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THE MELECTINE BEES OF CALIFORNIA

(*Hymenoptera: Anthophoridae*)

BY

P. D. HURD, JR., and E. G. LINSLEY

(Division of Entomology and Parasitology, University of California, Berkeley)

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THE MELECTINE BEES OF CALIFORNIA

(Hymenoptera: Anthophoridae)

The bees included in the present synopsis fall within the tribe Melectini as defined by Michener (1944:286). Although there is reason to believe that this tribe is polyphyletic, we have retained the category as a matter of convenience until such time as the genera may be reëxamined in the light of the non-parasitic anthophorids, especially those of Michener's tribe Anthophorini.

The North American melectine bees have been recently revised by Linsley (1939) with subsequent additions by Linsley (1943a) and Michener (1948). All of the California species are parasitic either in the nests of *Anthophora* (Cockerell, 1899; Hicks, 1927; Mickel, 1928; Linsley, 1939; *et al.*) or *Emphoropsis* (Linsley, 1943b).

Although life histories have not been worked out in detail for any North American form, Linsley and MacSwain (1942) have reported some of the features of the biology of *Xeromelecta (Melectomorpha) californica* (Cresson) as a parasite of *Anthophora linsleyi* Timberlake. They state that the egg is deposited just inside of the opening of the uncompleted nest cell of the host bee and is attached to the cell wall by one end. The incubation period of the egg of the parasite is shorter than that of the host and the hatching larva destroys the host egg by means of its long, slender mandibles. The larva then consumes the pollen store and when mature, constructs a tough, brown cocoon which completely fills the cell. The winter is passed as an inactive larva within the cocoon and pupation occurs in the spring. The pupa, unlike that of *Anthophora*, has a pair of spiny tubercles on the mesonotum, and is capable of considerable motion. Under laboratory conditions the pupal period averaged about one month. Adult emergence reaches its peak from four to six weeks after the host bees appear.

In the present paper, four genera and twelve species and subspecies are recorded from California. Of the remaining North American forms (exclusive of those from the West Indies) we recognize only two or three as probably valid species.

Zacosmia and *Xeromelecta* are confined to the New World and appear to have had their origin in the Sonoran regions of Mexico and southwestern United States. *Zacosmia* is a specialized genus (as indicated by the reduced wing venation and maxillary palpi, absence of tarsal arolia, presence of a pygidial plate in the male, etc.) still confined primarily to the Sonoran Life Zones (*Z. maculata maculata* to the Upper Sonoran, *Z. maculata desertorum* to the Lower Sonoran [map 1]). *Xeromelecta* does not appear to belong to the same phylogenetic line with *Zacosmia*. *Xeromelecta s. str.* is monotypic and essentially confined to the Lower Sonoran Life Zone (map 5). The subgenus *Melectomorpha*, although abundant in the Sonoran Zones, has successfully invaded the Transition and Canadian Zones and, as a result, one species ranges from at least as far south as central Mexico (Zacatecas) to British Columbia and from the Pacific Coast to the Mississippi River (map 5). An apparently related genus (or subgenus), *Nesomelecta*, occurs in Puerto Rico, a fact which further emphasizes the probable southern origin of this group.

Melecta, on the other hand, shows affinities with the Old World melectine fauna, and the genus is well represented in Europe and Asia. The northern relationship of the American species is also indicated by their present distributional patterns (see maps 2–4) and the fact that they are largely confined to the Pacific, Rocky Mountain, and Atlantic cordilleran areas. Where the more plastic species (*pacifica* and *separata*) have successfully invaded the Sonoran Life Zone they are represented by subspecifically distinct populations (maps 3, 4). One species, *M. edwardsii*, is apparently narrowly endemic, being restricted in its distribution to the Upper Sonoran Life Zone from the north-central coast ranges of California southward to the San Bernardino Mountains and southern coast ranges (map 2). Morphologically this species has diverged from *Melecta s. str.* and has been placed in a monotypic subgenus (*Melectomimus*).

In reporting distributional data for the

various species discussed below, we have recorded the location of specimens from which California records have been taken. The following abbreviations have been used for institutional collections: American Museum of Natural History (A.M.N.H.), Acadamy of Natural Sciences, Philadelphia (A.N.S.P.), California Academy of Sciences (C.A.S.), California Insect Survey, University of California, Berkeley (C.I.S.), University of Colorado (C.U.), Illinois Natural History Survey (I.N.H.S.), University of Idaho (I.U.), Kansas State College (K.S.C.), University of Kansas (K.U.), Los Angeles County Museum (L.A.M.), Oregon State College (O.S.C.), University of California, Davis (U.C.D.), University of California, Citrus Experiment Station, Riverside (U.C.R.), University of Minnesota, (U.M.) and the University of Nebraska (U.N.). We are indebted to the authorities of these institutions, as well as to individuals whose records are separately reported, for the privilege of studying the specimens which have formed the basis of this report.

Key to the Genera of Melectini in California

1. Marginal cell much longer than pterostigma (pl. 11,a); maxillary palpi three to six segmented; tarsi with arolia; antennae of male with intermediate flagellar segments at most twice as broad as long; seventh abdominal tergite of male without a pygidial plate 2
   Marginal cell scarcely longer than pterostigma (pl. 11,b); maxillary palpi with one free segment; tarsi without arolia; antennae of male with intermediate flagellar segments greatly thickened, several times as broad as long; seventh abdominal tergite of male with a pygidial plate ..... *Zacosmia* (p. 122)

2(1). Inner ramus of middle and posterior tarsal claws broad and lobe-like (pl. 11,g); maxillary palpi three or four segmented; antennae of male with intermediate flagellar segments distinctly broader than long ..... *Xeromelecta* (p. 121)
   Inner ramus of middle and posterior tarsal claws slender, usually long (pl. 11,i); maxillary palpi five or six segmented; antennae of male with intermediate flagellar segments about as long as broad ..... *Melecta* (p. 120)

Key to the California Species of Melecta

1. First abdominal tergite with long, erect, pale hairs; maxillary palpi five segmented or with a short sixth segment; scutellar lobes acute or armed with a stout spine; pygidial plate of female narrowed apically, not covering sixth tergite (*Melecta s. str.*) 2
   First abdominal tergite without long, erect, pale hairs; maxillary palpi six segmented, the sixth segment nearly as long as fifth; scutellar lobes armed with a long slender spine; pygidial plate of female broad, covering exposed surface of sixth tergite (*Melectomimus*) .... *edwardsii* (p. 123)

2(1). Antennae thirteen segmented; abdomen with seven visible segments, the last without a pygidial plate (males) 3
   Antennae twelve segmented; abdomen with six visible segments, the last with a pygidial plate (females) 6

3(2). Clypeus usually clothed with long white pubescence; outer face of both middle and hind tibiae white pubescent; abdomen usually with white lateral hair bands 4
Clypeus wholly or predominently clothed with black pubescence; outer face of middle and hind tibiae black pubescent; abdomen without white lateral hair bands 5

4(3). Antennae with first flagellar segment distinctly shorter than second; antennal flagellum without deep pit-like sensoria on inner ventral surface; ventral apical process of gonocoxite with short sparse hairs .... *bohartorum* (p. 124)
Antennae with first flagellar segment distinctly longer than second; antennal flagellar segments with deep pit-like sensoria on inner ventral surface (pl. 11,c); ventral apical process of gonocoxite with a brush of long bristle-like hairs .... *separata* (p. 124)

5(3). Antennal flagellar segments with deep pit-like sensoria on inner ventral surface (pl. 11,c); vertex with an impunctate, shining triangular area in front of anterior ocellus; ventral apical process of gonocoxite with a brush of long, bristle-like hairs; apex of last abdominal tergite broadly truncate .... *thoracica* (p. 126)
Antennal flagellar segments without deep pit-like sensoria on inner ventral surface; vertex without an impunctate, shining triangular area in front of anterior ocellus; ventral apical process of gonocoxite with short, sparse hairs; apex of last abdominal tergite deeply emarginate ... *pacifica* (p. 126)

6(2). Antennae with first flagellar segment longer than second 7
Antennae with first flagellar segment shorter than second ..... *bohartorum* (p. 124)

7(6). Vertex in front of anterior ocellus without a distinct impunctate, shiny, triangular area; pygidial plate narrowed and more or less parallel-sided posteriorly, apex narrowly rounded 8
Vertex in front of anterior ocellus with an impunctate, shiny, triangular area about as long as or longer than the diameter of the ocellus; pygidial plate broad, gradually narrowed posteriorly, apex broadly rounded .... *thoracica* (p. 126)

8(7). Antennae with first flagellar segment about one and one-half times as long as second; mesoscutum with a transverse band of thin black pubescence between wing bases; abdomen usually with white lateral hair bands .... *separata* (p. 124)
Antennae with first flagellar segment but little longer than second; mesoscutum without a transverse band of black pubescence; abdomen without white lateral hair bands ..... *pacifica* (p. 126)

Key to the California Species of Xeromelecta

1. Mandibles with inner margin unidentate (pl. 11,e); scutellar lobes unarmed; maxillary palpi with last segment much longer than penultimate; mesonotum uniformly, densely clothed with fulvous or fulvochraceous pubescence ..... *X. (Xeromelecta) larreae* (p. 128)
Mandibles with inner margin bidentate (pl. 11,d); scutellar lobes armed with a posterior tooth or spine; maxillary palpi with last segment shorter than penultimate; mesonotum irregularly clothed with white and black pubescence *X. (Melectomorpha) californica* (p. 128)

Discussion of Species

Zacosmia maculata (Cresson)

Melecta maculata Cresson, 1879, Trans. Amer. Ent. Soc., *7*:204, ♂, ♀; Linsley, 1939, Ann. Amer. Ent. Soc., *32*:460-461, ♂, ♀.

Geographic range:
See map 1.

Discussion:
The genus *Zacosmia* may readily be distinguished from the other North American melectine bees by the absence of tarsal arolia and the greatly enlarged, ring-like flagellar segments of the male. The wing venation is somewhat variable and examples have been seen with either the first or second transverse cubitus lacking from one or both wings. In this respect, *Zacosmia* approaches the monotypic genus *Brachymelecta*.

Zacosmia contains two nominal species, *maculata* (Cresson) and *suffusa* (Viereck). The latter is known only from Alberta and its exact status remains to be determined. The species *maculata* is better known and appears to be geographically ditypic (map 1). Both subspecies occur in California and the characters utilized for their separation are presented below.

Zacosmia maculata maculata (Cresson)

Melecta maculata Cresson, 1879, Trans. Amer. Ent. Soc., *7*:204. Type ♀, Nevada (A.N.S.P.).

Geographic range:
See map 1.

Host:
Anthophora (Micranthophora) curta Cresson (Hicks, 1934:265-266, fig. 2).

