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(Lepidoptera, Geometridae)

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A Revision of the Moth Genus *Hesperumia* (Lepidoptera, Geometridae)

FREDERICK H. RINDGE¹

ABSTRACT

The genus *Hesperumia* is revised for the first time; *Ultralcis* is placed as a synonym. Three previously named species are included and re-described: *sulphuraria* Packard, *latipennis* (Hulst), and *fumida* (Warren). One heretofore unrecognized species is described; the name *fumosaria* Comstock is available for it. This species is divided into two subspecies: nominate *fumosaria* from southern California and northern

Baja California; and *fumosaria impensa* occurring in central California, southwestern Oregon, and western Nevada, described as new. Keys and photographs are presented for the adults and male and female genitalia. All four species occur in western North America, with one species extending across the northern United States and southern Canada and ranging in the east from Nova Scotia to Virginia.

INTRODUCTION

Until now *Hesperumia* has been a monotypic genus containing one variable and widespread species. Part of the supposed variability, at least in California, was due to the presence of a second, unrecognized species. I compared the two species included in *Ultralcis* with those of *Hesperumia* and found them to be congeneric; consequently *Ultralcis* is placed as a synonym of the older generic name. In the present paper I revise *Hesperumia*, describe and illustrate all the species, and discuss briefly relationships with other genera.

Hesperumia was placed as an "abnormal" genus of the Boarmiini by Forbes (1948, p. 20). This tribe, as defined by Forbes, includes most of the genera included in McDunnough's revision of

the Cleorini (1920); McDunnough named *Ultralcis* in that study but did not include *Hesperumia*.

Hesperumia appears to be related to the New World species of *Serraca* Moore (= *Pseudoboarmia* McDunnough; Rindge, 1973.) Points of similarity between the two genera include the antennae (relatively few segments, the nature of the pectinations, and their origin from the middle to distal portion of the segments), venation (R_{1+2} tending to be connected with Sc in *Serraca*, Sc and R_1 anastomosed partly or completely in *Hesperumia*), the male genitalia (saccular ridge and median area of setae, aedeagus with two posterior thickenings), and the female genitalia (very long apophyses posteriores, the similarity of sterigma, reduced ductus bursae, and slender corpus bur-

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sae). Another possible similarity is found in the male genitalia; *Serraca* has a paired posterior process of the tegumen that terminates in a group of elongate, ventrally curving setae extending posteriad of the uncus (Rindge, 1973, figs. 11-14). In *Hesperumia*, two of the four species have a swelling at the base of the costa bearing very long, ventrally curving setae that also extend posteriad of the uncus. *Serraca* and *Hesperumia* may be separated by the shorter male antennal pectinations in the latter genus, by the different forewing venation, and by the genitalia. The members of *Hesperumia* have, in the male, a much more strongly developed sacculus ridge, and a different configuration of the aedeagus; in the female, a longer apophyses anteriores and the presence of a prominent signum.

A bibliographical problem arises when *Hesperumia* is cited. Apparently Packard published this name twice within a period of about six months and there is no obvious way to tell which was issued first. On page 79 of the Fifth Annual Report . . . of the Peabody Academy of Science, with a title page date of 1873, Packard wrote "*Hesperumia* nov. gen.: *sulphuraria*, n. sp.," and that "this genus will be characterized in the Proc. Bost. Soc. Nat. Hist. for May, 1873." In the latter publication, on page 37, both "*Hesperumia* n. gen." and "*Hesperumia ochreata* n. sp." are described separately; the title page for volume 16, containing the above, is dated 1874. The only internal evidence for any actual dates for either publication is found on page 33 of the Boston serial where November, 1873, is given for the appropriate signature; probably this indicates when the printer set the type.

A check of the literature shows that: Packard (1876) listed both publications as 1874, giving the Boston publication for the generic description but the Peabody one for both species (he synonymized *ochreata* with *sulphuraria* in 1876). Henshaw (1887) cited both papers as 1873, giving the Boston one first; Cockerell (1920) followed him. Heider (1932) did the same, with the notation that the name in the Peabody publication is a "nom. nud." (*nomen nudum*). Both Dyar ("1902" [1903]) and Neave (1939) reversed the above order of publications but retained 1873; the latter author did not retain Heider's notation. It can be seen that there is no

uniformity of application of the citations, thus indicating a lack of solid evidence as to actual dates of publication. The only comment on the above summary is that Heider was incorrect in applying the term *nomen nudum*; Packard's generic name qualifies as being validly published under the provisions of the present Code, Article 16 (a) (vi).

Fortunately, reprints (?preprints) have been located that bear what are assumed to be the dates of publication. In the files of both the Department of Entomology, the American Museum of Natural History, and the Library of the Museum of Comparative Zoology, are copies of the Peabody article stating that it was "Published, July, 1873." The above-mentioned library has a copy of the article in the Boston serial dated December, 1873, on the title page. I am accepting these dates as being as accurate as we can ascertain, a little over a century after the papers were published.

Taxonomically, *Hesperumia* has contained only a single species, *sulphuraria*, until now. That species has long been recognized as widespread and extremely variable in maculation; the more common varieties have all been named. A careful study of these moths in California has shown that two species occur there; they can usually be separated by maculation but it may be necessary in some cases to study the genitalia, which are distinct in both sexes. Both species fly together throughout California, having been caught at the same localities and at the same time; the larvae of both feed on several of the same genera of plants. Normally both these species have the wings with a yellow upper surface; one species is known to have an all brown form.

The two included species of *Ultracis* are brown or grayish brown and present quite a different appearance from the yellow moths of *Hesperumia*. However, study demonstrated that the members of *Ultracis* do not show any differences that I consider to be of generic value. There are slight venational differences, but these are not necessarily constant within any of the species; in the male genitalia both species lack the tuft of setae at the base of the valve found in *Hesperumia*. Perhaps the most surprising result is that the aedeagi of the species of *Ultracis* appear as a mirror image of those structures in *Hesperu-*

mia. The posterior half of this structure consists of two slender, separate, and heavily sclerotized "arms"; in *Hesperumia* the left is longer and has a median tooth, whereas in *Ultralcis* the right possesses the tooth. The female genitalia of both groups are very similar. Consequently, I am placing *Ultralcis* as a synonym of the older name, *Hesperumia*.

During the course of this study, I have examined 3030 specimens (1739 males, 1291 females), including the primary types of all names present in this country. In addition, I have studied 75 genitalic dissections (50 males, 25 females); I prepared all but 23 of these.

I took all the photographs in this revision. Whenever possible, I used material from the collection of the American Museum of Natural History; some of the adults are from other collections and are specifically noted as such. The following abbreviations have been used:

AMNH, the American Museum of Natural History

LAM, the Natural History Museum of Los Angeles County, California

MCZ, Museum of Comparative Zoology, Harvard University

Acknowledgments

For their cooperation and aid I thank the following colleagues who have allowed me to study the types and specimens in their charge, and who have been kind enough to furnish information from their collections: Dr. P. H. Arnaud, Jr., of the California Academy of Sciences; Dr. J. M. Burns of the Museum of Comparative Zoology, Harvard University; Mr. H. K. Clench of the Carnegie Museum, Pittsburgh; Dr. C. V. Covell, Jr., of the University of Louisville, Kentucky; Mr. J. P. Donahue of the Natural History Museum of Los Angeles County; Dr. D. C. Ferguson of the Systematic Entomology Laboratory, United States Department of Agriculture, for the National Museum of Natural History, Smithsonian Institution; Dr. W. C. McGuffin of the Department of the Environment, Canadian Forestry Service, for the Canadian National Collection; and Mr. R. H. Leuschner of Manhattan Beach, California.

I am also grateful to Ruth E. Hill, the Librarian

at the Museum of Comparative Zoology, who was most helpful in supplying me with bibliographic information.

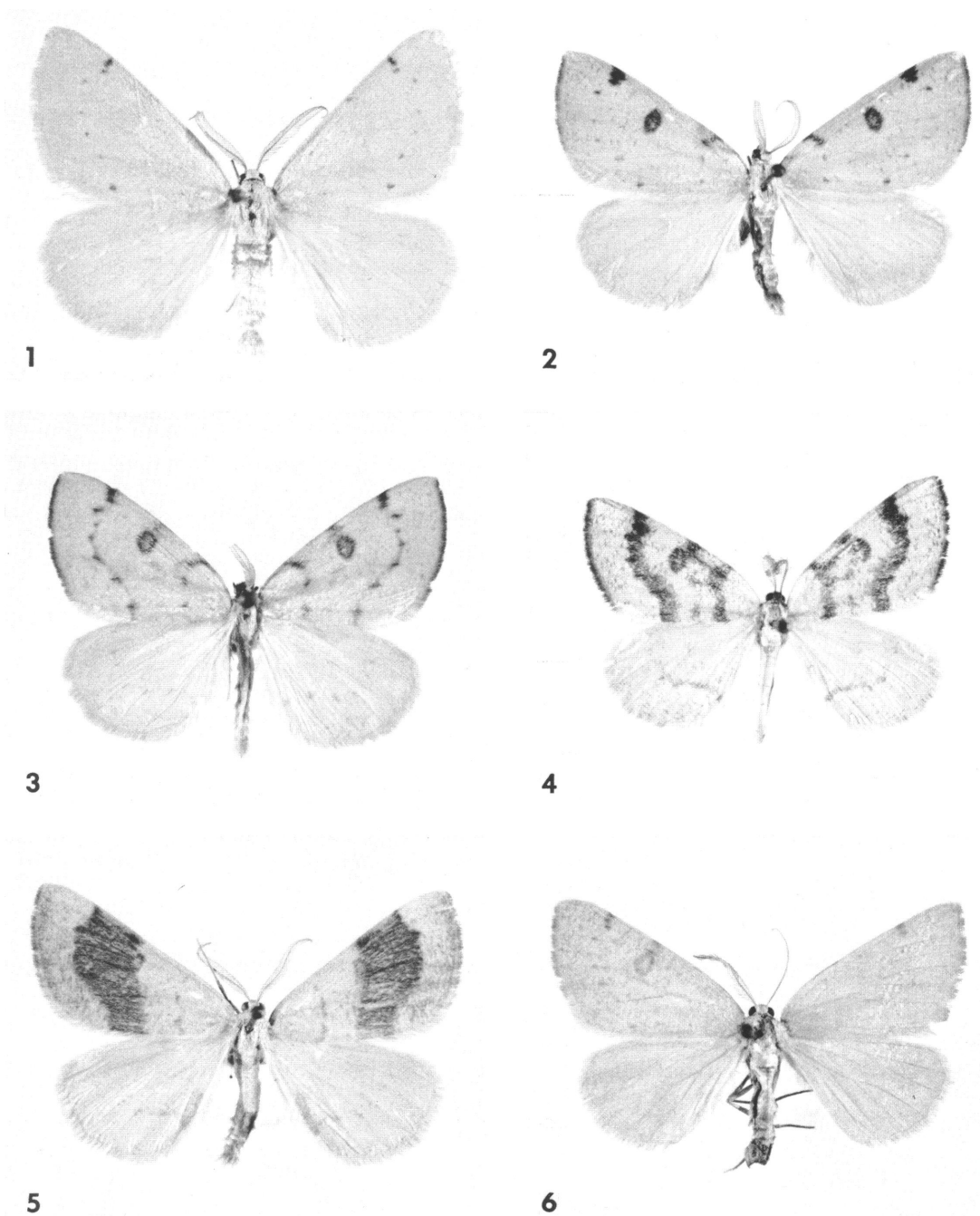
GENUS *HESPERUMIA* PACKARD

Hesperumia Packard, 1873a, p. 79; 1873b, p. 37; 1876, p. 476 (placed as synonym of *Opisthograptis* Hübner). Hulst, 1896, p. 344 (as synonym of *Alcis* Curtis). Dyar, "1902" [1903], p. 320 (as synonym of *Alcis*). Barnes and McDunnough, 1917, p. 113 (as valid genus). McDunnough, 1938, p. 161. Forbes, 1948, p. 51.

