII.51 (California Academy of Sciences); 1 ♂, 2 ♀♀, Coalinga, 12.X.58 (U.S. National Museum); 2 ♂♂, Firebaugh, 22.IV.48 (California Insect Survey); 1 ♀, Freestone, 7.IX.50 (California Department of Agriculture); 1 ♂, Idyllwild, San Jacinto Mountains, 16.VI.40 (California Insect Survey); 1 ♂, 2 ♀♀, Lake Anza, Oakland Hills, 19.X.50 (California Insect Survey and U.S. National Museum); 1 ♀, Oakland, 3.IV.50 (U.S. National Museum); 1 ♂, Sacramento, 4.IV.29 (California Department of Agriculture); 1 ♀, San Benito County, VIII.56, ex NH_3 walnut husk fly trap (California Department of Agriculture); San Francisco, 2 ♂♂, 1 ♀, 23.IV.09 (California Academy of Sciences and California Insect Survey), 1 ♂, 20.X.19 (California Insect Survey); San Francisco, reared ex *Anaphalis*, 2 ♂♂, 2 ♀♀, 1.III.34 (California Department of Agriculture); 1 ♂, 3 ♀♀, San Francisco, 27.VIII.36 (California Department of Agriculture); 3 ♂♂, 5 ♀♀, 5.X.37 (U.S. National Museum); 2 ♂♂, Snowline Camp, El Dorado County, 7.VII.48 (California Insect Survey and U.S. National Museum); 1 ♀, Solano County, 24.VI.50, citronella bait trap (California Department of Agriculture); 4 ♂♂, 2 ♀♀, Tahquitz, Riverside County, 14.III.38, on "everlasting" (San Diego Natural History Museum); 1 ♂, Triniti, 10.I.38 (California Insect Survey); Wood Lake, rotary trap, 1 ♀, 31.III.47, 1 ♂, 16.V.47, 1 ♀, 26.V.47, 1 ♀, 3.XI.47 (California Insect Survey).

Additional material as follows: ARIZONA: 1 ♀, Mount Lemmon, 16.VI.57. CALIFORNIA: 1 ♀, Fallbrook (San Diego County), 14.VIII.58. OREGON: 2 ♀♀, Brookings (Curry County), 6

to 7.VII.51; 1 ♀, Clatsop, 17.VII.25, collected by Dellinger bag. TEXAS: 1 ♂, 2 ♀♀, Clarendon, 19.IX.05, on *Grindelia squarrosa*; 1 ♀, Marfa, 6.IV.09.

Location of type.—California Academy of Sciences.

Discussion.—The marginal hyaline spot at the apex of vein R_{2+3} is separated from the next distal hyaline area by a short dark ray at least as wide to two times as wide as the dark ray over vein m. Most specimens in this study were easily separated by means of this character from *californica*, in which this short ray is rarely wider than that over vein m. In addition, the infuscation in the distal end of cell R is very distinctly margined in *signata*, whereas in *californica* the infuscation is present but indistinct. *T. pseudovicina* is closely related, but it possesses no infuscation in the apex of cell R and the marginal hyaline spot at the apex of cell R_{2+3} is smaller and farther removed from the next distal hyaline area.

Trupanea actinobola (Loew)

(Fig. 24)

Trypeta actinobola Loew, 1873, Smithsn. Inst. Misc. Collect. 11 (256): 326 (type loc. Tex., holotype ♂, descr.).

Urellia actinobola, Loew, 1873, ibid. 11 (256): 326 (transfers to *Urellia*).—Coquillett, 1899, N.Y. Ent. Soc. Jour. 7: 266 (mistakenly as synonym of *mevarna* Walk.).—Snow, 1903, Kans. Univ. Sci. Bul. 2: 219 (in list Dipt. Kans.).—Adams, 1904, ibid. 2: 450 (in key N.A. spp.).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 613 (in list N.A. spp.).

Trypeta (*Urellia*) *actinobola*, Osten Sacken, 1878, ibid. 16 (270): 194 (refs.).

Trypanea actinobola, Curran, 1932, Amer. Mus. Novitates No. 556: 6 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 4, 6, 16, fig. 1, *x* (short descr., fig. wing ♀).