California records:
ALAMEDA CO.: Tesla, Corral Hollow, ♂, IX-25-48 (P. D. Hurd, Jr., C.I.S.); ♂, X-15-48 (J. W. MacSwain, C.I.S.).
CONTRA COSTA CO.: Antioch, ♀, IX-9-35 (G. E. & R. M. Bohart, C.I.S.); ♂, VIII-22-37 (E. C. Van Dyke, C.A.S.); ♀, VIII-21-38 (E. C. Van Dyke, C.A.S.); ♂, VI-30-40 (E. C. Van Dyke, C.A.S.); 3 ♀, VIII-11-50 (P. D. Hurd, Jr., C.I.S.). Oakley, ♂, VIII-22-37 (E. C. Van Dyke, C.A.S.).
INYO CO.: Lone Pine, ♀, V-21-37 (E. C. Van Dyke, C.A.S.).
LASSEN CO.: Hallelujah Jct., ♂, VII-4-49 (J. E. Gillaspy, C.I.S.); 2 ♂, 7 ♀, same data, (P. D. Hurd, Jr., C.I.S.); ♂, same data (C. I. Smith, C.I.S.); 2 ♀, VII-7-49 (J. E. Gillaspy, C.I.S.); 2 ♂, 3 ♀, same data (P. D. Hurd, Jr., C.I.S.).
LOS ANGELES CO.: Tanbark Flat, San Dimas Experimental Forest, ♀, VI-23-50 (J. W. MacSwain, C.I.S.). Redondo Beach, ♀, VII-1930 (C.I.S.). Claremont, ♂, ♀ (C. F. Baker, U.C.R.). Piute Butte, ♀, V-12-44 (P. H. Timberlake, U.C.R.).
MERCED CO.: Dos Palos, ♂, IX-8-49 (J. E. Gillaspy). Turner Island, near Dos Palos, ♂, VI-18-50 (C. D. MacNeill, C.I.S.).
NEVADA CO.: Hobart Mills, 7 mi. N., ♂, VIII-26-48 (P. D. Hurd, Jr., C.I.S.).
RIVERSIDE CO.: Riverside, 32 ♂, 12 ♀, April-October, 1924-1942 (P. H. Timberlake, U.C.R.). Keen Camp, San Jacinto Mts., 3 ♂, ♀, VI-10-39 (E. G. Linsley, C.I.S.); ♂, same data (E. S. Ross, C.I.S.). Hemet, ♂, VIII-12-46 (J. W. MacSwain, C.I.S.); ♂, VIII-24-46 (J. W. MacSwain, C.I.S.). Corona, ♂, V-1911 (C.I.S.). The Gavilan, ♂, IV-18-40 (P. H. Timberlake, U.C.R.). Perris, ♂, VII-23-34 (C. M. Dammers, U.C.R.). Pigeon Pass, ♀, V-25-30 (P. H. Timberlake, U.C.R.). Joshua Tree National Monument, ♀, V-20-41 (E. C. Van Dyke, C.A.S.). Gilman Hot Springs, ♂, V-30-41 (F. C. Hadden, C.A.S.).
SACRAMENTO CO.: Rio Vista, ♂, VIII-9-50 (J. E. Gillaspy).
SAN BERNARDINO CO.: Kramer Hills, ♀, V-3-39 (P. H. Timberlake, U.C.R.). 2 ♂, V-16-36 (C. M. Dammers, U.C.R.). Morongo, ♀, IX-26-44 (P. H. Timberlake, U.C.R.). Colton, ♂, V-(26 to 28)-17 (E. P. Van Duzee, C.A.S.).
SAN DIEGO CO.: Encinitas, ♂, ♀, VI-28-34 (T. D. A. Cockerell, U.C.R.); ♂, ♀, same data (P. H. Timberlake, U.C.R.). Oceanside, ♀, VIII-17-46 (P. H. Timberlake, U.C.R.).
STANISLAUS CO.: ♂, August (C.I.S.).

Discussion:

This subspecies is characterized in the male by the usually piceous or black coloration of the antennal scape, legs, tegulae and pygidial field. The darker areas of the abdomen are clothed with brownish-black pubescence. The abdominal sternites are sparsely pubescent. The female may normally be recognized by the piceous or black antennae, legs, pronotal tubercles and sternites. The abdominal pubescence is like that of the male.

Certain specimens assignable to *maculata s. str.*, and which are from the more arid localities within the geographic range of this subspecies closely approach the coloration of the Lower Sonoran subspecies, *desertorum*.

Zacosmia maculata desertorum (Cockerell)

Zacosmia maculata desertorum Cockerell, 1916, Canad. Ent., *48*:391. Type ♂, Juarez (Chihuahua) Mexico.

Geographic range:

See map 1.

California records:

IMPERIAL CO.: Calexico, ♂, IV-28-50 (C. D. MacNeill, C.I.S.). Westmorland, ♀, V-15-33 (C.I.S.); ♀, V-21-32 (C.I.S.).

INYO CO.: Lone Pine, ♂, VI-4-37 (E. C. Van Dyke, C.A.S.).

RIVERSIDE CO.: Blythe, 2 ♂, VI-24-45 (E. G. Linsley, C.I.S.); ♂, V-8-47 (E. G. Linsley, C.I.S.). Andreas Canyon, ♂, IV-28-48 (P. H. Timberlake, U.C.R.).

SAN DIEGO CO.: San Felipe Creek, ♂, VI-5-36 (P. H. Timberlake, U.C.R.).

Discussion:

Desertorum may be recognized in the male by the reddish antennal scape, legs, tegulae, and pygidial field. In addition, the pale brownish pubescence of the darker areas of the abdomen distinguishes it from *maculata s. str.*, males. The female of *desertorum* has the antennae, legs, pronotal tubercles reddish, while the darker areas of the abdomen are clothed with pale yellowish-brown pubescence instead of brownish-black as in the nominate subspecies.

Melecta (Melectomimus) edwardsii Cresson[1]

Melecta edwardsii Cresson, 1878, Trans. Amer. Ent. Soc., *7*:92. Type ♂, California (A.N.S.P.).

Geographic range:

See map 2.

Host:

? *Emphoropsis* sp. (Linsley, 1939:450).

California records:

CONTRA COSTA CO.: Antioch, ♂, IV-22-33 (E. C. Van Dyke, C.A.S.); ♂, IV-4-36 (C.I.S.); 2♀, IV-18-36 (G. E. Bohart, C.I.S.); ♀, IV-25-36 (C.I.S.); 6 ♂, IV-11-37 (E. C. Van Dyke, C.A.S.); 5 ♂, 3 ♀, IV-18-37 (E. C. Van Dyke, C.A.S.); ♂, IV-1937 (E. S. Ross, C.A.S.); 5 ♂, IV-24-38 (E. C. Van Dyke, C.A.S.); ♀, V-8-38 (G. E. & R. M. Bohart); 9 ♂, IV-2-39 (E. C. Van Dyke, C.A.S.); 2 ♂, IV-4-39 (G. E. Bohart, U.C.D.); ♀, IV-29-50 (P. D. Hurd, Jr., C.I.S.); 2 ♀, same data (J. W. MacSwain, C.I.S.); ♀, V-8-50 (P. D. Hurd, Jr., C.I.S.).

LOS ANGELES CO.: Ontario, ♀, IV-20-36 (J. R. Warren, C.I.S.).

MONTEREY CO.: Jamesburg, ♂, VI-13-38 (C. D. Michener, K.U.).

RIVERSIDE CO.: Riverside, ♀, IV-4-30 (P. H. Timberlake, U.C.R.); ♂, III-14-33 (P. H. Timberlake, U.C.R.); ♂, III-15-33 (P. H. Timberlake, U.C.R.); ♂, ♀, III-20-33 (P. H. Timberlake, U.C.R.); ♂, III-21-33 (P. H. Timberlake, U.C.R.); ♂, III-7-34 (P. H. Timberlake, U.C.R.). Temecula, ♂, ♀, IV-11-50 (P. D. Hurd, Jr., C.I.S.). The Gavilan, ♂, IV-17-38 (P. H. Timberlake, U.C.R.).

SAN BENITO CO.: Pinnacles National Monument, ♂, V-3-46 (P. D. Hurd, Jr., C.I.S.).

SAN DIEGO CO.: San Diego, ♂ (F. E. Blaisdell, C.A.S.). Coronado Beach, ♂, 4♀, IV-27-90 (F. E. Blaisdell, C.A.S.).

SAN FRANCISCO CO.: San Francisco, 5 ♂ (F. E. Blaisdell, C.A.S.). San Francisco, sand dunes, 2 ♂, IV-11-20 (C. L. Fox, C.A.S., U.C.R.); ♂, IV-6-22 (C. L. Fox, C.A.S.); ♀, IV-30-22 (C. L. Fox, C.A.S.); ♂, V-3-25 (C. L. Fox, C.A.S.).

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[1] *Bombomelecta zygos* Viereck is a synonym of this species.

YOLO CO.: Putah Canyon, ♂, IV-1-38 (B. E. White, C.I.S.).

Discussion:

Edwardsii may readily be identified by the very long scutellar spines and the complete absence of long, pale, erect hairs on the first abdominal tergite. We regard it as subgenerically distinct from the other known *Melecta*, an interpretation which is supported by its very limited distribution (map 2).

Melecta (Melecta) bohartorum Linsley

Melecta (Melecta) bohartorum Linsley, 1939, Ann. Ent. Soc. Amer., *32*:442-443. Type ♀, near Mojave, California (C.A.S.).

Geographic range:

See map 2.

California records:

INYO CO.: Westgaard Pass (summit), ♀, VI-15-37 (C. D. Michener, K.U.).

KERN CO.: Mojave, 2♀, IV-10-36 (G. E. & R. M. Bohart, C.A.S., C.I.S.). Walker Pass, ♂, IV-26-49 (E. G. Linsley, C.I.S.).

LOS ANGELES CO.: Adelanto, ♀, V-11-35 (C. M. Dammers, U.C.R.).

SAN BERNARDINO CO.: Providence Mts., ♀, V-15-38 (D. Meadows, L.A.M.).

Discussion:

This species is the least known member of the genus in California. As may be seen from map 2, *bohartorum* is apparently restricted to the mountainous areas surrounding the northern Mojave Desert. The male of this species has now been collected and agrees in essential features with the characterization of the female given by Linsley (1939:442). As in that sex, the first flagellar segment of the antennae is much shorter than the second. The shape of the gonostylus and the vestiture of the ventral apical process of the gonocoxite suggest a relationship with *pacifica*. The antennal flagellar sensorial areas are shallow, narrow, and linear in outline.

Melecta (Melecta) separata Cresson

Melecta separata Cresson, 1879, Trans. Amer. Ent. Soc., *7*:204, ♀; Linsley 1939, Ann. Ent. Soc. Amer., *32*:443-444, ♂, ♀.

Geographic range:

See map 3.

Hosts:

Anthophora spp.

Discussion:

Separata is probably the most variable geographically of the North American *Melecta*. Six differentiation units have been named but only three of these are reasonably well known. The distributional records for this species are suggestive of a rassenkreis (map 3). Each of the segregates is characterized by quantitative differences in the color of the pale pubescence.

Three of the subspecies are now known to occur in California, namely, *separata s. str.*, *callura*, and *mojavensis*. The nominate subspecies is chiefly of Great Basin montane distribution. *Callura* occupies that area of California lying to the west of the crest of the Sierra Nevada. *Mojavensis* is known only from a small population in the northwestern edge of the Mojave Desert. Its exact status remains to be determined.

Melecta separata separata Cresson[2]

Melecta separata Cresson, 1879, Trans. Amer. Ent. Soc., 29:179. Type ♀, Nevada (A.N.S.P.).

Geographic range:

See map 3.

California records:

INYO CO.: Bishop, ♀, VI-22-29 (E. P. Van Duzee, C.A.S.).

NEVADA CO.: Truckee, ♀, VI-13-27 (E. P. Van Duzee, C.A.S.).

PLUMAS CO.: Meadow Valley, ♀, V-13-49 (P. D. Hurd, Jr., C.I.S.).

SHASTA CO.: Hat Lake, 3♀, VI-14-41 (P. D. Hurd, Jr., C.I.S.); ♀, VI-18-41 (C. W. Anderson, C.I.S.); ♀, VI-14-41 (C.I.S.).

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[2] *Bombomelecta maculata* Viereck (*nec* Cresson) should be considered a synonym of this subspecies and not of *Melecta separata callura* (Cockerell).

Discussion:

In general, this subspecies may be recognized by the reduction or absence of the pale bands of abdominal pubescence. Frequently specimens referrable to this subspecies display variation in the extent of the pale abdominal pubescence within a single local population. In some, this pubescence will approach the large sized pale areas exhibited by *callura*, and in others the pubescence may be reduced to very small, inconspicuous patches. The legs of the female are entirely black pubescent, and the white pubescence on the legs of the male is confined largely to the intermediate and posterior tarsi.

Melecta separata callura (Cockerell)

Bombomelecta callura Cockerell, 1926, Pan-Pacific Ent., *3*:58. Type ♂, Mill Valley, Marin County, California (C.A.S.).