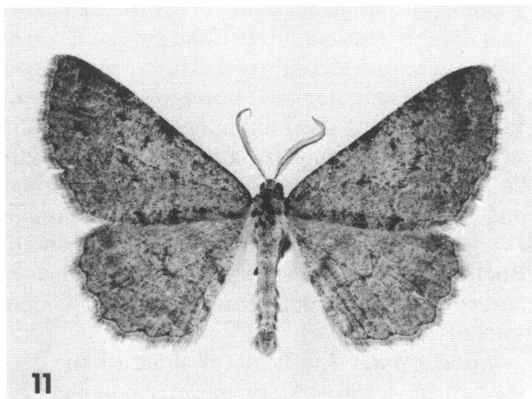
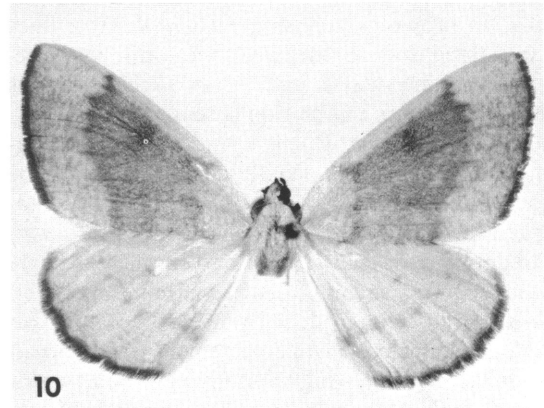
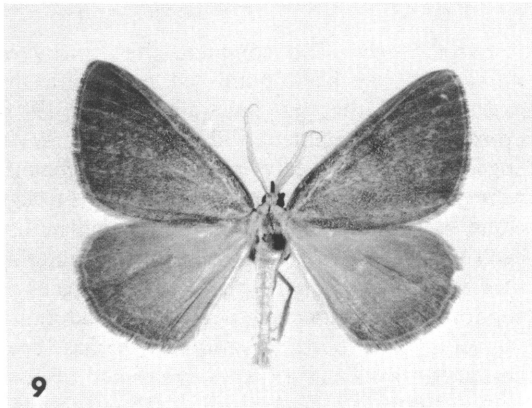
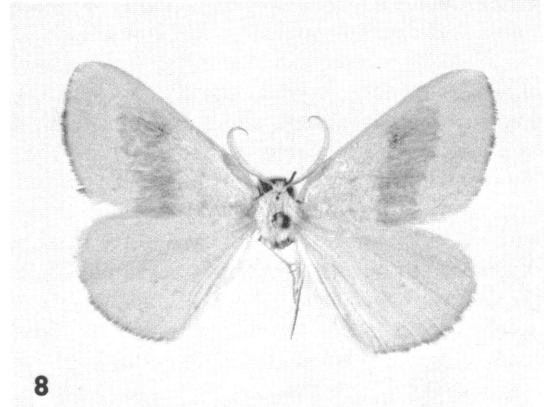
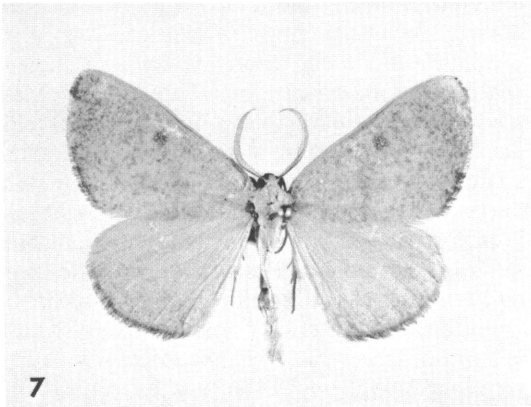
Ultralcis McDunnough, 1920, p. 21. NEW SYNONYM.

Diagnosis. The members of this genus can be recognized by the antennae of the male being bipectinate, with the pectinations arising distally on their basal segments, and by the relatively low number (42 to 53) of segments, by veins Sc and R₁ being partly or completely united, and by the genitalia. The male structures have a prominent saccular ridge, the median area has a few large setae on the inner face of the valve, and the posterior half of the aedeagus consists of two heavily sclerotized "arms"; the female structures have very long apophyses, a reduced ductus bursae, and a well-developed signum.

Adult. Head with eyes of male large, round, wider than front, of female of equal size or smaller than those of male; front flat, extending short distance in front of eyes; tongue present; palpi short, alike in both sexes, barely reaching front; antennae with from 42 to 53 segments, of male bipectinate, with pectinations arising distally, in length 3.0 to 4.5 times as long as basal segments, longest pectinations 0.4 to 1.1 mm. in length, terminal five to nine segments simple, shaft and pectinations scaled, latter with two rows of setae ventrally; antennae of female simple, serrate, or very shortly bipectinate. Thorax slender, without tufts; fore tibia unarmed, with process of male arising just basad of middle, of female distad of middle; hind tibia with two pairs of spurs in both sexes, males with small hair pencil. Abdomen slender and elongate, without tufts; males with broad, slightly curved band of elongate, slender scalelike setae on ventral surface of third segment, and last segment without modification.



FIGS. 1-6. Adults of *Hesperumia sulphuraria* Packard. 1. Male, Upper Santa Ana River, California, June 12, 1949 (G. H. and J. L. Sperry; AMNH). 2. Male, Sudbury, Ontario, July 8, 1959 (J. C. E. Riotte; AMNH). 3. Male, Wellington, British Columbia, July 22, 1950 (R. Guppy; AMNH). 4. Male, near La Pine, Oregon, July 26, 1960 (J. H. Baker; AMNH). 5. Male, Wagon Camp Road, California, July 8, 1934 (G. H. and J. L. Sperry; AMNH). 6. Bilateral gynandromorph, Artesian Springs, California, June 25, 1939 (J. A. Comstock; LAM). All X1.8.



FIGS. 7-12. Males of *Hesperumia*. 7-9. *H. fumosaria fumosaria* Comstock. 7. Los Angeles, California, June (O. Buchholz; AMNH). 8. Lytle Creek, California, July 1, 1937 (G. H. and J. L. Sperry; AMNH). 9. Holotype, Bouquet Canyon, California, June 14, 1937 (LAM). 10. *H. fumosaria impensa*, new subspecies, holotype, Miami Ranger Station, California, July 1, 1946 (F. H. Rindge; AMNH). 11. *H. latipennis* (Hulst), Mohawk, California, July 9, 1946 (W. R. Bauer; AMNH). 12. *H. fumida* (Warren), Big Thompson Canyon, Colorado, July 9, 1955 (R. H. Leuschner; AMNH). All $\times 1.75$.

Forewings broad, outer margin varying from smoothly rounded to weakly concave between veins; fovea present in male, small and simple; 11 or 12 veins present; Sc and R_1 anastomosed, either remaining united distally or splitting; areole present or absent, when present delimited by short, weak cross vein; R_5 from stalk of R_{3+4} ; M_1 from upper angle, mdc straight, ldc curved; Cu_1 from before lower angle. Hind wings broad, with rounded or weakly concave outer margin; frenulum strong in both sexes; Sc paralleling R for almost half length of cell; R and M_1 from before upper angle; m+ldc curved; M_3 from lower angle; Cu_1 from about one-fourth of distance between angle and Cu_2 .

Upper surface of forewings varying from yellow to brown or grayish brown, with cross lines and discal dots absent, weakly or strongly represented; hind wings paler than or concolorous with forewings, maculation absent or reduced.

Male Genitalia. Uncus triangular or with concave lateral margins, length subequal to width of base, apical region more or less laterally compressed, with posterior ridge or crest, apex ventroanterior, as transversally curved ridge or single acute point; socius absent; gnathos large, well sclerotized, U-shaped, with finely dentate swollen or elongate median enlargement; valves broad basally, symmetrical, apically pointed, costa sclerotized, with or without basal swelling having numerous elongate setae from dorsal surface, cucullus slightly swollen, sclerotized, with posterior, more heavily sclerotized, simple or dentate ridge terminating in elongate spinelike projection, and with sclerotized valvular area bearing one to four strong spines; transtilla absent; anellus with broad, sclerotized anterior area, posterior margin truncate or slightly pointed, extending posteriorly as elongate, more or less heavily sclerotized, rodlike structure, apically bifurcate, flattened or Y-shaped; cristae present, approximately 24 on each side, moderate to inconspicuous; tegumen broad, deep; saccus narrower, rounded or bluntly pointed; aedeagus relatively broad, varying in length from equal to combined lengths of uncus, tegumen and saccus to that of tegumen and saccus, posterior half membranous, having two lateral, slender, heavily sclerotized processes of varying shapes; vesica with single thick spine having strip of very slender setae, and

terminating in from one to three points, when exerted recurving along aedeagus or extended dorsally and at right angle to aedeagus.

Female Genitalia. Sterigma with prominent central sclerotized area, lateral areas more or less sclerotized, and having deep intersegmental fold; ductus bursae varying from having two, short sclerotized pieces to scarcely differentiated; ductus seminalis arising ventrally or on right side near posterior end of corpus bursae; corpus bursae long and more or less slender, posterior portion slender, sclerotized, longitudinally striate or finely dentate, anterior portion swollen; signum in form of transverse, indented ridge. Apophyses very long, apophyses posteriores 3.7 to 7.0 mm. in length, apophyses anteriores 2.6 to 6.1 mm. long.