Trupanea (*Trupanea*) *actinobola*, Benjamin, 1934, U.S. Dept. Agr. Tech. Bul. 401: 56, fig. 41, A–K (descr., discuss., figs. wings ♂ and ♀).

Previously recorded distribution.—Mexico and Arkansas, California, Florida, Georgia, Indiana, Kansas, Massachusetts, Nebraska, New Mexico, Rhode Island, and Texas.

Material examined.—Lectotype here selected is a male in the series of Loew cotypes with the following labels: "Texas, Lefv.," "94," "Loew Coll.," "Type 13321," and "used by Benjamin (1934) as type of name *actinobola*."

ALABAMA: 1 ♂. ARIZONA: 3 ♂♂, 1 ♀, Littlefield, Pinery Canyon, Roble's Pass, 23.VI to 15.XI. CALIFORNIA: 13 ♂♂, 6 ♀♀, Avernal, Claremont, Coalinga, 6 miles south of Coalinga, Sawmill Canyon, 25.V to 1.XI. COLORADO: 1 ♂, 1 ♀, Fort Collins, 31.VIII.43. FLORIDA: 49 ♂♂, 49 ♀♀, 29 localities throughout State, 12.XII to 22.XI. GEORGIA: 4 ♂♂, 10 ♀♀, Atlanta, Stone Mountain, Thomasville, Tifton, Valdosta, 20.VI to 11.XI. INDIANA: 1 ♂, 4 ♀♀, Lafayette, VII to VIII.15. KANSAS: 11 ♂♂, 5 ♀♀, Lawrence, Little Gabi (near Manhattan), Manhattan, Onaga, Ottawa County, 23.V to 26.X. MICHIGAN: 2 ♀♀, Honor, Shelby, 21.VI to 13.VII. NEBRASKA: 1 ♀, Lincoln, 25.X.27. NEVADA: 2 ♂♂, 1 ♀, Dry Lake, Glendale, Las Vegas, 15.IV to 6.XI. NEW MEXICO: 21 ♂♂, 16 ♀♀, Alamogordo, Cline's Corners, Cloudcroft, Highrolls, Las Vegas Hot Springs, 9.IV to 25.VIII. NEW YORK: 56 ♂♂, 53 ♀♀, Babylon (L.I.), Sea Cliff, Speonk, 7.VII

to 19.IX. NORTH CAROLINA: 3 ♂♂, Southport, 10.X.48. OKLAHOMA: 1 ♀, Wichita National Forest, 24.VII.32. SOUTH CAROLINA: 1 ♂, Florence, 29.XI.49. SOUTH DAKOTA: 1 ♂. TENNESSEE: 1 ♂, Knoxville. TEXAS: 11 ♂, 12 ♀♀, 12 localities throughout State, 3.IV to 17.IX. UTAH: 2 ♂♂, 3 ♀♀, Bellevue, Blue Creek, Brigham, Leeds, St. George, 30.V to 12.IX. VIRGINIA: 1 ♂, Kearney, 25.V.36. WYOMING: 1 ♂, 1 ♀, Lance Creek, 28 miles south of Newcastle, 14 to 18.VIII.

Adults have been collected from *Gutierrezia lucida*, *G. sarothrae*, *Hymenoclea salsola*, and *Pluchea sericea* in various States. They have also been reared in Florida from larvae in flowers of *Actinospermum* sp., *Aster adnatus*, *Erigeron quercifolius*, *E. vernus*, *Hieracium* sp., *Solidago chapmanii*, *S. serotina*, and *S.* sp.

Location of type.—Museum of Comparative Zoology, Harvard University.

Discussion.—*T. actinobola* is an extremely variable and widespread species with a single ray through cell 1st M_2, commonly ending short of vein M_3+Cu_1, the apex of cell R with or without infuscation, and with or without a spot at the center of vein M_3+Cu_1. Curran (*1942*) keys *actinobola* by the presence of a spot on vein M_3+Cu_1, but many specimens have this character on one wing and not on the other, or the spot may be absent on both wings. *T. actinobola* may be recognized most easily among closely related species by the head, which in both sexes is about as long as high with a rather flat front in profile. The wing (fig. 24) is from a New York specimen but resembles that of the Texas type in every important respect, except that in the latter the hyaline area in the extreme base of cell R_5 is more diffuse and occupies more of the cell width.