Geographic range:

See map 3.

Host:

Anthophora edwardsii Cresson.

California records:

ALAMEDA CO.: Berkeley, ♀, III-22-31 (G. Heid, C.A.S.); ♂, III-11-31 (G. E. & R. M. Bohart); ♂, III-10-33 (E. G. Linsley, C.I.S.); ♂, III-14-37 (G.E. & R.M. Bohart); ♀, IV-10-38 (C. D. Michener, K.U.); ♀, II-16-39 (J. W. MacSwain, C.I.S.); 2♀, III-7-39 (J. W. MacSwain, C.I.S.). Oakland, ♀, III-1931 (C.I.S.). Oakland Hills, ♀, III-5-39 (E. G. Linsley, C.I.S.).

CALAVERAS CO.: Mokelumne Hill, ♀, February (F. E. Blaisdell, C.A.S.).

CONTRA COSTA CO.: Somersville, 3♂, 11♀, II-15-47, ex-nests of *Anthophora edwardsii* (E. G. Linsley, J. W. MacSwain, and R. F. Smith, C.I.S.); ♀, II-18-47 (J. W. MacSwain, C.I.S.). Point Richmond, ♀, III-30-47 (C. A. Hanson, C.I.S.).

FRESNO CO.: Coalinga, Los Gatos Canyon, ♂, III-17-31 (E. P. Van Duzee, C.A.S.).

LOS ANGELES CO.: Griffith Park, Los Angeles, ♀, IV-5-36 (E. G. Linsley, C.I.S.). Mint Canyon, ♀, V-3-36 (E. G. Linsley, C.I.S.); ♀, V-10-36 (E. G. Linsley, C.I.S.).

MENDOCINO CO.: Ryan Creek, 2♂, III-26-49 (P. D. Hurd, Jr., C.I.S.).

MONTEREY CO.: Stone Canyon, ♂, III-22-31 (E. P. Van Duzee, C.A.S.).

RIVERSIDE CO.: Riverside, ♀, IV-4-30 (P. H. Timberlake, U.C.R.); 2♀, III-10-33 (P. H. Timberlake, U.C.R.); 2♀, III-7-34 (P. H. Timberlake, U.C.R.); 2♀, III-9-34 (P. H. Timberlake, U.C.R.); ♀, III-6-36 (P. H. Timberlake, U.C.R.); ♀, III-14-36 (P. H. Timberlake, U.C.R.); ♀, IV-13-36 (C. M. Dammers, U.C.R.); ♀, IV-17-36 (P. H. Timberlake, U.C.R.); ♀, IV-3-38 (P. H. Timberlake, U.C.R.); ♀, III-22-46 (P. H. Timberlake, U.C.R.). Perris, ♀, IV-3-36 (C.I.S.). Arlington, ♂, IV-18-31 (C. M. Dammers, U.C.R.). Keen Camp, San Jacinto Mts., ♀, IV-2-33 (C. M. Dammers, U.C.R.). The Gavilan, ♂, III-1936 (F. R. Platt, U.C.R.); ♀, IV-13-36 (P. H. Timberlake, U.C.R.).

SAN BERNARDINO CO.: Bonanza King Mine, Providence Mountains, ♀, IV-10-36 (C. M. Dammers, U.C.R.).

SAN JOAQUIN CO.: Tracy, 6 mi. W., 2♂, ♀, III-4-48 (P. D. Hurd, Jr., C.I.S.); ♂, same data (J. W. MacSwain, C.I.S.).

STANISLAUS CO.: Westley, ♂, ♀, IV-1-48 (P. D. Hurd, Jr., C.I.S.). Adobe Creek, ♀, V-6-48 (J. W. MacSwain, C.I.S.).

TULARE CO.: Lindsay, ♀, IV-1-33 (P. H. Timberlake, U.C.R.); ♀, IV-10-33 (P. H. Timberlake, U.C.R.). Tulare, ♂, ♀, III-9-37 (P. H. Timberlake, U.C.R.).

YOLO CO.: Davis, ♀, III-1-34 (C.I.S.).

Discussion:

This subspecies is the commonest member of the *separata* complex on the Pacific Coast. The males possess large, conspicuous white lateral pubescent patches on abdominal tergites two to six, though sometimes those on tergite two may be reduced or lacking. The abdominal pubescent patches of the female are somewhat reduced, but on the average are larger than those of the nominate subspecies. The legs of both sexes are largely black pubescent, although the hind tibiae, and the middle and hind tarsi frequently possess considerable white pubescence.

Melecta separata mojavensis Linsley

Melecta separata mojavensis Linsley, 1939, Ann. Ent. Soc. Amer., *32*:446-447. Type ♀, Mojave, California (C.A.S.).

Geographic range:

See map 3.

California records:

Known only from the type series.

Discussion:

Mojavensis differs chiefly from *callura*, the closest recognized segregate, in the possession of fulvochraceous thoracic and facial pubescence. It appears to be a very localized differentiation unit. Its coloration is at times approached by certain early spring or teneral specimens of *callura*. However, until such time as the interracial relationships of the various subspecies of *separata* are better understood, the writers have retained name.

Melecta (Melecta) thoracica Cresson[3]

Melecta thoracica Cresson, 1875, Wheeler Exp., Zool., 5:726, plate 33, figure 5. Type ♀, "eastern Nevada" [Colorado?] (A.N.S.P.).

Geographic range:

See map 2.

Host:

Emphoropsis cinerea Smith, subsp. (Linsley, 1943:160).

California records:

ELDORADO CO.: Snowline Camp, ♀, VI-20-48 (O. E. Myers, C.I.S.). Placerville, ♀, IV-18-32 (F. H. Wymore, U.C.D.).

MARIPOSA CO.: Miama Ranger Station, 3♀, V-15-42 (E. G. Linsley, C.I.S.); ♀, V-16-42 (E. G. Linsley, C.I.S.).

Discussion:

Thoracica has virtually remained unrecognized since it was first described by Cresson. The species was not known to Linsley (1939:436), but later (1945:151-153) he rediscovered and recharacterized the female of *thoracica* and illustrated some of its structural features. Michener (1948:17) in examining the genitalia and associated structures of *"pacifica"* material from the Rocky Mountains concluded that *pacifica* and *fulvida* (treated as subspecies by Linsley, 1939:439 ff.) represented distinct species.

A reëxamination of this material reveals that what Michener believed to be males of *pacifica* were apparently males of *thoracica*. The genitalia of *pacifica* has the ventral apical process of the gonocoxite provided with short, more or less pale hairs. The seventh abdominal tergite is plainly emarginate on its posterior margin and the antennal flagellar sensorial areas are elongate, narrow and scarcely differentiated from the adjacent integument. In *thoracica*, as we understand the species, the ventral apical process of the gonocoxite is provided with a brush of long, bristle-like hairs. The seventh abdominal tergite is broadly truncate on its posterior margin and the antennal flagellar sensorial areas are represented by small, deep, pit-like excavations, one per segment. In both sexes, immediately before the anterior ocellus, a triangular, impunctate and glabrous area, which is as long as or longer than a diameter of the ocellus, is present.

A careful comparison of *thoracica* (as understood by us) and *sierrae* has failed to reveal any morphological differences and *sierrae* is therefore considered synonymous with *thoracica*.

The majority of the specimens which have been seen by us possess yellowish-white pubescence on the dorsum of the thorax and first abdominal tergite. However, specimens from Zion National Park, although agreeing morphologically with *thoracica*, possess pubescence as fulvous as the darkest specimens of *fulvida*. If these are the true *thoracica*, *sierrae* may prove to be subspecifically distinct.

In California *thoracica* appears to be confined to the Sierra Nevada Mountains and its southern extensions.

Melecta (Melecta) pacifica Cresson

Melecta pacifica Cresson, 1878, Trans. Amer. Ent. Soc., 7:91, ♀; Linsley, 1939, Ann. Ent. Soc. Amer., 32:439, ♂, ♀.

Geographic range:

See map 4.

Discussion:

This species is divisible into two subspecies, both of which occur in California. It superficially resembles *thoracica* but may be readily separated by the

[3] *Melecta (Melecta) sierrae* Linsley is a synonym of this species. *(New synonymy)*.

absence of deep, pit-like antennal flagellar sensorial areas, and by the presence of an emargination on the apex of the seventh abdominal tergite. Females may be distinguished from those of *thoracica* by the absence, or very nearly so, of the triangular area before the anterior ocellus. In addition, the pygidial plate narrows towards the apex and becomes parallel-sided, while in *thoracica* it is triangular or cuneiform in outline.

A study of the holotype of *Melecta semifulva* Cockerell suggests that it is conspecific with *pacifica*. We have been unable to discover any morphological differences, but since it is clothed with long, grayish-brown hair on the abdominal tergites its facies is quite different from that of any other specimens of *pacifica* seen by us.

Melecta pacifica pacifica Cresson[4]

Melecta pacifica Cresson, 1878, Trans. Amer. Ent. Soc., 7:91. Type ♀, California (A.N.S.P.).

Geographic range:
See map 4.

California records:

ALAMEDA CO.: Tesla, Corral Hollow, ♀, IV-27-50 (W. F. Ehrhardt, C.I.S.).

ALPINE CO.: Hope Valley, ♀, VII-9-48 (C. D. MacNeill, C.I.S.); ♀, same data (J. W. MacSwain, C.I.S.); ♀, VII-18-48 (P. D. Hurd, Jr., C.I.S.).

ELDORADO CO.: Snowline Camp, ♀, VI-20-48 (K. W. Tucker, C.I.S.).

KERN CO.: Green Horn Mts., ♀, V-7-31 (E. C. Van Dyke, C.A.S.). Isabella, ♀, V-17-37 (E. C. Van Dyke, C.A.S.). Glennville, ♀, IV-22-50 (R. M. Bohart, U.C.D.).

LASSEN CO.: Cinder Cone, ♂, V-19-41 (P. D. Hurd, Jr., C.I.S.). Summit Camp, ♀, VI-28-49 (P. D. Hurd, Jr., C.I.S.); 2♀, same data (L. L. Jensen, C.I.S.); 8♀, same data (J. N. Simons, C.I.S.); 2♀, same data (C. I. Smith, C.I.S.).

LOS ANGELES CO.: Claremont, 2♂, ♀ (C. F. Baker, U.C.R.). Swartout Valley, ♀, VI-3-28 (W. H. Thorpe, U.C.R.). Mint Canyon, ♀, V-3-36 (E. G. Linsley, C.I.S.). Palmdale, ♂, IV-11-36 (G. E. & R. M. Bohart, C.I.S.). Eagle Rock, ♀, II-22-35 (C. D. Michener, K.U.).

MARIPOSA CO.: El Portal, ♀, V-18-38 (C.I.S.).

MONTEREY CO.: Paraiso Springs, ♂, IV-8-34 (L. S. Slevin, I.N.H.S.).

PLACER CO.: Towle, 2♀, VI-25-33 (M. A. Cazier, U.C.R.). Alta, 2♀, IV-7-39 (C.I.S.).

RIVERSIDE CO.: Riverside, ♂, III-13-33 (P. H. Timberlake, U.C.R.); 2♂, III-7-34 (P. H. Timberlake, U.C.R.); ♂, 2♀, III-12-34 (P. H. Timberlake, U.C.R.); ♀, III-14-34 (P. H. Timberlake, U.C.R.); ♂, II-27-36 (P. H. Timberlake, U.C.R.); ♂, II-7-38 (P. H. Timberlake, U.C.R.); ♀, II-21-38 (P. H. Timberlake, U.C.R.). The Gavilan ♀, V-18-39 (P. H. Timberlake, U.C.R.); ♀, V-10-50 (P. H. Timberlake, U.C.R.); ♂, IV-16-50 (P. H. Timberlake, U.C.R.). Perris, 2 mi. W., III-19-36 (P. H. Timberlake, U.C.R.). Temecula, ♀, IV-11-50 (P. D. Hurd, Jr., C.I.S.).