Early Stages. The complete life history of *sulphuraria* has been published and, with the exception of the egg, illustrated (Dyar, 1904; Comstock and Dammers, 1934; Comstock, 1937; Sugden, 1964). The larva and pupa of *latipennis* were described and illustrated by Hardy (1958). None of the finer details of the caterpillars has been given, so it is not possible to characterize the larvae, although they do have two pairs of subdorsal tubercles on the second abdominal segment. The pupa of *sulphuraria* has been described as having either a cremaster of four hooks, one pair being very short (Comstock and Dammers, 1934), or having one with the "usual two spines" (Forbes, 1945); the six I have examined are of the second type. The former character of the cremaster does not agree with the primary division of the Ennominae (Forbes, 1948), where the subfamily is basically separated into tribes that have a cremaster ending in two spines and those ending in eight hooked setae. Among the genera included by Forbes (*op. cit.*) in the Boarmiini was "*Hesperumia* (?)." The pupa of *latipennis* has a cremaster with two short, stout spines (Hardy, 1958).

Food Plants. The hosts of three of the four species are known. *Sulphuraria* is polyphagous, *fumosaria* has been reared on various genera of Rosaceae, Rhamnaceae, and Ericaceae, and *latipennis* feeds on *Holodiscus* (Rosaceae).

Type Species. For *Hesperumia*, *sulphuraria* Packard; sole included species. For *Ultracis*, *latipennis* Hulst; by original designation.

Distribution. One species is transcontinental in distribution and extends throughout most of western North America; the remaining three species all occur only in western North America.

KEY TO SPECIES
BASED ON COLOR, MACULATION
AND DISTRIBUTION

1. Upper surface of forewings cream colored or yellow, with variable amount of brown scaling; hind wings contrastingly white; rarely with all wings brown, without cross lines 2
Upper surface of all wings grayish brown or brown, with distinct cross lines 4
2. Upper surface of forewings with large (1 to 2 mm. wide and 2 mm. long), round or elliptical discal spot having some pale scaling medially; transcontinental and western North America in distribution . *sulphuraria*
Upper surface of forewings with smaller (0.7 to 1.0 mm. wide and 1.5 mm. long) solid colored discal dot; California, southwestern Oregon, northern Baja California 3
3. Length of forewing 15 to 17 mm.; approximately one-third of specimens with median area of forewing above brown, this color extending from discal dot to t. p. line; southern California and northern Baja California *fumosaria fumosaria*
Length of forewing 18 to 21 mm.; approximately one-tenth of specimens with median area of forewing above broadly brown, this color extending from t. a. to t. p. lines; central and northern California, southwestern Oregon . . *fumosaria impensa*
4. Upper surface of wings grayish brown; length of forewing 16 to 20 mm.; male antennae with longest pectinations 0.8 to 1.1 mm. in length; Pacific Coast states *latipennis*
Upper surface of wings dark brownish gray; length of forewing 15 to 17 mm.; male antennae with longest pectinations 0.4 mm. in length; Colorado and southern Wyoming *fumida*

BASED ON MALE GENITALIA

1. Base of each valve swollen, bearing numerous, very long setae from outer surface 2
Base of each valve without swelling or setae 3

2. Aedeagus with heavily sclerotized process on left side not enlarged distally, tapering to blunt point *sulphuraria*
Aedeagus with process on left side capitate *fumosaria*
3. Anellus with posterior projection slender, very heavily sclerotized, apex Y-shaped *latipennis*
Anellus with posterior projection less heavily sclerotized, apically enlarged and approximately T-shaped *fumida*

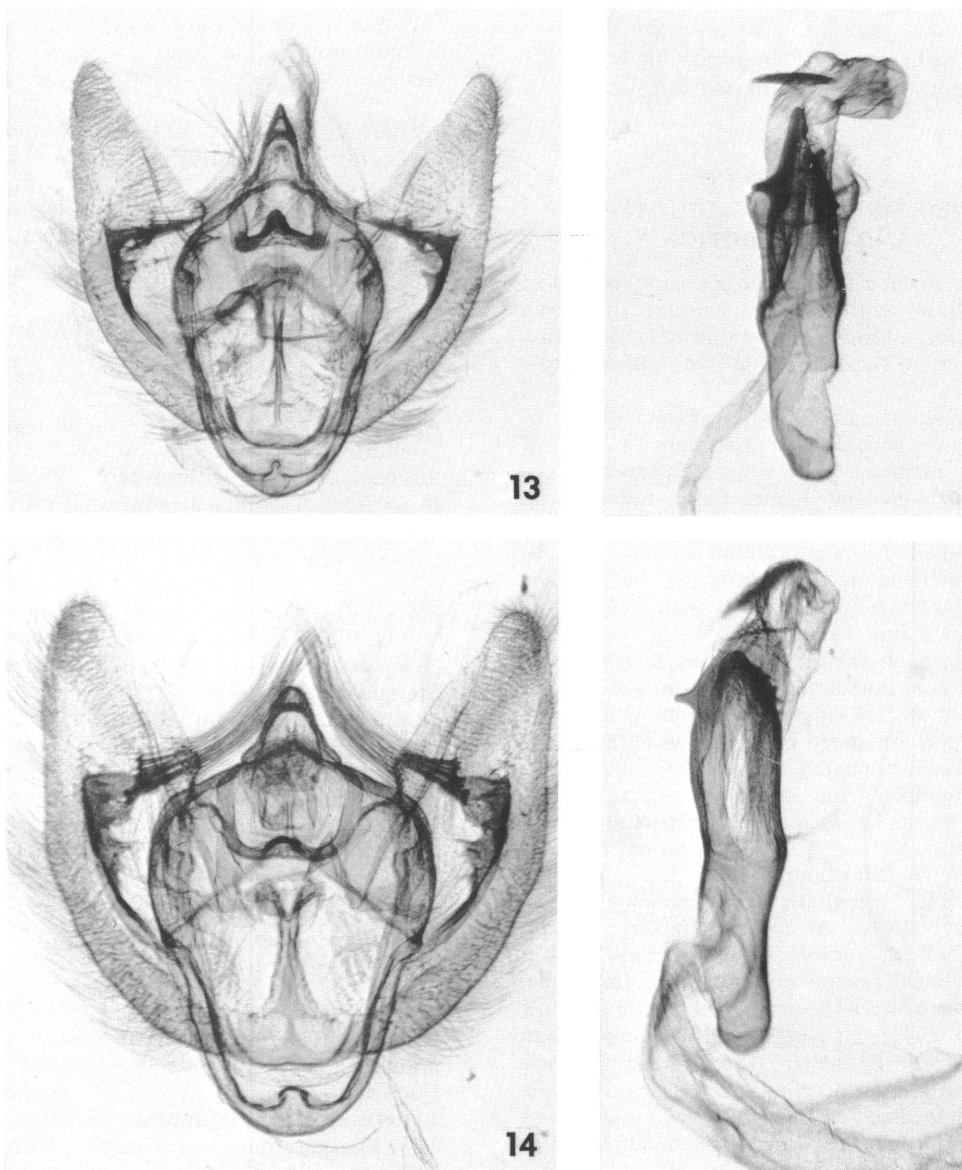
BASED ON FEMALE GENITALIA

1. Apophyses posteriores 4.9 mm. in length or longer 2
Apophyses posteriores 4.2 mm. in length or shorter 3
2. Sterigma elliptical, with posterior end broadly rounded or with median indentation; posterodorsal portion of corpus bursae with membranous area about 0.5 mm. in length *sulphuraria*
Sterigma triangular, with posterior end bluntly pointed; posterodorsal portion of corpus bursae sclerotized *fumosaria*
3. Sterigma large, 0.6 to 0.7 mm. across, rounded; corpus bursae with posterior end wider than sterigma, without noticeable ductus bursae *latipennis*
Sterigma smaller, 0.4 to 0.5 mm. across, tapering anteriorly to blunt point; corpus bursae narrowed posteriorly, with definite ductus bursae *fumida*

Hesperumia sulphuraria Packard
Figures 1-6, 13, 17, 18, 22

Hesperumia sulphuraria Packard, 1873a, p. 79. Henshaw, 1887, p. 41. Barnes and McDunnough, 1917, p. 113. Blackmore, 1927, p. 41. Forbes, 1928, p. 600; 1945, p. 209; 1948, p. 51. Comstock and Dammers, 1934, p. 31, pls. 10, 11 (caterpillar and pupa). Comstock, 1937, p. 124, pl. 56 (caterpillar). McDunnough, 1938, p. 161. Procter, 1938, p. 238; 1946, p. 276. Jones, 1951, p. 129. Tietz, [1952], p. 135. Ferguson, 1954, p. 312. Moore, 1955, p. 69. Prentice, 1963, p. 432, fig. 268 (distribution in Canada). Sugden, 1964, p. 36. Muller, 1965, p. 75. Covell, 1970, p. 176.

Opisthograptis sulphuraria: Packard, 1876, p. 477, pl. 11, fig. 47 (adult male). Gumpfenberg, 1896, p. 306.



FIGS. 13, 14. Male genitalia of *Hesperumia*. 13. *H. sulphuraria* Packard, Guatay, California, July 9, 1953 (W. J. and J. W. Gertsch; AMNH). 14. *H. fumosaria impensa*, new subspecies, paratype, Yosemite National Park, California, April 30, 1949 (H. Ghosn; AMNH).