T. actinobola may be distinguished from *californica*, principally by its shorter ovipositor (usually determined only by a side-by-side comparison of females of the two species) and more easily by the position of the marginal hyaline spot at the apex of vein R_{2+3}. In *actinobola* this spot forms, with the distal margin of the surrounding dark area, a short ray more than twice as wide as that over vein m, whereas in *californica* (fig. 21) this spot is usually much closer to the next distal hyaline area. *T. californica* is apparently restricted to the Western States, where its separation from the more widely distributed *actinobola* is more difficult than can be made outside that area on the basis of geographic distribution.

Possibly a statistical study based on a much larger number of specimens than are now available would show the presence of several subspecies on the North American Continent. The material is not now adequate to demonstrate the presence of discontinuities and/or intergrades within the concept of the species as presented in this study.

Trupanea vicina (van der Wulp)

(Fig. 25)

Urellia vicina van der Wulp, 1899, *in* Salvin and Godman, Biol. Cent.-Amer. 2: 427, fig. (type loc. Orizaba, Mex., descr. from 2 ♀♀, fig. wing).—Snow, 1904, Kans. Univ. Sci. Bul. 2: 345 (in list Dipt. Ariz.).—Adams, 1904, ibid. 2: 450 (in key N.A. spp.).—Aldrich, 1905, Smithsn. Inst. Misc. Collect. 46 (1444): 614 (in list N.A. spp.).—Cresson, 1907, Amer. Ent. Soc. Trans. 33: 106 (brief descr.).

Trypanea vicina, Curran, 1932, Amer. Mus. Novitates No. 556: 6 (in key N.A. spp.).—Malloch, 1942, U.S. Natl. Mus. Proc. 92: 6, 13, fig. 1, q (descr., fig. wing ♀).

Previously recorded distribution.—Orizaba and Gulf of California (Mex.) and Arizona, New Mexico, and Texas.

Material examined.—ARIZONA: 1 ♂, 5 ♀♀, Bill Williams Fork, Chiricahua Mountains, 12.VII to 7.VIII. CALIFORNIA: 1 ♂, 4 ♀♀, La Jolla, San Diego, 20.VI to 13.VII. NEW MEXICO: 15 ♂♂, 15 ♀♀, Alamogordo (Bernalillo County), Cloudcroft, La Luz, Las Cruces, Las Vegas, Steins, Tajique, 25 miles west of Tularosa, 22.IV to 8.VIII. TEXAS: 4 ♂♂, 8 ♀♀, Austin, Big Bend National Park, Brewster County, Chisos Mountains, Crystal City, Victoria, 4.II to 6.IX.

Adults have been reared from larvae in the flowers of marigold and have been collected from spinach, tumbleweed, and *Sphaeralcea angustifolia*.

Location of type.—British Museum (Natural History).

Discussion.—A specimen resembling *Trupanea vicina* was compared with the type of that species by F. Van Emden, British Museum (Natural History). The pattern of the right wing of the Crystal City specimen (fig. 25), according to Van Emden, differs in no important respect from that of either type. The most distinctive feature of this wing pattern is the extensive evenly dark nonareolate infuscation in the apex of cell R and the characteristic manner in which the dark ray through the stigma tends to run into it rather than more obliquely to vein r–m. In addition, the marginal hyaline spot at the apex of vein R_{2+3} is more or less centered in the dark area on each side of it. Van der Wulp's figure is misleading in indicating both these characters are otherwise, but his illustration of an incomplete ray through cell 1st M_2 is well within the range of variation I have seen. Malloch's figure (*1942*) is a much more accurate representation of the wing pattern of *vicina*.