SAN BERNARDINO CO.: Wrightwood, ♀, VI-8-32 (C. M. Dammers, U.C.R.). Loma Linda, ♀, V-20-33 (A. J. Basinger, U.C.R.). San Bernardino, 10 mi. W., ♀, V-26-36 (E. G. Linsley, C.I.S.). Deep Creek, ♀, IV-26-36 (E. G. Linsley, C.I.S.).

SAN DIEGO CO.: Cuyamaca, ♂, IV-9-50 (J. W. MacSwain, C.I.S.).

SAN LUIS OBISPO CO.: Maricopa Grade, ♀, III-21-31 (E. P. Van Duzee, C.A.S.).

SHASTA CO.: Hat Creek, ♀, VI-1-41 (E. G. Linsley, C.I.S.); ♀, VI-17-48 (L. G. Smith, C.I.S.). Viola, 4 mi. W., ♀, V-29-41 (E. G. Linsley, C.I.S.). Hat Lake, Lassen National Park, ♂, VI-3-41 (C. D. Michener, C.I.S.); ♀, VI-14-41 (C. W. Anderson, C.I.S.); ♀, same data (P. D. Hurd, Jr., C.I.S.); ♂, same data (C. D. Michener, C.I.S.).

TRINITY CO.: Big Flat, Coffee Creek, ♀, VI-21-34 (E. C. Van Dyke, C.A.S.).

Discussion:

This subspecies is characterized by the white, grayish-white or ochraceous pubescence on the vertex, occiput, dorsum of thorax and first abdominal tergite. Some specimens from intergradation areas (map 4) are difficult to allocate to one or the other subspecies since they are intermediate in colorational features.

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[4] *Melecta thornica* Bray is a misidentification as well as *lapsus* for this subspecies.

Melecta pacifica fulvida Cresson

Melecta pacifica, var. *fulvida* Cresson, 1879, Trans. Amer. Ent. Soc., 7:204. Type ♀, Nevada (A.N.S.P.).

Geographic range:
See map 4.

California records:
LASSEN CO.: Black's Mt., ♀, VI-13-41 (C. W. Anderson, C.I.S.); ♀, same data (P. D. Hurd, Jr., C.I.S.).
MODOC CO.: Happy Camp, Modoc National Forest, ♀, V-6-34 (K. A. Salman, C.I.S.).
MONO CO.: West Walker River, 7200 ft., ♀, VI-25-37 (C. D. Michener, K.U.).
NEVADA CO.: Truckee, ♀, VI-18-27 (E. P. Van Duzee, U.C.R.); ♀, VI-19-27 (E. P. Van Duzee, U.C.R.); 2♀, VII-4-27 (E. P. Van Duzee, C.A.S.); ♀, VI-15-27 (E. P. Van Duzee, C.A.S.); ♀, VII-13-27 (E. P. Van Duzee, C.A.S.).
SHASTA CO.: Hat Lake, Lassen National Park, ♀, VI-14-41 (P. D. Hurd, Jr., C.I.S.). Crater Lake Mt., 2♀, VI-26-50 (M. Wasbauer, C.I.S.).

Discussion:
This subspecies may be recognized by the fulvous coloration of the pubescence on the vertex, occiput, dorsum of thorax and first abdominal tergite. In its California distribution, *fulvida* occurs principally to the east of the crest of the Sierra Nevada (map 4).

Xeromelecta (Xeromelecta) larreae (Cockerell)[5]

Bombomelecta larreae Cockerell, 1900, Canad. Ent., 32:361. Type ♀, Mesilla Park, New Mexico.

Geographic range:
See map 5.

California records:
INYO CO.: Argus Mts., ♀, V-22-37 (W. C. Reeves, C.I.S.); 5♂, 2♀, same data (E. C. Van Dyke, C.A.S.). Lone Pine, 4♀, V-24-37 (E. C. Van Dyke, C.A.S.). Emigrant Springs, Death Valley, 2♂, IV-27-50 (D. Davis, C.I.S.).
RIVERSIDE CO.: Riverside, ♂, V-22-35 (C. M. Dammers, U.C.R.). Palm Springs, ♀, IV-23-33 (P. H. Timberlake, U.C.R.).
SAN BENITO CO.: Pinnacles National Monument, ♂, V-19-41 (J. W. MacSwain, C.I.S.).
SAN BERNARDINO CO.: Mitchells Caverns, Providence Mts., 2♀, V-18-35 (C. M. Dammers, U.C.R.). Deep Creek, 4♂, 6♀, IV-6-36 (E. G. Linsley, C.I.S.); ♂, V-5-36 (E. G. Linsley, C.I.S.); 10♂, 3♀, same data (P. H. Timberlake, U.C.R.).
SAN DIEGO CO.: Borego Valley, ♀, IV-10-33 (H. S. Gentry, C.I.S.); 2♂, IV-10-36 (C.I.S., I.N.H.S.).

Discussion:
The genus *Xeromelecta* may be readily distinguished from *Melecta* by the lobe-like inner ramus of the tarsal claws, the abbreviated maxillary palpi which are at most four segmented, and the enlarged flagellar segments of the male antennae. The nominate subgenus possesses unidentate mandibles, unarmed scutellar lobes, and an elongate last segment of the maxillary palpi. It contains but one species, *X. (X.) larreae* which may be easily recognized by the erect, dense, fulvous or fulvochraceous mesonotal pubescence, very black wings, and evanescent abdominal hair bands. *Melectomorpha* seems best regarded as a subgenus of *Xeromelecta*, differing primarily in the bidentate mandibles, acute or armed scutellar lobes, shorter maxillary palpi with the last segment abbreviated and the pattern of mesonotal and abdominal pubescence.

Xeromelecta (Melectomorpha) californica (Cresson)[6]

Melecta californica Cresson, 1878, Trans. Amer. Ent. Soc., 7:91. Type ♂, California (A.N.S.P.).

Geographic range:
See map 5.

Hosts:
Anthophora abrupta (Say) (*californica*,

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[5] *Bombomelecta azygos* Viereck is a synonym of this species.

[6] *Pseudomelecta miranda* Fox and *P. pasadenensis* Cockerell are herein considered as synonyms of *californica* (Cresson); *Melecta sladeni* Viereck has previously been shown to be synonymous with *Pseudomelecta pasadenensis* Cockerell.

Linsley, 1943:227). *Anthophora* [*bomboides*] *stanfordiana* Cockerell (*californica*, Linsley & MacSwain, 1942:408). *Anthophora edwardsii* Cresson (*californica*, Linsley & MacSwain, *ibid.*). *Anthophora linsleyi* Timberlake (*californica*, Linsley & MacSwain, 1942:408). *Anthophora neomexicana* (Cockerell) (*miranda*, Hicks, 1926:224; Mickel, 1928:73). *Anthophora occidentalis* (Cockerell) (*miranda*, Cockerell, 1899:156 f.n.). *Anthophora urbana* Cresson (*californica*, Linsley, 1939:456; and Linsley & MacSwain, 1942:408).

California records:

ALAMEDA CO.: Livermore Mts., 2♂, V-2-36 (E. S. Ross, C.A.S., C.I.S.). Hills back of Oakland, 8♂, VIII-2-08 (E. C. Van Dyke, C.A.S.). Berkeley Hills, ♀, VI-4-33 (P. H. Timberlake, U.C.R.). Berkeley, ♂, VIII-27-15 (E. P. Van Duzee, C.I.S.); ♂, II-19-17 (E. C. Van Dyke, C.A.S.); ♀, IV-27-21 (E. C. Van Dyke, C.A.S.); ♀, VI-19-39 (C.I.S.). Tesla, Corral Hollow, ♂, V-23-46 (J. W. MacSwain, C.I.S.); ♂, IX-25-48 (J. E. Gillaspy, C.I.S.); ♂, 4♀, same data (P. D. Hurd, Jr., C.I.S.); ♀, X-15-48 (J. W. MacSwain, C.I.S.).

ALPINE CO.: Hope Valley, ♀, VII-9-48 (J. W. MacSwain, C.I.S.).

BUTTE CO.: Chico, 2♂, V-1920 (V. G. Stevens, C.I.S.).

CALAVERAS CO.: Big Trees, 2♀, IX-13-37 (F. E. Blaisdell, C.A.S.). Mokelumne Hill, ♂, IV-12-30 (R. L. Usinger, C.I.S.).

CONTRA COSTA CO.: Mt. Diablo, 5♀, VI-14-33 (G. E. & R. M. Bohart and P. H. Timberlake, U.C.D., U.C.R.); 5♂, VI-25-39 (E. C. Van Dyke, C.A.S.). Avon, ♂, VIII-29-37 (E. C. Van Dyke, C.A.S.). Oakley, ♂, VIII-9-36 (E. C. Van Dyke, C.A.S.). Antioch, ♂, IX-12-36 (P. H. Timberlake, U.C.R.); ♀, X-1-32 (E. O. Essig, C.I.S.); ♂, VII-3-38 (J. W. MacSwain, C.I.S.); ♀, X-23-38 (J. W. MacSwain, C.I.S.); ♂, VIII-5-38 (C.I.S.); 2♂, V-24-49 (P. D. Hurd, Jr., C.I.S.); 4♂, ♀, V-21-49 (P. D. Hurd, Jr., C.I.S.); ♀, V-21-39 (E. C. Van Dyke, C.A.S.); ♂, X-21-48 (J. E. Gillaspy).

EL DORADO CO.: Strawberry Valley, ♂, VIII-13-12 (E. C. Van Dyke, C.A.S.); ♀, VIII-14-12 (E. C. Van Dyke, C.A.S.). Fallen Leaf Lake, ♀, VII-26-15 (E. C. Van Dyke, C.A.S.). Angora Peak, 8625 ft., ♀, VII-19-31 (E. O. Essig, C.I.S.). Camino, 3 mi. S., ♂, 11♀, VI-26-48 (P. D. Hurd, Jr., C.I.S.); ♂, same data (C. D. MacNeill, C.I.S.); ♂, same data (J. W. MacSwain, C.I.S.); ♂, VII-21-48 (P. D. Hurd, Jr., C.I.S.). Snowline Camp, ♂, VI-26-48 (O. E. Myers, C.I.S.); ♀, VI-27-48 (J. W. MacSwain, C.I.S.); ♂, ♀, VI-28-48 (P. D. Hurd, Jr., C.I.S.). Pollock Pines, ♂, VII-14-48 (J. W. MacSwain, C.I.S.). Echo Lake, 3♂, ♀, VII-21-48 (P. D. Hurd, Jr., C.I.S.). China Flat, ♀, VI-28-48 (P. D. Hurd, Jr., C.I.S.); ♂, VIII-2-49 (J. W. MacSwain, C.I.S.). Pyramid Ranger Station, ♂, VIII-1-49 (J. W. MacSwain, C.I.S.). Coloma, 2 mi. N.W., 4♂, X-10-45 (J. W. MacSwain, C.I.S.). Kyburz, ♀, VII-23-50 (W. F. Ehrhardt, C.I.S.).

FRESNO CO.: Panoche Canyon, 4♂, ♀, IV-24-26 (E. C. Van Dyke, C.A.S.). Coalinga, ♂, VI-13-38 (I. McCracken, C.A.S.). Huntington Lake, 7000 ft., 4♂, 4♀, VII-(7 to 30)-19 (E. P. Van Duzee, C.A.S.). Kings River Canyon, ♂, VII-6-10 (E. C. Van Dyke, C.A.S.). Firebaugh, ♀, VIII-16-49 (A. D. Telford, C.I.S.); 2♂, IX-22-49 (R. F. Smith, C.I.S.).

IMPERIAL CO.: Coyote Wells, 4♂, IV-12-38 (E. P. Van Duzee, C.A.S.). Palo Verde, 3 mi. S., ♂, IV-8-49 (P. D. Hurd, Jr., C.I.S.).