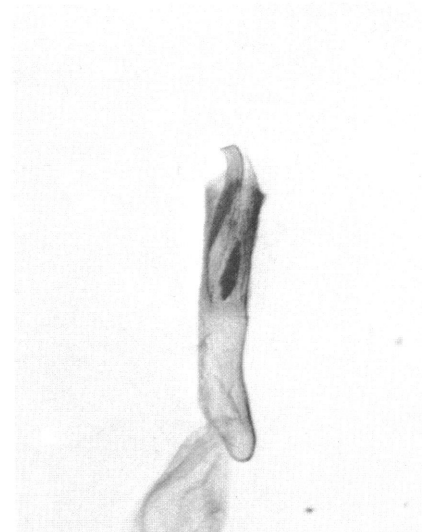
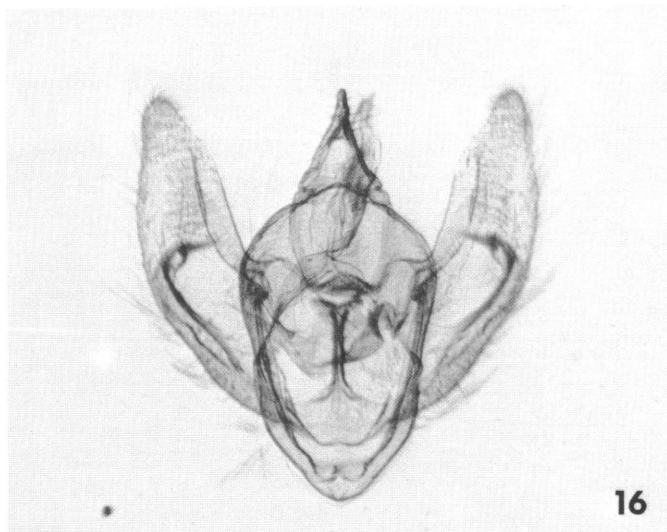
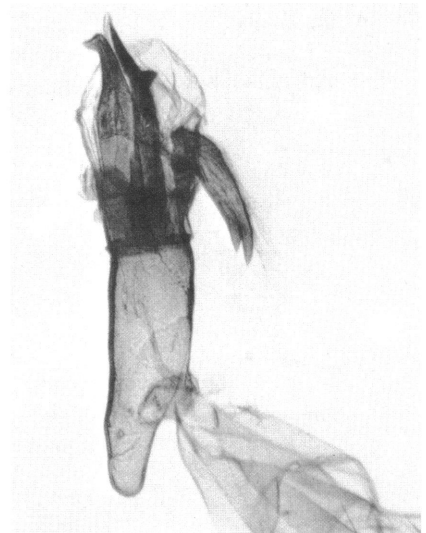
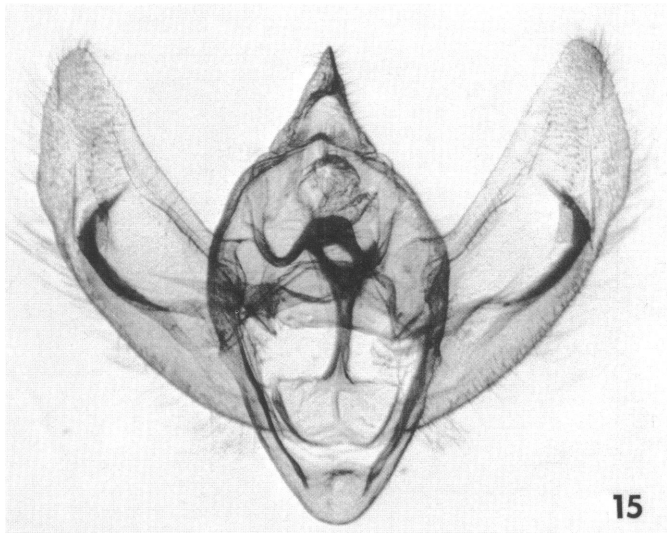
Opistograptis [sic] *sulphuraria*: Smith, 1891, p. 66.

Rumia sulphuraria: Anon., 1882, p. 25.

Alcis sulphuraria: Hulst, 1896, p. 345. Dyar,

"1902" [1903], p. 320; 1904, p. 909. Smith, 1903, p. 76.

Hesperumia ochreatea Packard, 1873b, p. 37. Henshaw, 1887, p. 41.



FIGS. 15, 16. Male genitalia of *Hesperumia*. 15. *H. latipennis* (Hulst), Oregon Caves National Monument, Oregon, July 10, 1958 (AMNH). 16. *H. fumida* (Warren), Estes Park, Colorado, July 17, 1968 (A. and M. E. Blanchard; AMNH).

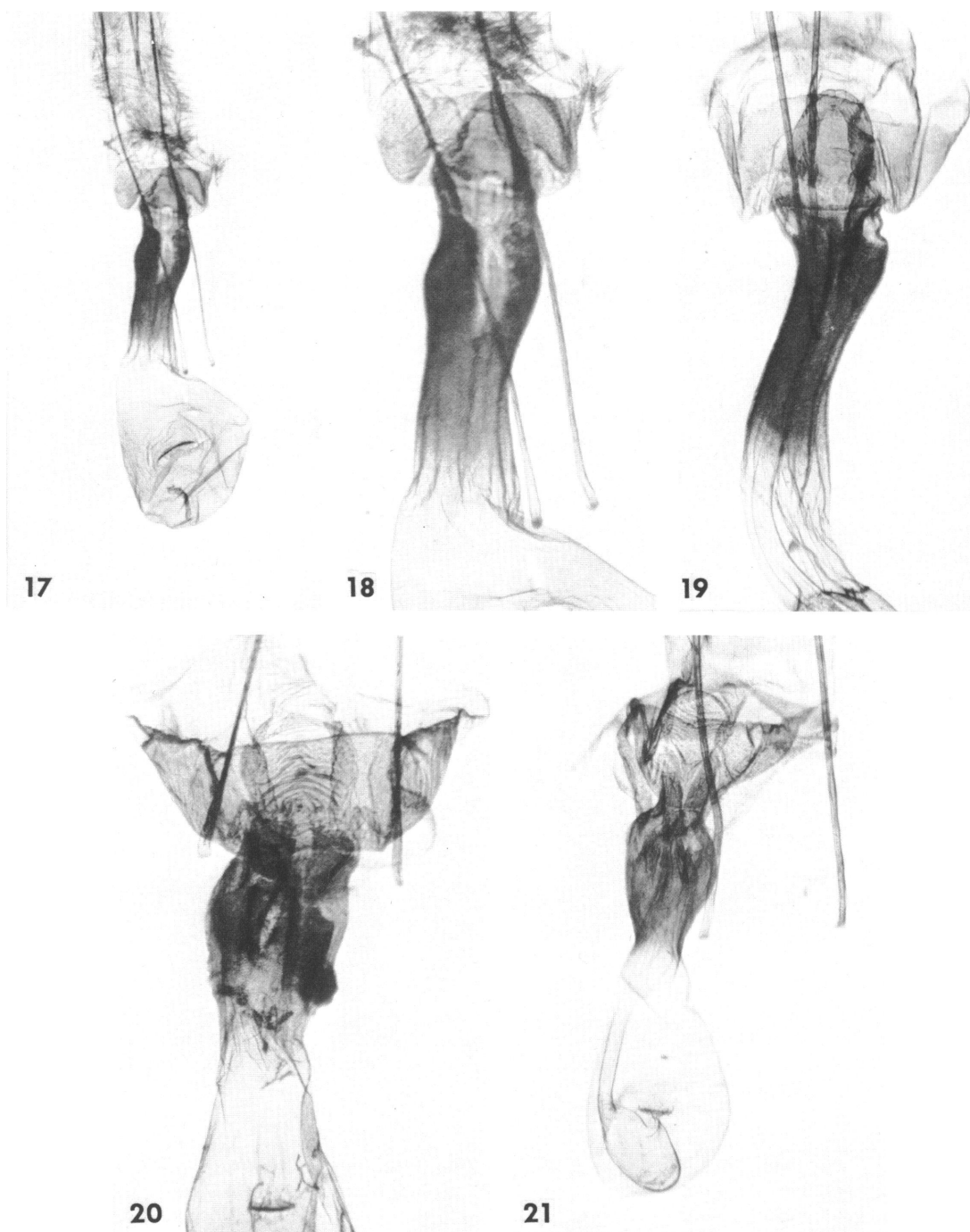
Opisthograptis ochreata: Packard, 1876, p. 477 (placed as synonym of *sulphuraria*).

Hesperumia sulphuraria ochreata: Barnes and McDunnough, 1917, p. 113. Blackmore, 1927, p. 41. McDunnough, 1927, p. 246; 1938, p. 161. Jones, 1951, p. 129. Return to synonymy.

Rumia baltearia Hulst, 1880, p. 43; 1886b, p. 51 (placed as variety of *ochrearia* [sic]). Anon., 1882, p. 25. Rindge, 1955, p. 138.

Alcis baltearia: Holland, 1919, pl. 44, fig. 1 ("type ♂").

Opisthograptis [sic] *sulphuraria baltearia*: Smith, 1891, p. 66.



FIGS. 17-21. Female genitalia of *Hesperumia*. 17, 18. *H. sulphuraria* Packard, Childs Meadows, California, July 9, 1939 (G. H. and J. L. Sperry; AMNH). 19. *H. fumosaria fumosaria* Comstock, Descanso, California, August, 1947 (N. Crickmer; AMNH). 20. *H. latipennis* (Hulst), Rimrock, Washington, July 28, 1956 (A. I. Good; AMNH). 21. *H. fumida* (Warren), Estes Park, Colorado, July 16, 1968 (A. and M. E. Blanchard; AMNH).

- Alcis sulphuraria baltearia*: Dyar, "1902" [1903], p. 320. Smith, 1903, p. 76.
- Alcis sulphuraria* form *baltearia*: Holland, 1919, p. 343.
- Hesperumia sulphuraria* var. *baltearia*: Forbes, 1948, p. 51.
- Hesperumia sulphuraria ochreata* form *baltearia*: Barnes and McDunnough, 1917, p. 113. Blackmore, 1927, p. 41. McDunnough, 1938, p. 161.
- Rumia ochrearia* var. *unicoloraria* Hulst, 1886a, p. 208. Rindge, 1955, p. 155.
- Opistograptis* [*sic*] *sulphuraria unicoloraria*: Smith, 1891, p. 66.
- Alcis sulphuraria unicoloraria*: Dyar, "1902" [1903], p. 320. Smith, 1903, p. 76.
- Hesperumia sulphuraria* var. *unicoloraria*: Forbes, 1948, p. 51.
- Hesperumia sulphuraria ochreata* form *unicoloraria*: Barnes and McDunnough, 1917, p. 113. Blackmore, 1927, p. 41. McDunnough, 1938, p. 161. Jones, 1951, p. 129.
- Hesperumia sulphuraria* form *duaria* Cassino and Swett, 1922, p. 177.
- Hesperumia sulphuraria ochreata* form *duaria*: McDunnough, 1938, p. 161.

Diagnosis. This species has the upper surface of the forewings cream to deep yellow; the discal spot, when present, is large and either round or elliptical, and usually has a pale center. The maculation is very variable; the forewings range from being completely immaculate, to having the cross lines represented by dots or broad lines, to having the median area brown. The genitalia of both sexes possess good specific characters (see keys).

Male. Head with vertex cream colored to pale yellow; front cream to pale yellow medially, lateral margins and ventrally becoming brownish; palpi grayish brown; antennae with longest pectinations about 0.8 mm. in length. Thorax above cream colored; collar and patagia of some specimens faintly yellow; below pale grayish white; legs pale grayish white, with outer surface of forelegs and, to lesser extent, middle legs, grayish brown. Abdomen faintly cream colored above and below.

Upper Surface of Wings: Forewings varying from cream colored to bright yellow; maculation extremely variable, with wings varying from immaculate, to having cross lines represented by

either small dots or broad lines, to having part or entire median area more or less completely brown; discal spot usually present, dark brown, round or elliptical, large, 1 to 2 mm. wide and 2 mm. long, with some pale scaling medially; t. a. line, when present, arising on costa one-fourth distance from base, outwardly curved into cell, then going more or less at right angle to inner margin; median shade line, when present, arising near middle of costa and extending to discal spot, curving basad and thence to inner margin; t. p. line, when present, arising on costa three-fourths distance from base, slightly concave to vein M_1 , then weakly S-shaped to inner margin, tending to have line thickened or outwardly dentate on veins; s. t. line absent; terminal line absent or weakly represented, pale brown; fringe varying from being concolorous with wing to dark brown. Hind wings white or pale grayish white, some suffused with yellow distally, and having a few scattered brown scales; maculation absent in most specimens, but brown postdiscal line sometimes partially represented; discal dot and terminal line absent; fringe concolorous with wing or slightly darkened.