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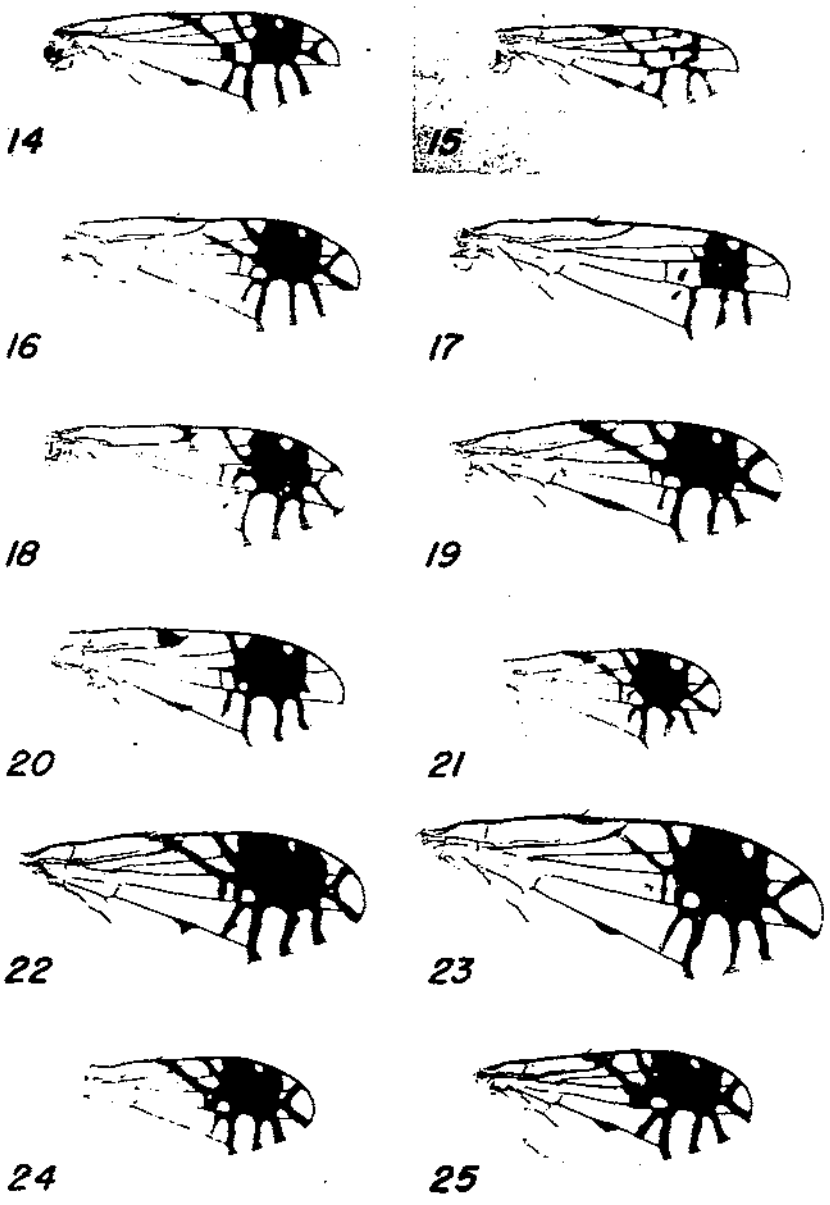

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FIGURES 1–25.—Right wing, dorsal view. *Trupanea* spp.: 1, *conjuncta* ♀; 2, *femoralis* ♂; 3, *femoralis* ♀; 4, *nigricornis* ♂; 5, *bisetosa* ♀; 6, *bisetosa* ♂; 7, *dactyloptera* ♀; 8, *arizonensis* ♀; 9, *maculipeca*, n. sp., ♀; 10, *ageratae* ♂; 11, *wheeleri* ♀; 12, *mexarma* ♀; 13, *texana* ♀; 14, *imperfecta* ♀; 15, *imperfecta* ♂; 16, *radifera* ♀; 17, *radifera* ♂; 18, *eclipta* ♀; 19, *jonesi* ♀; 20, *jonesi* ♂; 21, *californica* ♀; 22, *pseudovicina* ♀; 23, *signata*, n. sp., ♀; 24, *actinobola* ♀; 25, *ricina* ♀.

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