INYO CO.: Big Pine Creek, ♂, VIII-1929 (I. McCracken, C.A.S.). Bishop, ♀, VI-22-29 (E. P. Van Duzee, C.A.S.). Bishop, 15 mi. N., ♀, VIII-5-48 (P. D. Hurd, Jr., & J. W. MacSwain, C.I.S.). Olancha, 3 mi. S., 2♂, ♀, VIII-6-48 (P. D. Hurd, Jr., & J. W. MacSwain, C.I.S.).

KERN CO.: Bakersfield, ♂, III-30-41 (C.I.S.). Kern Canyon, ♂, VII-24-46 (C.I.S.); ♀, VII-28-46 (C.I.S.).

LASSEN CO.: Litchfield, 22 mi. N., 3♂, VII-10-46 (P. D. Hurd, Jr., & R. F. Smith, C.I.S.). Hallelujah Jct., ♂, ♀, VII-4-49 (P. D. Hurd, Jr., C.I.S.); ♂, VI-13-49 (P. D. Hurd, Jr., C.I.S.); ♂, same data (J. W. MacSwain, C.I.S.); ♂, same data (F. Morishita, C.I.S.). Summit Camp, ♂, ♀, VII-9-49 (C. I. Smith, C.I.S.). Bridge Creek Camp, ♂, ♀, VII-9-49 (J. W. MacSwain, C.I.S.); 7♀, same data (D. Cox, U.C.D.). Black's Mt., ♂, VI-13-41 (P. D. Hurd, Jr., I.U.).

LOS ANGELES CO.: Pasadena, ♀, VI-12-45 (K. W. Cooper, M.C.Z.); ♀ (N. Banks, M.C.Z.); ♂, X-22-11 (E. W. Rust, U.C.R.). Claremont, ♀, IV-11-27 (E. C. S., Jr., C.A.S.). Alhambra, ♂, X-31-20 (E. C. Van Dyke, C.A.S.). Los Angeles, ♂, X-15-17 (E. P. Van Duzee, C.A.S.). Santa Monica, ♀

(F. C. Clark, C.A.S.). Puente Hills, ♂, V-27-36 (P. H. Timberlake, U.C.R.). Mt. San Antonio, ♂, VIII-5-48 (W. E. Kelson, C.I.S.). Camp Baldy, 2♂, ♀, VII-11-50 (P. D. Hurd, Jr., C.I.S.); ♀, same data (J. W. MacSwain, C.I.S.). Crystal Lake, 2♂, ♀, VI-29-50 (P. D. Hurd, Jr., C.I.S.); ♀, same data, (J. W. MacSwain, C.I.S.). Palmdale, 6♂, 43♀, X-6-35 (E. G. Linsley, C.I.S.). West Hollywood Hills, 3♂, ♀, VIII-15-49 (R. G. Howell, C.I.S.). Tanbark Flat, San Dimas Experimental Forest, ♀, VI-19-50 (J. W. MacSwain, C.I.S.); ♂, VI-22-50 (J. W. MacSwain, C.I.S.); ♂, VI-23-50 (J. W. MacSwain, C.I.S.); ♀, VII-14-50 (T. R. Haig, C.I.S.).

MADERA CO.: North Fork, 2♀, VI-7-33 (R. P. Allen, C.A.S.). Nipinnawasse, ♂, V-24-36 (E. S. Ross, C.A.S.). Madera, 6♂, V-5-42 (E. G. Linsley, U.C.R.); ♂, V-20-42 (A. J. Walz, C.I.S.); ♂, VI-5-42 (A. J. Walz, C.I.S.); ♂, VI-5-42 (C.I.S.). Oakhurst, 2♂, VI-8-42 (A. J. Walz, C.I.S.). Bass Lake, ♂, VI-3-38 (N. F. Hardman, C.I.S.); ♂, VI-6-38 (R. M. Bohart, U.C.D.); ♂, VI-7-38 (N. F. Hardman, C.I.S.); ♀, V-22-42 (C.I.S.). Soquel Basin, ♂, VII-4-46 (T. O. Thatcher, C.I.S.); ♂, same data (R. L. Usinger, C.I.S.).

MARIN CO.: Bear Valley, ♀, V-30-16 (C. L. Fox, C.A.S.).

MARIPOSA CO.: Fish Camp, ♂, VI-10-42 (A. J. Walz, C.I.S.); Miami Ranger Station, ♀, VI-4-42 (A. J. Walz, C.I.S.). Wawona, ♂, VI-11-42 (E. G. Linsley, C.I.S.). Yosemite, ♀, VI-17-31 (C.I.S.); ♀, VI-1926 (P. J. Woolf, C.I.S.). Yosemite Valley, ♀, VI-7-21 (E. C. Van Dyke, C.A.S.); ♀, VI-24-26 (P. H. Timberlake, U.C.R.); ♂, VI-9-30 (F. E. Blaisdell, C.A.S.).

MENDOCINO CO.: Twin Rocks, ♀, VII-10-29 (E. C. Van Dyke, C.A.S.).

MERCED CO.: Dos Palos, 2♂, IX-22-48 (J. E. Gillaspy).

MODOC CO.: Alturas, ♀, VII-9-22 (C. L. Fox, C.A.S.). Lake City, 23♂, 3♀, VII-9 to VIII-1-22 (C. L. Fox, C.A.S.). Lake City, 4 mi. S., ♀, VII-9-46 (P. D. Hurd, Jr., C.I.S.). Lassen Creek, ♂, VII-22-22 (C. L. Fox, C.A.S.). Davis Creek, ♀, VII-13-22 (C. L. Fox, C.A.S.). Cedarville, 6 mi. N., 2♀, VII-9-46 (R. F. Smith, C.I.S.). Fandango Pass, ♂, VII-6-50 (H. E. Cott, U.C.D.).

MONO CO.: Mono Lake, ♀, VII-22-11 (J. M. Aldrich, I.U.); ♀, VI-17-17 (C. L. Fox, C.A.S.).

MONTEREY CO.: Paraiso Springs, ♀, V-12-34 (L. S. Slevin, C.A.S.); ♂, IV-8-39 (E. C. Van Dyke, C.A.S.). Pacific Grove, 11♂, IX-(4 to 16)-20 (F. E. Blaisdell, C.A.S.); ♀ (Mann, M.C.Z.). Spreckles, ♀, VI-21-39 (L. S. Slevin, C.A.S.).

NAPA CO.: Mt. St. Helena, ♀, V-12-26 (M. C. Van Duzee, C.A.S.); ♀, VIII-13-50 (J. E. Gillaspy).

NEVADA CO.: Hobart Mills, 7 mi. N., 4♂, VIII-26-48 (M. A. Cazier, C.I.S.); 5♂, same data (P. D. Hurd, Jr., C.I.S.); 4♂, same data (E. G. Linsley, C.I.S.); 4♂, same data (J. W. MacSwain, C.I.S.); 4♂, same data (R. F. Smith, C.I.S.).

ORANGE CO.: Anaheim, ♀, VIII-19-25 (P. H. Timberlake, U.C.R.). Irvine, ♂, IX-20-26 (A. J. Basinger, U.C.R.). Yorba Linda, ♂, VIII-15-20 (P. H. Timberlake, U.C.R.); 4♂, 2♀, X-3-26 (P. H. Timberlake, U.C.R.). Laguna Beach, 4♂, VIII-7-36 (P. H. Timberlake, U.C.R.). Costa Mesa, 2♀, VIII-2-39 (P. D. Hurd, Jr., C.I.S.). Orange, ♀, August (T. D. A. Cockerell, C.U.).

PLACER CO.: Dutch Flat, ♀, VI-28-38 (I. McCracken, C.A.S.); ♂, ♀, VIII-25-48 (R. F. Smith, C.I.S.). Lake Tahoe, ♀, VII-21-97 (H. C. Fall, M.C.Z.); ♂, 12♀, VII-(12 to 26)-49 (E. G. Linsley, C.I.S.).

PLUMAS CO.: Meadow Valley, 3500-4000 ft., 4♂, 4♀, VI-12 to VII-6-24 (E. C. Van Dyke, C.A.S.). Bucks Lake, ♀, VI-23-49 (J. N. Simons, C.I.S.); ♀, same data (L. L. Jensen, C.I.S.). Lake Almanor, ♀, VII-8-49 (P. D. Hurd, Jr., C.I.S.); ♀, same data (E. G. Linsley, C.I.S.). Quincy, 4 mi. W., 2♀, VI-22-49 (P. D. Hurd, Jr., C.I.S.); ♀, VI-21-49 (J. N. Simons, C.I.S.); ♀, VI-30-49 (F. Morishita, C.I.S.); ♂, VII-1-49 (J. W. MacSwain, C.I.S.).

RIVERSIDE CO.: Riverside, 59♂, 48♀, March - December, 1923-1950 (P. H. Timberlake, U.C.R.). Tahquitz Canyon, ♀, VI-30-28 (E. C. Van Dyke, C.A.S.). Tahquitz Valley, 3♂, VII-23-28 (P. H. Timberlake, U.C.R.). Keen Camp, ♂, ♀, VI-(6 to 12)-17 (E. P. Van Duzee, C.A.S.); ♂, VI-1-39 (E. S. Ross, C.I.S.). Idyllwild, ♀, VII-14-32 (P. H. Timberlake, U.C.R.); ♂, VII-22-33 (P. H. Timberlake, U.C.R.); 2♂, V-10-39 (E. G. Linsley, C.I.S.); ♂, VI-4-39 (E. S. Ross, C.I.S.); ♂, VI-8-39 (E. S. Ross, C.I.S.); ♂, VI-9-39 (E. G. Linsley, C.I.S.); ♂, VI-10-39 (E.

G. Linsley, C.I.S.); 2♂, VI-19-40 (E. G. Linsley, C.I.S.). Pinon Flat, ♂, V-24-39 (E. G. Linsley, C.I.S.); ♂, same data (E. S. Ross, C.I.S.); ♂, VII-29-46 (P. D. Hurd, Jr., C.I.S.). Stone Creek, San Jacinto Mts., ♂, VI-21-40 (E. G. Linsley, C.I.S.); ♂, same data (P. H. Timberlake, U.C.R.). Hemet, ♂, ♀, VII-24-46 (J. W. MacSwain, C.I.S.); 3♂, VII-28-46 (J. W. MacSwain, C.I.S.). Hemet Reservoir, San Jacinto Mts., ♀, V-22-39 (E. S. Ross, C.I.S.). Corona, 4♂, IX-1920 (C.I.S.). Santa Rosa Peak, ♂, VI-8-40 (P. H. Timberlake, U.C.R.). Palm Springs, ♀, XI-13-45 (P. H. Timberlake, U.C.R.). The Gavilan, ♂, ♀, VI-9-50 (P. H. Timberlake, U.C.R.). Whitewater, ♀, X-10-33 (C. M. Dammers, U.C.R.); ♀, X-27-34 (P. H. Timberlake, U.C.R.). Blythe, ♀, X-16-34 (C. M. Dammers, U.C.R.). Pine Cove, San Jacinto Mts., ♂, ♀, VI-3-39 (E. G. Linsley, C.I.S.).

SACRAMENTO CO.: Sherman Island, 6♂, ♀, X-16-25 (E. C. Van Dyke, C.A.S., C.I.S.); 4♂, same data (F. H. Wymore, U.C.D.). Rio Vista, 3 mi. S., ♀, VI-24-49 (C. D. MacNeill, C.I.S.).