Under Surface of Wings: All wings pale cream colored to yellow; forewings with discal spot and cross lines more or less indicated; hind wings often with faint, small discal dot; fringes similar to those of upper surface.

Length of Forewing: 15 to 20 mm.

Female. Similar to male; antennae very shortly serrate.

Length of Forewing: 14 to 20 mm.

Male Genitalia. Uncus with concave lateral margins, apex with posterior end rounded, terminating in curved transverse ridge; gnathos with moderately elongate, median enlargement, apex bluntly pointed to nearly truncate; valves with swelling at base of each costa, with elongate setae from dorsal surface extending posteriad of uncus, sacculus with raised ridge 0.2 mm. from edge of valve, having asymmetrical median teeth or protuberances; anellus with posterior margin pointed, extending posteriorly to form slender rodlike structure, having median dorsal ridge, apically with less heavily sclerotized, posteriorly rounded flangelike lateral extensions; aedeagus about equal in length to combined lengths of uncus, tegumen, and saccus, 1.8 to 2.0 mm. long,

with sclerotized process on left side slightly longer than that on right, with prominent median protuberance, and tapering to blunt point, process on right side slightly curved, with median row of small teeth; vesica, when exerted, with spine extending to left side or dorsally at approximate right angle to aedeagus, 0.3 to 0.4 mm. in length, terminating in single point.

Female Genitalia. Sterigma with central area heavily sclerotized, platelike, somewhat variable in shape, roughly elliptical, larger anterior end varying from truncate to having shallow median incision, in length 0.5 mm., greatest width 0.4 to 0.5 mm.; lateral areas of lamella postvaginalis less heavily sclerotized than central area, wider and longer, with posterior and lateral margins rounded, anteromedial margin concave; ductus bursae scarcely differentiated, slightly wider than central plate of sterigma; corpus bursae with slender posterior portion finely dentate except for membranous posterodorsal strip about 0.5 mm. in length, posterior end slightly asymmetrical with small swelling on right side, weakly tapering anteriorly, and with rounded membranous anterior portion; signum 0.3 to 0.6 mm. wide; apophyses posteriores 4.9 to 5.6 mm. in length.

Early Stages. All stages have been described, and some of them have been illustrated: the egg by Dyar (1904, p. 909); mature caterpillars by Comstock and Dammers (1934, p. 31, pl. 10), Comstock (1937, p. 124, pl. 56), and Sugden (1964, p. 36); the pupae by Comstock and Dammers (1934, p. 31, pl. 11) and Forbes (1945, p. 209). The caterpillars are apparently rather variable in color and maculation, and differences apparently occur in the cremaster of the pupae; it is possible that specimens of the following species from California may have been described as *sulphuraria*. The specimen originally reared by Comstock and Dammers, from Pine Knot, California, has apparently been lost (Donahue, in letter), so its identification cannot be checked. The above authors reared additional specimens on *Ceanothus* from Bouquet Canyon, California; moths of *sulphuraria* and *fumosaria* from that locality that were fed *Ceanothus* have been studied.

Food Plants. This species is polyphagous. One or more species in each of the following genera has been reported as a food plant: *Larix*, *Picea*,

Pinus, *Pseudotsuga*, *Tsuga* (Pinaceae); *Populus*, *Salix* (Salicaceae); *Alnus*, *Betula* (Betulaceae); *Ribes* (Saxifragaceae); *Adenostoma*, *Ame-lanchier*, *Cercocarpus*, *Holodiscus*, *Rosa*, *Prunus* (Rosaceae); *Ceanothus* (Rhamnaceae); *Cornus* (Cornaceae); ?*Gaylussacia*, *Vaccinium* (Ericaceae); *Symphoricarpos* (Caprifoliaceae). The above records have been taken both from the literature and previously unpublished ones have been added from label data on specimens studied. The citations from the literature are Comstock and Dammers (1934), Comstock (1937), Forbes (1948), Jones (1951), Tietz ([1952]), Ferguson (1954), Prentice (1963), Sugden (1964), and Muller (1965).

Types. Packard described *sulphuraria* from two males. One of these is in the Museum of Comparative Zoology; it is hereby designated as the lectotype. The specimen is in good condition, although the right hind wing is torn and the abdomen is missing. The location of the second type specimen is not known.

Packard described *ochreata* from "1♂, 2♀, Sierra Nevada, Cal., and Nevada (Edwards)." There are two specimens labeled types in the collection of the Museum of Comparative Zoology. One is a male in excellent condition from "California," bearing Henry Edwards's number 1363; in Edwards's catalogue at the American Museum of Natural History the entry for this number says "Hesperumia ochreata Packd., Santa Clara Co., [California], June (H. Edwards), taken by beating bushes in pine forests." The second specimen is a somewhat rubbed female, labeled "Nevada" and Henry Edwards's number 2856. The catalogue entry for this number reads "Hesperumia ochreata Packd., Virginia [City], Nevada, Santa Clara Co. [California], July (H. Edwards), in bushy places; = 1363." The third specimen has not been located; there are two males and one female in the American Museum of Natural History labeled Nevada, number 2856, but none bear a type label. As the data on the male in the Museum of Comparative Zoology do not agree with those published in the original description, it is thought advisable to designate the female as lectotype; it is MCZ 14602.

Hulst described *baltearia* from four specimens, sex not specified, from Minnesota and Colorado.

The specimen from the Hulst collection is a male from Minnesota; it is in the American Museum of Natural History (Rindge, 1955, p. 138) and is hereby designated as the lectotype. Both the left forewing and abdomen are missing. The moth figured by Holland (1919, pl. 44, fig. 1) as "type ♂" is in the Carnegie Museum; the only label data on the moth is "Ariz. 11" or "Aug. 12," handwritten, and there is no type label or anything to indicate that the specimen was ever seen by Hulst (Clench, in letter). This specimen is considered to be a spurious type. In the collection of the National Museum of Natural History there is a male labeled as a type, bearing the locality data "Wash. T." (Washington Territory); as this locality was not mentioned in the original description, the specimen is also considered to be a spurious type.

Hulst described *unicoloraria* in a single sentence, without giving any information as to number of specimens or locality. The specimen from the Hulst collection, now in the American Museum of Natural History, is a male from Arizona in very good condition, with the genitalia mounted on slide FHR 17240. There is a female in the National Museum of Natural History

labeled as type, and also from "Ariz." The above male is hereby designated as the lectotype.

The holotype, male, and allotype, female, of *duaria* are in the Museum of Comparative Zoology, bearing their type number 22114. The holotype is rather battered and lacks the left forewing.

Type localities. Streaked Mountain, Paris, Oxford County, Maine (*sulphuraria*); Virginia City, Storey County, Nevada (*ochreatea*); Minnesota (*baltearia*); Arizona (*unicoloraria*); Davis Creek, Modoc County, California (*duaria*).

Distribution. Transcontinental across southern Canada and the northern United States. In Canada this species extends from Nova Scotia to British Columbia, occurring in every province (Prentice, 1963, fig. 268) and in the District of Mackenzie, Northwest Territories. In the eastern United States the species occurs as far south as Virginia and Missouri. It extends westward across the northern tier of states to the Black Hills of South Dakota, the Rocky Mountains, and the Pacific Coast states. In the west it extends south into northern Arizona, New Mexico, possibly western Texas (this last record needs to be verified), and across the Great Basin; in California it

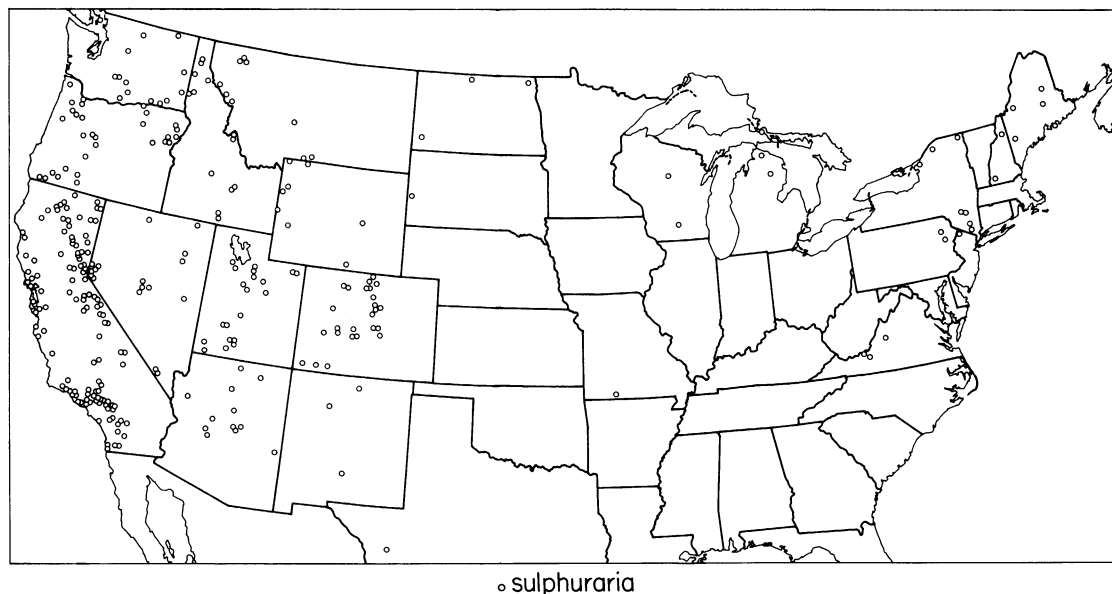


FIG. 22. Distribution of *Hesperumia sulphuraria* Packard in the United States.

is one of the most widespread species of geometrid (see fig. 22). No specimens have been seen from Mexico.

Flight Period. The majority of specimens have been taken in June, July, and August; the species is normally univoltine. Occasional specimens have been taken from March into October; it is possible that *sulphuraria* has a complete or partial second generation.

Remarks. Two thousand forty specimens (1143 males, 897 females) and 29 genitalic dissections (20 males, nine females) have been studied.

Packard described *sulphuraria* from Maine and *ochreata* from Nevada within a few months' time (1873a, 1873b); he recognized in 1876 (p. 478) that they represented the same species. *Ochreata* remained as a synonym until Barnes and McDunnough (1917, p. 113) placed it as the western subspecies of *sulphuraria*; it has retained this status until now. I see no consistent character or characters that can be used to separate the two, and so am returning *ochreata* to the synonymy of *sulphuraria*.