SAN BERNARDINO CO.: South Fork Camp, San Bernardino Mts., 6200 ft., 2♂, IX-10-44 (P. H. Timberlake, U.C.R.); ♂, IX-11-44 (P. H. Timberlake, U.C.R.). Big Pines Camp, 9♂, 13♀, VII-12-27 to VIII-22-44 (P. H. Timberlake, U.C.R.). Big Bear Valley, 6♂, 2♀, VIII-(7 to 13)-33 (P. H. Timberlake, U.C.R.). Victorville, ♂, 4♀, X-23-27 (P. H. Timberlake, U.C.R.). Victorville, 12 mi. N., ♂, 4♀, X-29-32 (P. H. Timberlake, U.C.R.). Adelanto, ♀, X-27-32 (P. H. Timberlake, U.C.R.). Mill Creek, San Bernardino Mts., ♀, V-30-38 (U.C.R.). Mill Creek Canyon, San Bernardino Mts., 5♂, IX-21-23 (E. P. Van Duzee, C.A.S.). Valley of the Falls, San Bernardino Mts., ♂, VIII-11-35 (P. H. Timberlake, U.C.R.). Trail to Dobbs Cabin, San Bernardino Mts., 7000 ft., 2♂, VIII-2-36 (P. H. Timberlake, U.C.R.). Deep Creek, ♂, ♀, IV-28-36 (E. G. Linsley, C.I.S.); ♂, ♀, V-5-36 (P. H. Timberlake, U.C.R.). San Bernardino, ♂, IV-26-36 (E. G. Linsley, C.I.S.). Cajon, 2♂, VII-24-30 (T. F. Winburn & R. H. Painter, K.S.C.). Forest Home, ♂, VI-18-28 (E. C. Van Dyke, C.A.S.); 3♂, 6♀, VI-20-28 (E. C. Van Dyke, C.A.S.). Idlewild, ♂, VI-24-28 (E. C. Van Dyke, C.A.S.); ♂, VII-7-28 (E. C. Van Dyke, C.A.S.); ♀, VII-9-28 (E. C. Van Dyke, C.A.S.). Bear Valley, ♀, VI-1-28 (E. C. Van Dyke, C.A.S.). Colton, ♀, V-(26 to 28)-17 (E. P. Van Duzee, C.A.S.). Arrowhead, ♀, VI-3-28 (E. C. Van Dyke, C.A.S.). Morongo, 3♀, IX-26-44 (P. H. Timberlake, U.C.R.). Morongo Valley, 2♀, X-5-34 (P. H. Timberlake, U.C.R.). Mojave River at Apple Valley, ♂, VI-29-40 (P. H. Timberlake, U.C.R.). Beal, ♂, IV-13-49 (P. H. Timberlake, U.C.R.). Santa Ana River, San Bernardino Mts., ♂, VIII-20-49 (P. H. Timberlake, U.C.R.).

SAN DIEGO CO.: Encinitas, ♂, VI-28-34 (T. D. A. Cockerell, U.C.R.); 9♂, ♀, same data (P. H. Timberlake, U.C.R.); 3♂, V-1934 (I. McCracken, C.A.S.). Poway, ♂ (F. E. Blaisdell, C.A.S.). Borego Valley, ♀, III-26-33 (P. H. Timberlake, U.C.R.). Warner's Ranch, ♂, ♀, X-11-43 (T. D. A. Cockerell & Wylie, U.C.R.). Julian, ♂, IX-19-49 (R. A. Flock, U.C.R.). Mt. Laguna, 14♂, VII-16-50 (D. Cox, C.I.S.). Jacumba, ♂, VIII-12-17 (W. M. Wheeler, M.C.Z.). Warrens, ♂, ♀, VIII-14-17 (W. M. Wheeler, M.C.Z.).

SAN FRANCISCO CO.: San Francisco, ♀, IX-9-18 (C. L. Fox, C.A.S.); ♀, IX-25-21 (C. L. Fox, C.A.S.); ♂, VIII-13-22 (C. L. Fox, C.A.S.); 3♂, ♀, IX-2-22 (C. L. Fox, C.A.S.). Lake Merced, ♂ (J. E. Cottle, C.A.S.). Lone Mt., ♀, VII-1-22 (F. X. Williams, U.C.R.).

SAN JOAQUIN CO.: Stockton, ♂, 2♀, IX-20-30 (C.I.S., U.C.D.). Corral Hollow, ♂, X-27-46 (G. E. Bohart, C.I.S.). Tracy, 3♂, VI-13-49 (J. W. MacSwain, C.I.S.); 3♂, VI-21-49 (R. F. Smith, C.I.S.); ♀, VIII-1-49 (P. D. Hurd, Jr., C.I.S.).

SAN LUIS OBISPO CO.: San Luis Obispo, ♂, VI-1938 (I. McCracken, C.A.S.). Paso Robles, 2♂, V-22-28 (L. S. Slevin, C.A.S.). Morro Bay, 2♀, VI-17-50 (E. I. Schlinger, U.C.D.).

SAN MATEO CO.: Millbrae, ♂, IX-11-12 (F. E. Blaisdell, C.A.S.); ♂, IX-9-22 (C. L. Fox, C.A.S.). San Bruno Hills, ♂, IX-29-12 (E. C. Van Dyke, C.A.S.). Menlo Park, ♀, VII-19-37 (F. X. Williams, U.C.R.).

SANTA BARBARA CO.: Santa Barbara, ♀, VIII-13-29 (F. E. Blaisdell, C.A.S.).

SANTA CLARA CO.: Mt. Hamilton, ♂, VI-20-22 (S. E. Flanders, C.I.S.); 2♂, V-25-50 (P. D. Hurd, Jr., C.I.S.); ♀, same data (E. G. Linsley, C.I.S.); ♂, ♀, same data (J. W. MacSwain, C.I.S.). San Antonio Valley, 2♀, IX-14-48 (P. D. Hurd,

Jr., C.I.S.). Stanford University, ♂, IX-14-09 (N. Banks, M.C.Z.).

SANTA CRUZ CO.: Capitola, 4♂, VIII-18-35 (P. H. Timberlake, U.C.R.).

SHASTA CO.: Shingletown, ♀, VI-2-41 (P. D. Hurd, Jr., C.I.S.); ♀, same data (C. D. Michener, C.I.S.); ♂, VI-7-41 (P. D. Hurd, Jr., C.I.S.). Hat Creek, ♀, VI-4-41 (C. D. Michener, C.I.S.); ♀, VI-5-41 (P. D. Hurd, Jr., C.I.S.). Hat Creek, 4 mi. S., ♀, VI-11-41 (C. W. Anderson, C.I.S.).

SIERRA CO.: Gold Lake, ♂, 5♀, VII-12 to VIII-24-21 (C. L. Fox, C.A.S.). Calpine, 3♂, VIII-27-48 (E. G. Linsley, C.I.S.); ♂, same data (R. F. Smith, C.I.S.). Sierraville, ♂, VIII-26-48 (P. D. Hurd, Jr., C.I.S.); 5♂, same data (E. G. Linsley, C.I.S.); 12♂, same data (J. W. MacSwain, C.I.S.); 6♂, same data (R. F. Smith, C.I.S.).

SISKIYOU CO.: Dunsmuir, 4♂, IX-7-41 (E. C. Van Dyke, C.A.S.). Sisson, 4♂, VII-26-30 (H. F. Wickham, C.A.S., M.C.Z.).

SONOMA CO.: Sobre Vista, ♂, IX-10-10 (J. A. Kusche, C.A.S.).

STANISLAUS CO.: Adobe Creek, ♂, IX-19-48 (P. D. Hurd, Jr., C.I.S.). Patterson, ♂, VI-22-49 (T. F. Leigh, C.I.S.).

TRINITY CO.: Big Flat, Coffee Creek, ♀, VI-21-24 (E. C. Van Dyke, C.A.S.). Carrville, ♀, V-22-34 (G. E. Bohart, U.C.D.).

TULARE CO.: Alta Meadows, 9100 ft., Giant Forest, ♀, VII-19-28 (C. L. Fox, C.A.S.); 2♂, ♀, IX-3-32 (P. H. Timberlake, U.C.R.). Mineralking, 3♀, VII-31-23 (C. L. Fox, C.A.S.). Redwood Meadows, ♂, VIII-3-23 (C. L. Fox, C.A.S.). Porterville, 3♀, XI-9-25 (E. C. Van Dyke, C.A.S.). Potwisha, Sequoia National Park, ♂, V-17-29 (E. C. Van Dyke, C.A.S.); 3♀, VII-26-30 (T. F. Winburn & R. F. Painter, K.S.C.). Bird Lake, 18♂, VIII-21-32 (I. McCracken, C.A.S.). Lindsay, ♂, IX-6-32 (P. H. Timberlake, U.C.R.). Wood Lake, ♀, V-25-47 (N. W. Frazier, C.I.S.).

TUOLUMNE CO.: Twain-Harte, 117♂, ♀, VII-1937 (F. E. Blaisdell, C.A.S.). Sonora Pass, ♂, VII-20-39 (I. McCracken, C.A.S.). Pinecrest, 7♂, 3♀, VIII-4-48 (P. D. Hurd, Jr. & J. W. MacSwain, C.I.S.).

VENTURA CO.: Saticoy, ♀, VII-24-27 (T. Craig, C.A.S.). Santa Paula, ♂, (E. O. Essig, C.I.S.); ♀, VII-3-36 (C.I.S.); 2♂, VII-13-31 (C.I.S.). Ojai, 13 mi. N., ♂, ♀, XI-12-50 (P. H. Timberlake, U.C.R.). Sespe Canyon, ♂, VI-4-26 (C.I.S.).

YOLO CO.: Davis, ♀, VIII-7-49 (C. D. MacNeill, C.I.S.). Putah Canyon, 2♂, V-30-49 (H. E. Cott, U.C.D.).

Discussion:

The subgenus *Melectomorpha* is represented in North America by two species, *viz.*, *californica* and *interrupta*. Only the former is known to occur in California, but since *interrupta* is known to occur as far west as Globe, Arizona and since its distribution is apparently largely contained within that of *californica*, the distributions of these two species have been presented in map 5.

In *californica* the propodeal spiracle is bounded posteriorly by an elevated rugose ridge which near the summit of the spiracle becomes strongly carinate and unites with the anterior spiracular lip. The area between the ridge and the posterior lip of the spiracle is glabrous and shiny. The propodeal spiracles of *interrupta*, like those of *larreae*, are without this modification. The forewings of *californica* are mottled with brown while those of *interrupta* are uniformly infuscated with brown except for a small hyaline spot at the apex of the third discoidal and third submarginal cells. The undersurfaces of the coxae and the posterior face of the propodeum are white pubescent in *californica* and black pubescent in *interrupta*. Many specimens of *interrupta* display a yellowish tinge to the pale thoracic vestiture, and this condition is even more pronounced in specimens from the southwestern portions of its geographic range. In *californica* the mesonotal punctures immediately adjacent to the anterior portion of the mesonotal line are separated by approximately their diameter with the interspaces glabrous and shiny. Those of *interrupta* are nearly confluent with each other and the mesonotal line and are therefore without glabrous or shiny areas. The area immediately posterior to the ocelli is frequently devoid of sculpture and appears shiny in bright light in *interrupta* while in *californica* this area is never without puncturation. The females of *californica* possess acute scutellar tubercles and the pygidial plate is elongate triangular. In *interrupta* the scutellar tubercles are short and rounded and the pygidial plate is more broadly triangular. The gonostylus of *californica* males is short, scarcely longer than broad

and is nearly triangular in outline while that of *interrupta* is long and nearly parallel-sided.

We have been unable to distinguish *rociadensis* from *interrupta* and regard it as a synonym of that species.

Californica (as herein understood) apparently contains a number of incipient differentiation units which have thus far defied definition. Several of these have been recognized and named in the past. *Miranda* was proposed by Fox (1893: 143) for large specimens occurring in the eastern portions of the range of *californica*. *Pasadenensis* was characterized by Cockerell as a distinct species and so recognized by Linsley (1939: 457), primarily on the basis of colorational differences exhibited by the vestiture. Linsley, *loc. cit.*, has observed that it occurs along the Pacific Coast and flies in the spring, and is also larger than characteristic specimens of *californica*. However, a review of these forms has failed to reveal any consistent or segregable differences. In absence of geographic correlation of size or color we can see no useful purpose for maintaining these names.