One characteristic of this widespread species is its variability. The variation extends from having completely immaculate yellow forewings (form "unicoloraria"), to having forewings with a strongly represented discal spot, relatively weak cross lines, and a yellow median area (*sulphuraria*), to having thick, prominent cross lines (form "duaria"), to having the median area brown (form "baltearia"). Any of the above major forms, with intergrades, can occur in any area; in general, eastern specimens tend to be slightly less variable than do those from the west. Figures 1-5 show some of the variations in pattern that are present in *sulphuraria*.

Figure 6 is a bilateral gynandromorph; the left side is male and the right female. This is the only specimen of this nature known to me in this genus.

Hesperumia fumosaria Comstock,
new status

Hesperumia sulphuraria form *fumosaria* Comstock, 1937, p. 123.

Diagnosis. This species may be separated from *sulphuraria* by the smaller, unicolorous discal

dot, when present, on the upper surface of the forewings. The genitalia of both sexes have good specific characters; some of these are outlined in the keys.

Male. Head, thorax, and abdomen similar to those of *sulphuraria*.

Upper Surface of Wings: Forewings similar to those of *sulphuraria*, differing mainly as follows: color averaging slightly less yellow, being more cream colored and pale yellow; maculation differing mainly by smaller, solid brown discal dot, 0.7 to 1.0 mm. wide and 1.5 mm. in length when present; fewer specimens with cross lines, and more with brown median area, latter usually separated from costal margin by band of cream or pale yellow along costa; most specimens with dark brown fringe. Hind wings similar to those of *sulphuraria*, differing mainly by most specimens having dark fringe.

Under Surface of Wings: Similar to that of *sulphuraria*, differing mainly as follows: all wings tending to be slightly deeper yellow, with more scattered brown scaling, and most specimens having brown fringes.

Length of Forewing: 15 to 21 mm.

Female. Similar to male, but having upper surface of wings a brighter yellow; fewer specimens with brown median area, and more tending to have greatly reduced maculation; antennae very shortly serrate.

Length of Forewing: 15 to 20 mm.

Male Genitalia. Similar to those of *sulphuraria*, differing mainly as follows: uncus slightly shorter, with apex more rounded; gnathos with more slender sides, more rounded in outline; valves with sacculus ridge tending to be wider and to have more teeth or protuberances; anellus with rodlike structure slightly shorter, apically more bifurcate; aedeagus with left sclerotized process longer, capitate, with swelling extending anterodorsally to median protuberance, shorter right sclerotized process more curved distally; vesica minutely spiculate, when exerted, spine extending dorsally from right side.

Female Genitalia. Similar to those of *sulphuraria*, differing mainly as follows: sterigma with central platelike area larger, 0.6 mm. in length and 0.6 to 0.8 mm. wide, roughly triangular or bell-shaped, with anterior margin truncate, posteriorly tapering, apex rounded or with very shal-

low indentation; lateral areas of lamella postvaginalis not larger than central area; corpus bursae with posterodorsal surface finely dentate; apophyses posteriores 6.2 to 7.0 mm. in length.

Early Stages. Apparently undescribed (see discussion under *sulphuraria*).

Food Plants. The nominate subspecies has been reared on *Adenostoma*, *Cercocarpus*, *Rosa* (Rosaceae); *Ceanothus* (Rhamnaceae); *Arctostaphylos* (Ericaceae).

Remarks. The name of this species is available under Article 45(e) of the International Code of Zoological Nomenclature.

This species is divided into two subspecies. The population from southern California is small in size and has a relatively high percentage of the moths with a brown median area of the forewing in both sexes. The moths from central and northern California are larger and have about one-third as many specimens with the brown median area. This character appears to be restricted to the males. The data for the brown median area is given in table 1 for both *fumosaria* and *sulphuraria* occurring in the same geographic regions. The figures probably do not reflect accurately the percentages that are found in nature, as they

are based on specimens in collections. It is well known that collectors tend to catch various forms and aberrations at the expense of the normal variety and to add them to their collections; as has been mentioned, both these species abound with different color forms. However, it has not been recognized until now that what was called *sulphuraria* in California is really two species, one of which is represented by two subspecies. Thus no bias could have been applied to one or the other species, and the differential between the natural populations and museum collections should be constant.

Hesperumia fumosaria fumosaria

Comstock

Figures 7-9, 19, 23

Hesperumia sulphuraria form *fumosaria* Comstock, 1937, p. 123.

Hesperumia sulphuraria var. *fumosaria*: Forbes, 1948, p. 51.

Diagnosis. The population in southern California and northern Baja California consists of small-sized moths with approximately one-third having the median area of the forewings narrowly

TABLE 1
BROWN MEDIAN AREA OF FOREWINGS IN SPECIMENS OF *HESPERUMIA FUMOSARIA* AND
HESPERUMIA SULPHURARIA IN CALIFORNIA

		Median area		Total Specimens	Percent Brown	Portion of California
		Brown	Yellow			
<i>fumosaria fumosaria</i>	Male	85	139	224	38	Southern
	Female	60	110	170	35	
	Total	145	249	394	37	
<i>fumosaria impensa</i>	Male	20	77	97	20	Central, northern
	Female	0	73	73	0	
	Total	20	150	170	12	
<i>sulphuraria</i>	Male	24	173	197	12	Southern
	Female	17	124	141	12	
	Total	41	297	338	12	
<i>sulphuraria</i>	Male	37	171	208	18	Central, northern
	Female	40	229	269	15	
	Total	77	400	477	16	

brown, and the males tending to be cream colored.

Male. Forewings with upper surface cream colored; maculation varying from immaculate or rarely with cross lines (in approximately 60% of specimens) to having median area narrowly brown, extending from discal dot to t. p. line (remaining 40% of specimens), or rarely with entire upper surface completely suffused with brown.

Length of Forewing: 15 to 17 mm.

Female. Forewings with upper surface brighter yellow; maculation varying from immaculate or rarely with cross lines (in approximately 74% of specimens) to having median area narrowly brown (remaining 26% of specimens), or rarely with entire upper surface completely suffused with brown.

Length of Forewing: 15 to 17 mm.

Male Genitalia. As described for the species.

Female Genitalia. As described for the species.

Early Stages. Undescribed.

Food Plant. The holotype was reared on *Ade-nostoma* (Rosaceae). Other food plants include *Cercocarpus*, *Rosa* (Rosaceae); *Ceanothus* (Rhamnaceae); *Arctostaphylos* (Ericaceae).

Types. The holotype, male (see fig. 9), and allotype, female, are in the collection of the Natural History Museum of Los Angeles County. The genitalia of the holotype are mounted on slide FHR 17256.

Type Locality. Bouquet Canyon, Los Angeles County, California.

Distribution. Southern California and northern Baja California (see fig. 23). The moths occur from the coastal plain up into the San Bernardino and San Gabriel mountains, extending north into coastal Santa Barbara County. The species is absent from the Mojave and Sonora deserts. Specimens of this population and of *sulphuraria* have been caught flying at the same localities and same time; both species have been reared on *Ade-nostoma*, *Cercocarpus*, and *Ceanothus*.

Remarks. Five hundred fifty specimens (317 males, 233 females) and 10 genitalic dissections (six males, four females) have been studied.

***Hesperumia fumosaria impensa*,**

new subspecies

Figures 10, 14, 23

Diagnosis. The population from central and

northern California and from southwestern Oregon consists of larger moths with approximately one-seventh having the median area of the forewings broadly brown and the males tending to be yellower than those of the nominate population.

Male. Forewings with upper surface pale yellow; maculation varying from immaculate or rarely with cross lines represented by dots on veins (in approximately 80% of specimens) to having median area broadly brown, extending from t. a. to t. p. lines (remaining 20% of specimens).

Length of Forewing: 18 to 21 mm.; holotype, 19 mm.

Female. Forewings with upper surface brighter yellow; maculation immaculate or with weakly spotted t. p. line (no specimens with brown median area seen).

Length of Forewing: 18 to 20 mm.; allotype, 19 mm.

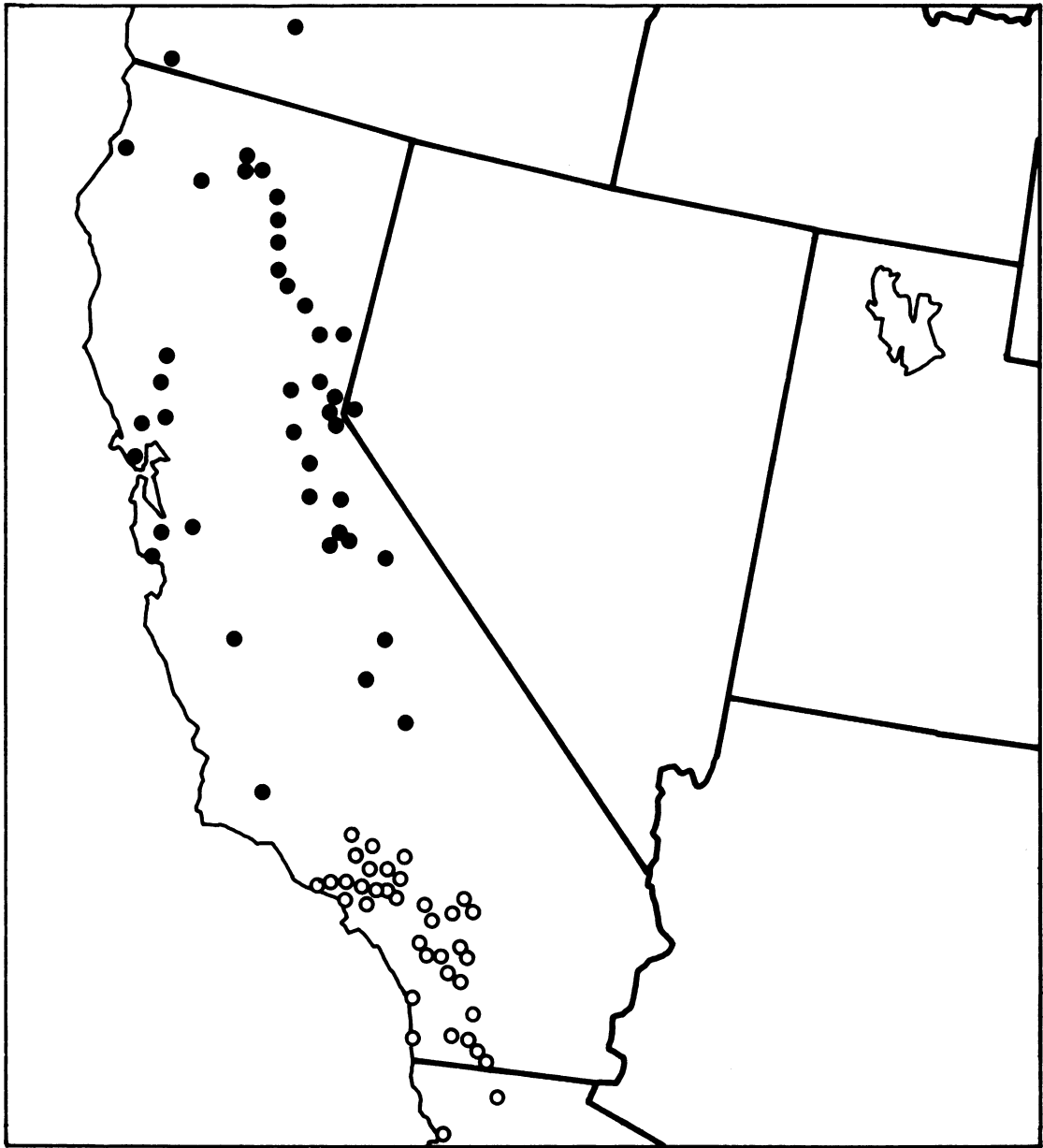
Male Genitalia. As described for the species.