Michener (1948: 17) has reported the capture of *californica* as far south as Fresnillo, Zacatecas, Mexico.

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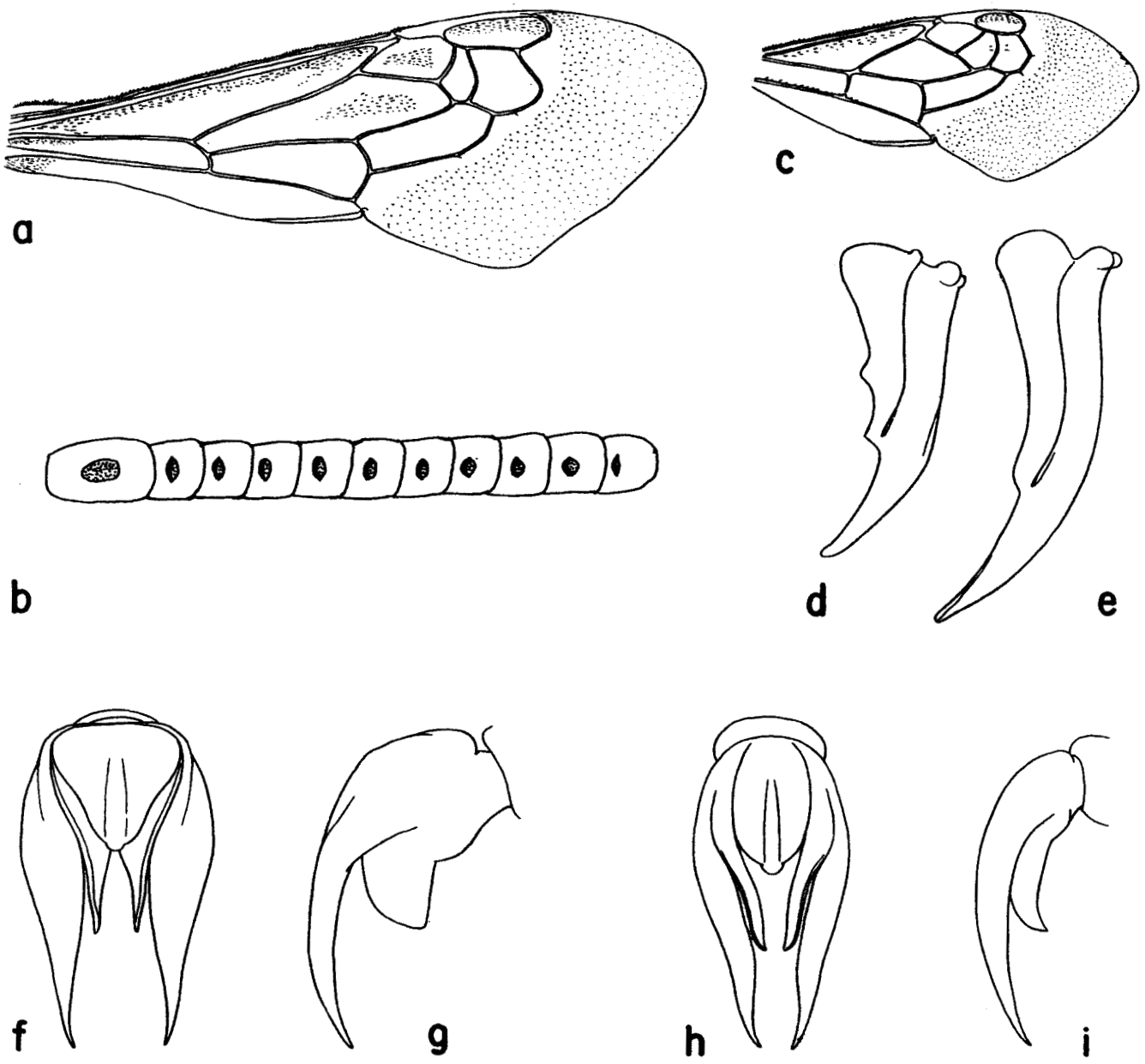
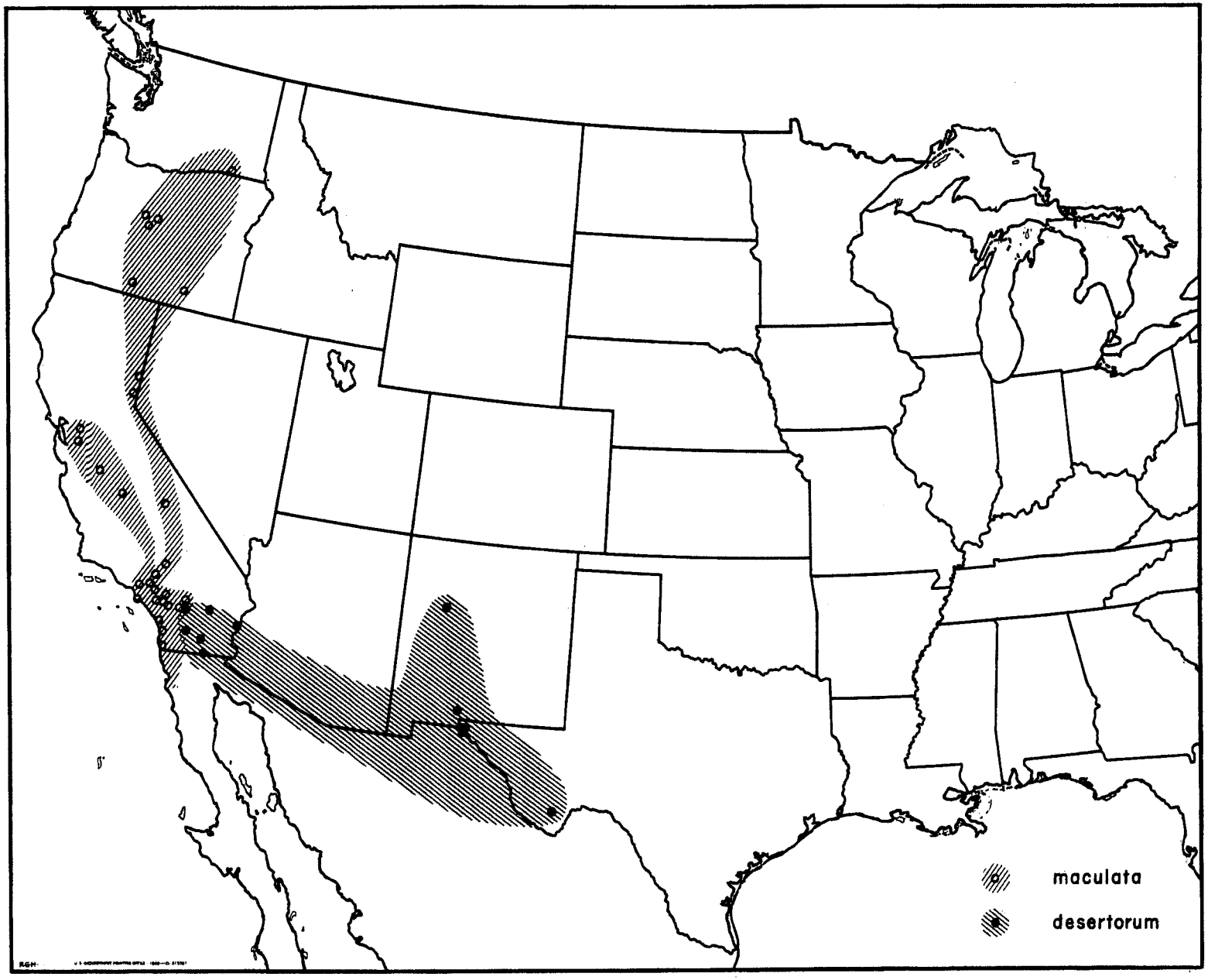
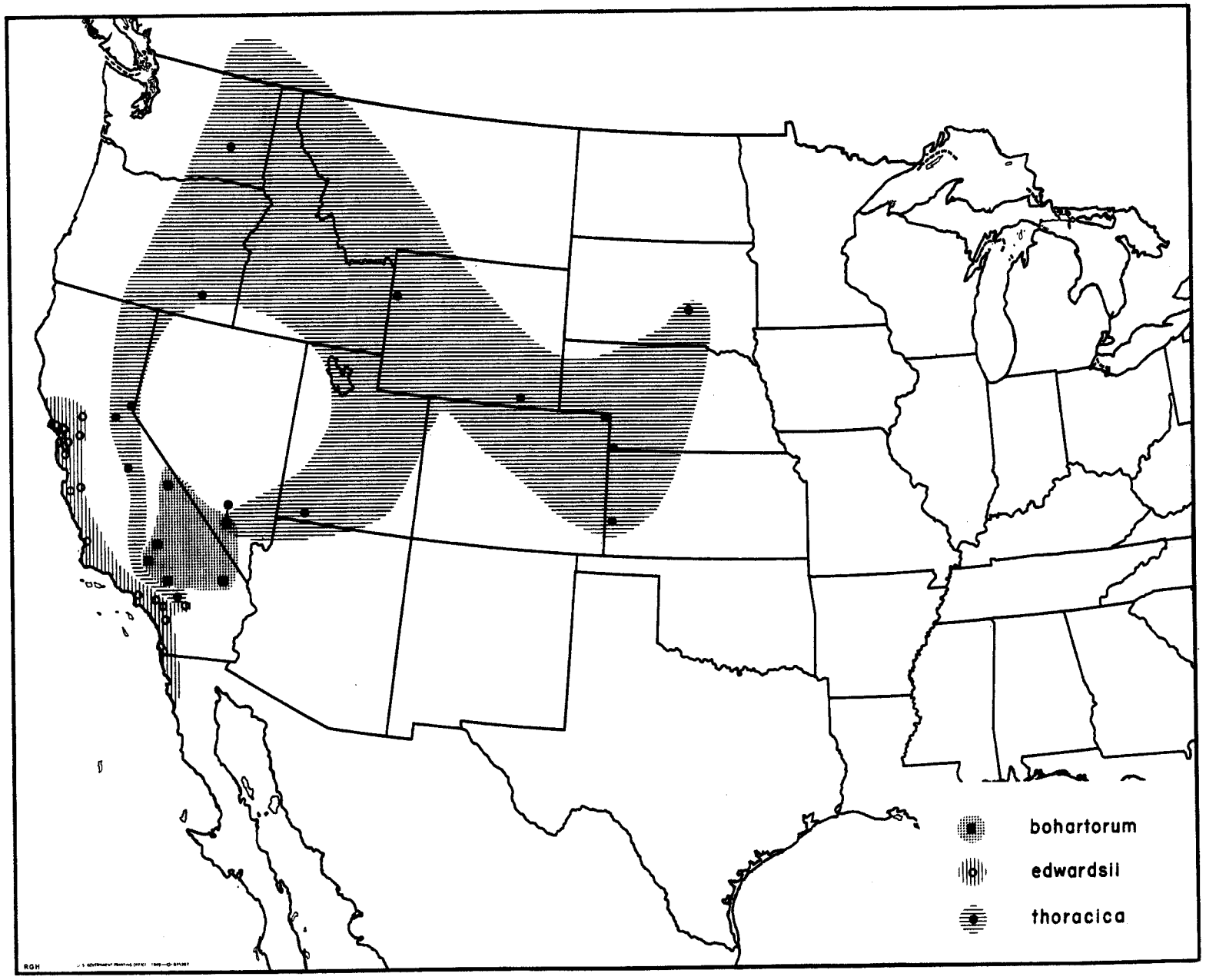