Female Genitalia. As described for the species; tending to be slightly larger than for nominate subspecies.

Early Stages. Unknown.

Food Plant. Unknown.

Types. Holotype, male, Miami Ranger Station, Mariposa County, California, July 1, 1946 (F. H. Rindge); allotype, female, Keddie, Plumas County, California, July 20, 1941 (F. H. Rindge); both specimens are from the author's collection. The genitalia of the holotype are mounted on slide FHR 17325, and those of the allotype on FHR 17349. Paratypes: CALIFORNIA: *Calaveras County*: Buck Meadows, July 13, 1935 (E. C. Johnston), one female. *El Dorado County*: Meeks Bay, Lake Tahoe, July 14, 1941 (G. H. and J. L. Sperry), one male; Lake Tahoe, August 17, one male; Fallen Leaf Lake, Lake Tahoe, August 12, 1932 (H. H. Keifer), one male, one female; south fork, American River, Placerville-Pino Grande road, July 26, 1963 (H. B. Leech), two females. *Fresno County*: Cedar Grove, Kings River Canyon, July 17, 1952 (M. Cazier, W. Gertsch, R. Schrammel), three females. *Lake County*: Mt. Sanhedron, June 23, 1936 (E. C. Johnston), one male; Cash Creek, Lower Lake, May 10, 1926 (E. P. Van Duzee), one male; Lucerne, July 29, 30, 1955 (H. B. Leech), two females. *Marin County*: Mill Valley, June 20, 1909 (F. X. Williams), July 2, 1927 (H. H. Keifer), three males. *Mariposa Coun-*



○ *fumosaria fumosaria* ● *fumosaria impensa*

FIG. 23. Distribution of *Hesperumia fumosaria* Comstock.

ty: Miami Ranger Station, July 1, 2, 1946 (F. H. Rindge), two males. *Mendocino County*: Laytonville, July 24, 1949 (R. F. Sternitzky), one male. *Mono County*: Mammoth, July 17, 1936 (C. W. Kirkwood), August 11, 1955 (W. A. Rees), July 28, 1943, two males, two females. *Napa County*: Mt. St. Helena, June 9, 1918 (E. P. Van Duzee), two males, one female. *Placer County*: Michigan Bluff (E. R. Leach), one male, six females; Cisco, August 10, 1937, two females; Ward Creek, 2 miles south of Tahoe City, August 16, 1966 (N. Westerland), two females. *Plumas County*: Keddie, July 7, 19, 1941 (F. H. Rindge), one male, one female; Almanor, elevation 4500 feet, July 30, 31, 1965 (E. and I. Munroe), two males; 2 miles northwest of Almanor, elevation 4500 feet, August 1, 1965 (E. and I. Munroe), four males, one female; 3 miles northwest of Almanor, elevation 4500 feet (E. and I. Munroe), one male, one female; south end, Red Clover Valley, 8 miles north of Beckwourth, August 28, 1963 (H. B. Leech), six males, one female; Butt Valley, July 3, 1960 (D. C. Rentz), one female; Mohawk, July 5, 1946 (W. R. Bauer), one male. *San Benito County*: Head of Larious Creek, mountains above Idria, elevation 4350 feet, July 20, 1963 (H. Leech), two males; 0.4 mile south of highway 25, road to Pinnacles National Monument, July 19, 1963 (H. B. Leech), one female. *Santa Barbara County*: Figueroa Mountain, June 22, 29, 30, 1965, July 7, 1965 (C. W. Kirkwood), five females. *Santa Clara County*: Los Gatos, June 19, 1933 (J. A. Kusche), one male; San Antonio Valley, elevation 2000 feet, May 7, 1927 (T. Craig), one male. *Santa Cruz County*: Santa Cruz, July 7, July 6, 1927, two males. *Shasta County*: Hat Creek Ranger Station, July 2, 16, 17, 1947 (F. H. Rindge), three males, two females; Hat Creek Post Office, July 19, 1955 (J. W. MacSwain), one male; Hat Creek, August 13, 1956 (H. Ruckes, Jr.), one female, August 29, 1949 (W. R. Bauer), one female, without date, July 16, 17, 1951, July 16, 1952 (G. Pronin), one male, three females; McArthur-Burney Falls Park, June 21-24, 1960 (S. G. Jewett, Jr.), one male; 10 miles north of Lassen National Park, July 21, 1937 (J. A. Comstock), 22 males, 20 females. *Siskiyou County*: McBride Springs, Mt. Shasta, elevation 4800 feet, July 20, 23 24, 25, 1965 (E. and I. Munroe), six males, two females;

Mt. Shasta, July 20, 1936, August 19, 1939 (E. C. Johnston), two males; south fork, Sacramento River, elevation 3200 feet, July 7, 1963 (H. P. Chandler), one female; Fowlers Camp, 5 miles east of McCloud, July 22, 1962 (D. C. Rentz, C. D. MacNeill), seven males; 4 miles east of Shasta City, July 23, 1962 (D. C. Rentz, C. D. MacNeill), two males, one female; Sisson, August 1, 1910, one female. *Sonoma County*: The Geysers, June 21, 1935 (E. C. Johnston), two males. *Trinity County*: Carrville, elevation 2400-2500 feet, June 16, 1934 (E. C. Van Dyke), two males. *Tulare County*: Smoky Valley, June 21, 1954 (C. Ingham and C. Henne), one male; Big Meadows, July 25, 1954 (R. J. Ford), one male; Monachee Meadows, July 24-31, one male. *Tuolumne County*: Twain Harte, elevation 4000 feet, July, 1937 (F. E. Blaisdell), one female; 1.5 miles north of Pinecrest Lake, elevation 6000 feet, August 8, 1964 (H. B. Leech), one female. *Yosemite National Park*: April 30, 1949 (H. Ghosn), one male; Yosemite Valley, July, 1925 (E. H. Nast), one female; Glacier Point, elevation 7300 feet, July 28, 1962 (R. Leuschner), one female. **NEVADA**: *Douglas County*: Glenbrook, elevation 6300 feet, July 17, 1957 (C. W. Kirkwood), August 22, 1967 (D. L. Bauer), one male, one female. **OREGON**: *Josephine County*: O'Brien, July 31, 1972 (L. P. Gray), two males. *Klamath County*: Ft. Klamath, elevation 4000 feet, August 6, 1973 (R. H. Leuschner), one male.

The following specimens have been excluded from the type series because of incomplete or dubious data: California (H. Edwards), one male; "Sier. Nev., Cal." (H. Edwards), one male, one female; "Mt. Talhoe, Cal., 8-9-15," one female; Durango, [La Plata County], Colorado, August, one female; "Camp Baldy, San Bern. Mts., Calif., June 24-30," one male.

The holotype and allotype are in the collection of the American Museum of Natural History; paratypes are in the collections of that institution, the Canadian National Collection, the Natural History Museum of Los Angeles County, and of R. H. Leuschner.

Distribution. Widespread in central and northern California, and extending into adjacent Nevada and southwestern Oregon (see fig. 23). The moths are found in the Sierra and Cascade mountains, ranging from Tulare County, California,

into Josephine and Klamath counties, Oregon; in the western part of California they extend from the mountains of Santa Barbara County north.

One female, labeled Durango, [La Plata County], Colorado, has been examined; more material is required before this record can be accepted.

Flight Period. Late June, July, and August in the Sierra and Cascade mountains, with one specimen labeled April 30; May, June, and July in the coastal areas.

Remarks. Two hundred seventy-eight specimens (166 males, 112 females) and 11 genitalic dissections (seven males, four females) have been examined.

Specimens of *sulphuraria* have been examined from nearly every California locality of *impensa*.

Etymology. The subspecific name is from the Latin *impensus*, great or large, in reference to the size of the moths and to the width of the median brown band of the forewings being greater than that of the nominate population.

Hesperumia latipennis (Hulst),
new combination
Figures 11, 15, 20, 24

Alcis latipennis Hulst, 1896, p. 346. Dyar, "1902" [1903], p. 321. Smith, 1903, p. 76. Rindge, 1955, p. 147.

Cleora latipennis: Barnes and McDunnough, 1917, p. 118.

Ultralcis latipennis: McDunnough, 1920, p. 21, pl. 3, fig. 1 (male genitalia), pl. 7, fig. 12 (adult male), pl. 9, fig. 6 (male antenna); 1927, p. 226; 1938, p. 163. Blackmore, 1927, p. 42. Jones, 1951, p. 131. Hardy, 1958, p. C34, figs. (adult male; front of head, underside of segment, first and second abdominal segments of larva; cremaster of pupa).

Diagnosis. This species can be separated from the preceding ones by grayish brown color of the upper surface of the wings, with the fore and hind wings being the same color.

Male. Head with vertex grayish brown; front and palpi dark brown; antennae with longest pectinations 0.8 to 1.1 mm. in length. Thorax above gray to grayish brown, with collar slightly darker; below pale gray; legs with mixture of pale gray and brown scales, outer surface of fore and middle legs dark brown. Abdomen above with mix-

ture of gray and brown scales, posterior margin of each segment tending to be pale gray; below gray.

Upper Surface of Wings: Forewings pale gray with numerous scattered brown scales, producing unicolorous grayish brown; cross lines varying from obsolescent to complete, very slender; t. a. line tending to be obsolescent, when present arising on costa one-fourth distance from base, with basal tooth on radial vein, sharply outwardly curved in cell, then going more or less straight to meet inner margin about three-tenths distance from base; median shade band arising as brown spot near middle of costa, then becoming more or less obsolescent, apparently passing through or near small, dark brown discal spot, and going straight to inner margin; t. p. line arising on costa three-fourths distance from base, paralleling outer margin, thickened and with outward points on veins, more or less complete; s. t. line varying from being absent to very weakly represented, pale gray; terminal line dark brown, narrow or obsolescent at vein endings, thickened in cells; fringe concolorous with wing. Hind wings concolorous with forewings; intradiscal line rather broad, nebulous, straight; discal dot dark brown; extradiscal, s. t., and terminal lines, and fringe similar to those of forewings.

Under Surface of Wings: All wings unicolorous grayish brown; maculation of upper surface more or less represented.

Length of Forewing: 16 to 20 mm.

Female. Similar to male but with maculation of upper surface tending to be somewhat more obsolescent; antennae varying from simple but with terminal pair of small projections medially to very shortly serrate.

Length of Forewing: 16 to 19 mm.

Male Genitalia. Uncus tapering to sharp posterior ridge, latter angled anteroventrally, terminating in single point; gnathos with slender sides and elongate, weakly dentate median enlargement; valves relatively broad, without swelling at base of each costa, sacculus ridge extending to anterior margin of valve, without median teeth; anellus with straight posterior margin and small longitudinal median ridge, rodlike extension heavily sclerotized, narrow, curved ventro-posteriad, elongate, terminally Y-shaped; aedeagus 2.1 to 2.5 mm. in length, with sclerotized

process on left side thicker and slightly shorter than that on right, apex bent outward at approximately right angle to process, process on right side tapering to point and having outward tooth-like projection at about two-thirds of length; vesica, when exerted, with spine extending to right side, recurving back along aedeagus, spine 0.5 to 0.7 mm. in length, variable in shape, terminating in from one to four points.

Female Genitalia. Sterigma with central area sclerotized, round, width 0.6 to 0.7 mm., surface with several curved or weakly angulate transverse ridges; lateral areas of lamella postvaginalis less heavily sclerotized than central area, rounded, extending slightly anteriorly of central area; lamella antevaginalis in form of broad, weakly sclerotized area; ductus bursae not differentiated externally, appearing as broad sclerotized area, as wide as sterigmal plate, within membranous corpus bursae; corpus bursae constricted medially, posteriorly with short, centrally divided, dentate, sclerotized portion within membranous outer covering; signum 0.3 to 0.4 mm. wide; apophyses posteriores 3.7 to 4.0 mm. in length.

Early Stages. The mature larva and pupa have been described and illustrated by Hardy (1958).

Food Plant. *Holodiscus discolor* (Pursh) *Maximowicz* (Rosaceae).

Types. Hulst described *latipennis* without giving the number or sex of the specimens. There is a male labeled as type in the American Museum of Natural History from the Hulst collection (Rindge, 1955), and a female in the National Museum of Natural History. The former specimen is hereby designated as the lectotype.

Type Locality. Easton, Kittitas County, Washington.

Distribution. Southern British Columbia to central California (see fig. 24). The largest number of specimens have been taken along the Cascade Range from south-central British Columbia (McDunnough, 1927) into California, extending into the northern Sierra Nevadas. The species also occurs along the coastal area from Vancouver Island, British Columbia, and the Olympic Peninsula of northwestern Washington, south to the Monterey Peninsula of central California.

Flight Period. June, July, August, and early September.

Remarks. One hundred twenty-one specimens

(79 males, 42 females) and 16 genitalic dissections (11 males, five females) have been studied.

In general, the moths caught along the Cascade Mountains tend to be slightly grayer and to have more clearly defined maculation than do specimens from the coastal areas of British Columbia, Washington, and central California.

Hesperumia fumida (Warren),
new combination
Figures 12, 16, 21, 24

Exelis ? fumida Warren, 1904, p. 581.

Cleora fumida: Barnes and McDunnough, 1917, p. 118.

Mericisca fumida: McDunnough, 1938, p. 163.

Ultracis fumida: Rindge, 1958, p. 14, fig. 7 (adult male).

Diagnosis. This species can be distinguished from *latipennis* by its smaller size, darker color, shorter pectinations in the male antennae, and more strongly serrate female antennae. Good genitalic characters are present in both sexes; see the keys for details.

Male. Head with vertex dark grayish brown; front and palpi blackish brown; antennae with longest pectinations 0.4 mm. in length. Thorax above dark grayish brown; below dark gray; legs with mixture of gray and dark grayish brown scales, outer surface of fore and middle legs blackish brown. Abdomen above with mixture of gray and brown scales, posterior portions of each segment with broad blackish brown band, posterior margin narrowly gray; below grayish brown.

Upper Surface of Wings: Forewings dark gray with numerous blackish brown scales, producing unicolorous dark brownish gray; maculation similar to that of *latipennis*. Hind wings concolorous with forewings; maculation similar to that of *latipennis*.

Under Surface of Wings: All wings unicolorous dark gray, with scattered brown and blackish brown scales; maculation absent except for small discal dots on all wings and narrow, dark terminal line.

Length of Forewing: 15 to 17 mm.

Female. Similar to male but with maculation of upper surface tending to be somewhat more obsolescent; antennae varying from serrate to very shortly pectinate.

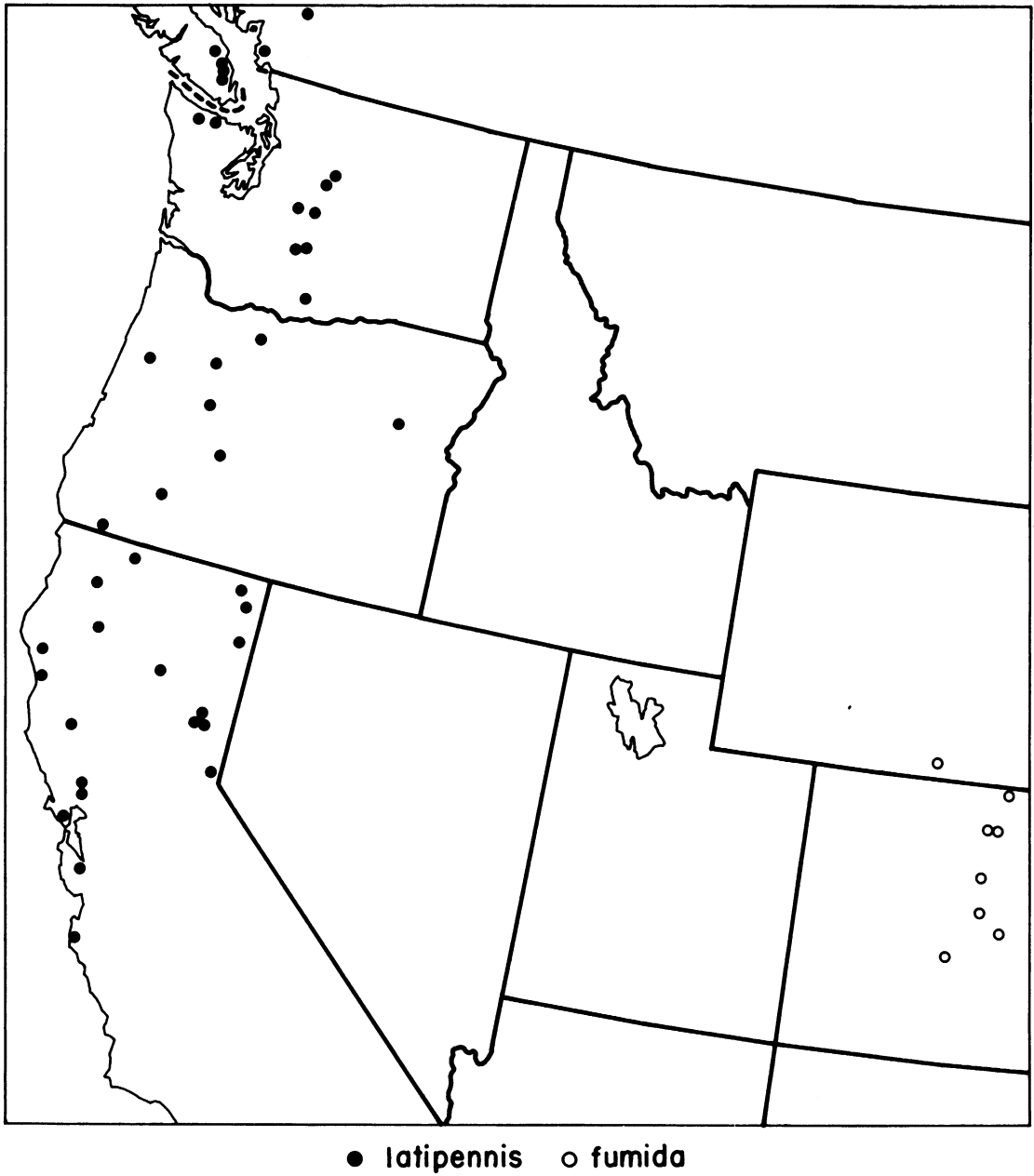


FIG. 24. Distribution of *Hesperumia latipennis* (Hulst) and *H. fumida* (Warren).

Length of Forewing: 15 to 16 mm.

Male Genitalia. Similar to those of *latipennis*, differing mainly as follows: smaller; uncus narrower; gnathos with weakly dentate median swelling; valves with each costa angled medially, and with saccular ridge sclerotized farther basad; anellus with posterior margin weakly pointed medially, rodlike extension flatter, less heavily sclerotized, slightly wider, with longitudinal lateral ridges, apex broadly expanded, roughly T-shaped, with small median indentation; aedeagus 1.5 to 1.6 mm. in length, with sclerotized process on left side thicker and slightly longer than that on right, apex outwardly pointed, process on right side tapering to sharp point, having prominent outward toothlike projection at about two-thirds of length; vesica with spine 0.25 to 0.30 mm. in length, variable in shape, terminating in from one to four points.

Female Genitalia. Similar to those of *latipennis*, differing mainly as follows: sterigma with central sclerotized area smaller, 0.4 to 0.5 mm. wide, tear-shaped, tapering to anterior point; lateral areas approximately same size as central area, well sclerotized, not extending anteriorly of central area; lamella antevaginal less clearly defined, with deeper median indentation; ductus bursae narrower than central area of sterigma, 0.3 mm. in width, longer than wide; corpus bursae swollen anteriorly of ductus bursae and constricted medially, posterior end with less developed internal, dentate area; signum smaller, not more than 0.2 mm. wide; apophyses posteriores longer, 3.8 to 4.2 mm. in length.

Early Stages. Unknown.

Food Plant. Unknown.

Type. Holotype, male, in the British Museum (Natural History).

Type Locality. South Park, Colorado. This intermountain area lies principally within Park County.

Distribution. The mountains of central and northern Colorado, and southern Wyoming (see fig. 24). All known localities for this species are on the eastern side of the continental divide.

Flight Period. July and early August.

Remarks. Forty-one specimens (34 males, seven females) and nine genitalic dissections (six males, three females) have been studied.

I have not examined the holotype; the identi-

fication was made by means of drawings of the maculation and genitalia, kindly furnished by Mr. D. S. Fletcher of the British Museum (Natural History) (Rindge, 1955).

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