Plate 11

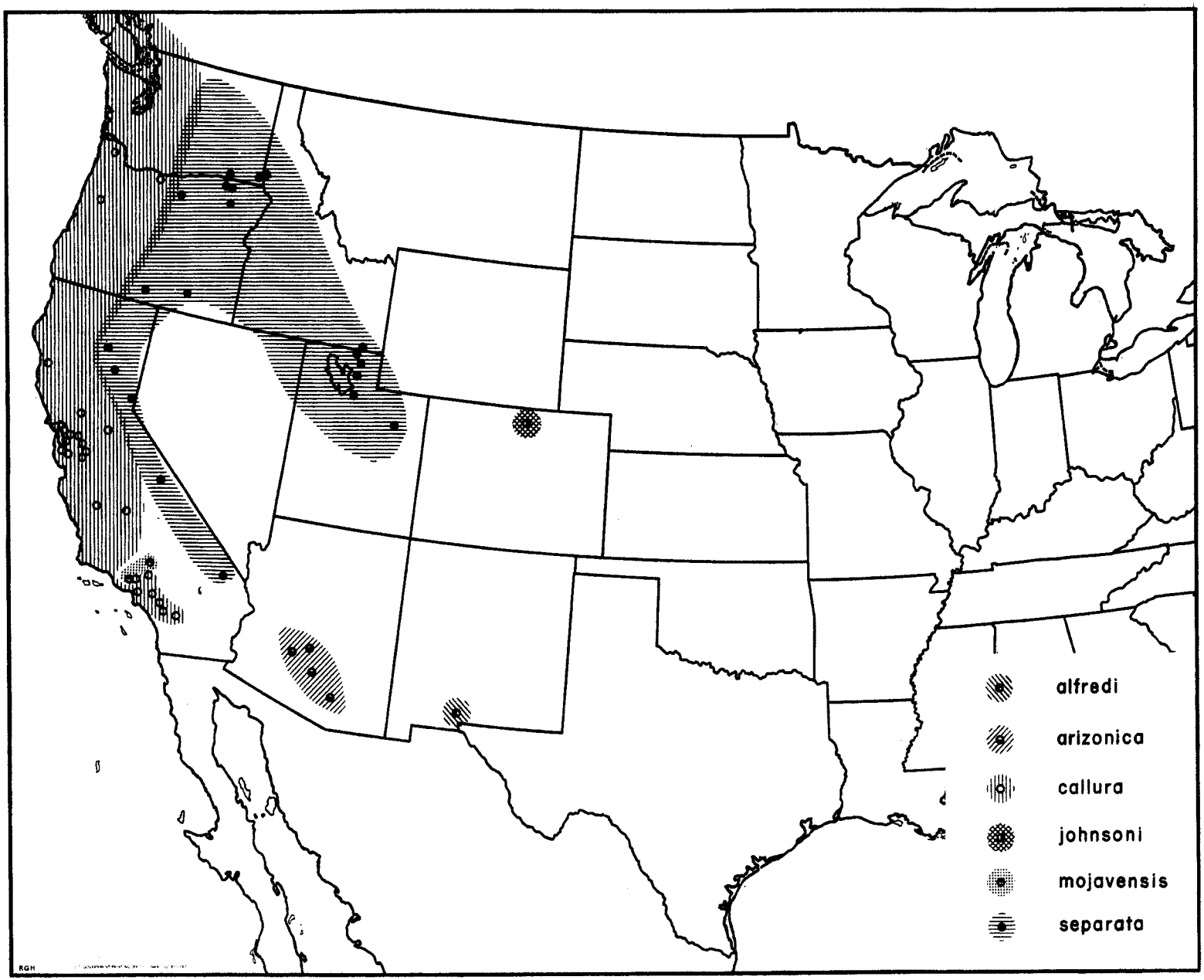
Melectine bees. a, forewing of *Melecta*; c, forewing of *Zacosmia*; b, flagellum of *Xeromelecta (Melectomorpha) californica* as seen from below; d, left mandible of *Xeromelecta (Melectomorpha)*; e, left mandible of *Melecta*; f, g, hind tarsal claws of *Xeromelecta (Melectomorpha)*; h, i, hind tarsal claws of *Melecta*.



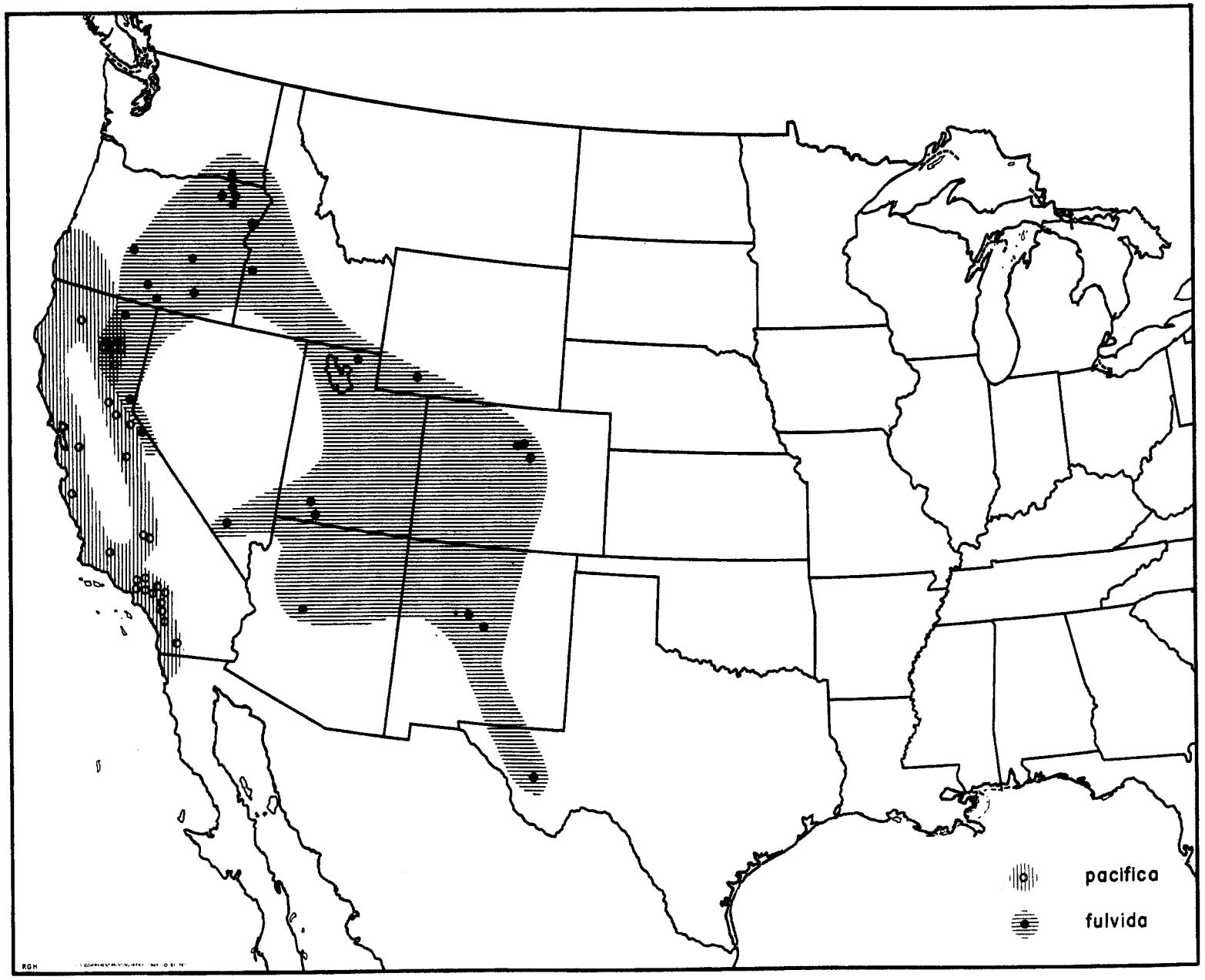
Map 1. Distribution of *Zacosmia maculata* (Cresson).



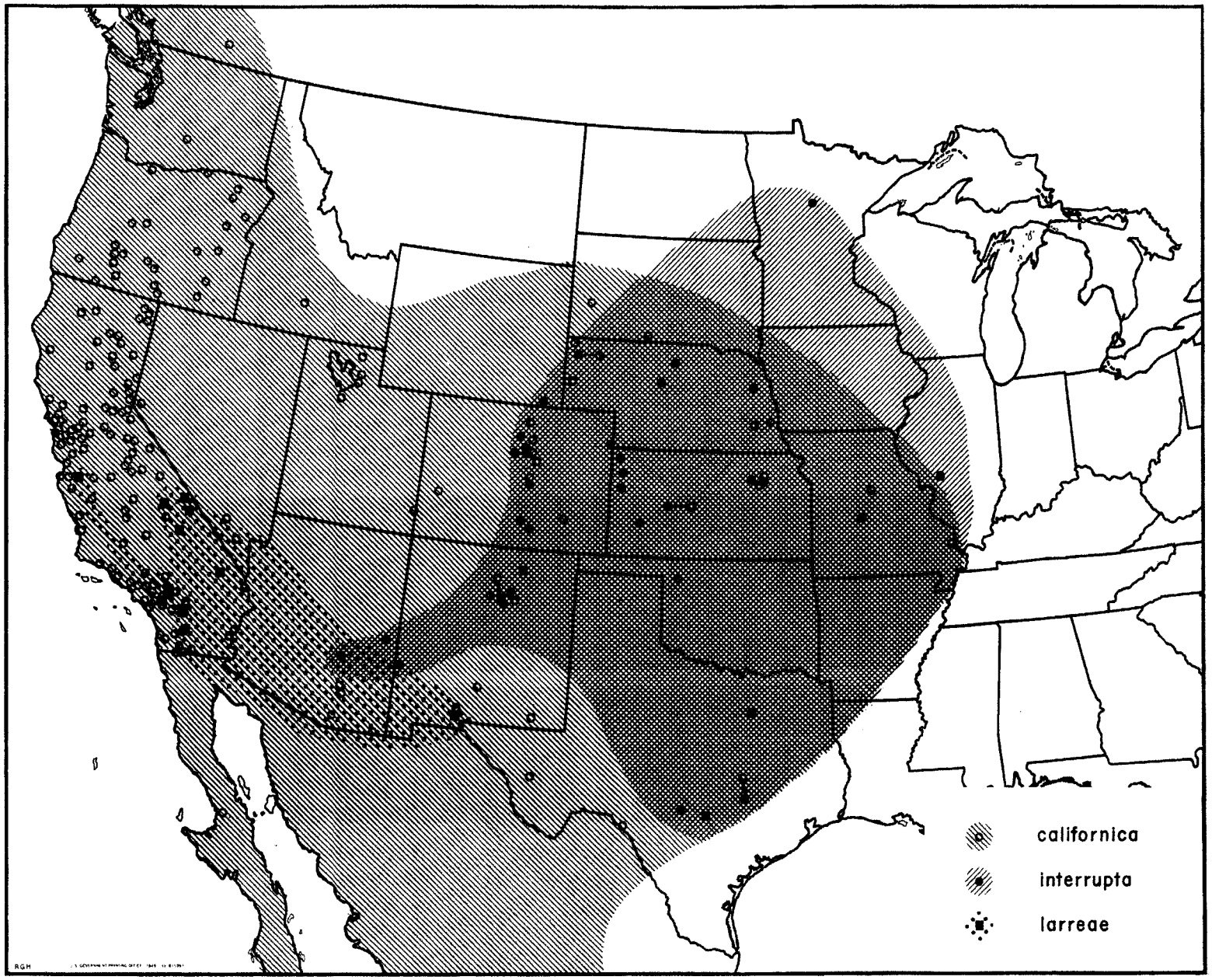
Map 2. Distribution of *Melecta bohartorum* Linsley, *Melecta edwardsii* Cresson and *Melecta thoracica* Cresson.



Map 3. Distribution of *Melecta separata* Cresson.



Map 4. Distribution of *Melecta pacifica* Cresson.



Map 5. Distribution of *Xeromelecta (Xeromelecta) larreae* (Cockerell), *X. (Melectomorpha) californica* (Cresson) and *X. (Melectomorpha) interrupta* (Cresson).